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Hon Geo. N. Gilbert

THE

SUPPLEMENT

TO THE

PENNY CYCLOPÆDIA

OF

THE SOCIETY

FOR THE

DIFFUSION OF USEFUL KNOWLEDGE.

VOLUME II.

HABENARIA——ZINGIBER.

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[The abbreviations P. C. and P. C. S. signify the Penny Cyclopædia and Penny Cyclopædia Supplement.]

HABENA'RIA, a genus of plants belonging to the natural order Orchideæ. The tribe has a ringent hooded perianth, a 3-lobed entire spurred lip. There are three species natives of Great Britain.

Habenaria viridis, the Frog Orchis, has a very short 2-lobed spur, linear flat 3-pointed lip, the middle point the shortest. The flower is green, and the lip of a brownish colour. It is the Peristylus of Lindley, and the Himantoglossum of Reichenbach. It grows in pastures.

H. bifolia, the Lesser Butterfly Orchis, is distinguished by the lip being linear and entire, and the pollen masses parallel. The flowers are white. It is found in heathy places.

H. chlorantha, the Great Butterfly Orchis, has the same general characters as the preceding species; but the flowers are larger and the plant is taller and stouter. The pollen masses ascend obliquely and converge upwards. It grows in moist woods and thickets.

(Babington, *Manual of British Botany*.)

HABINGTON, WILLIAM, was the son of Thomas Habington, a Roman Catholic gentleman of family and fortune in Worcestershire. His mother, the daughter of Lord Morley, has been supposed to have been the writer of the famous letter which revealed the Gunpowder Plot [FAWKES, GUY, P. C.]; and her husband (who had been long imprisoned as implicated in Babington's conspiracy) gave shelter to some of the accomplices of Fawkes, and was sentenced to die, but received a pardon through the intercession of his wife's brother, on condition of retiring to his manor of Hindlip. Their son had been born there upon the very day now marked as the date of the plot, the 5th of November, 1605. He was educated in the Jesuit college of St. Omer, and afterwards at Paris; and endeavours were used, but in vain, to induce him to enter the society. He returned to England, and lived in retirement with his father, who long survived him, and who directed and co-operated with him in historical and other studies. William Habington married Lucy, daughter of William Herbert, the first Lord Powis; and the whole of his subsequent life appears to have been spent in literary and rural quiet. It is said by Anthony Wood that he 'did run with the times, and was not unknown to Oliver the Usurper,' a charge which may either be untrue or involve nothing discreditable. He died at Hindlip on the 13th of November, 1645, when he had but just completed his fortieth year. His published writings were the following:—1, 'Castara,' a collection of poems, first printed together in 1635, and again more fully and correctly in 1640. They were included in Chalmers's English Poets in 1810, were reprinted separately in 1812, and are given wholly in Southey's 'Select Works of the British Poets.' The name at the head of them is the poetical one he gave to the lady whom he married. They are in three parts: the first containing sonnets and other small pieces, chiefly addressed to his mistress before marriage; the second part containing similar poems, chiefly addressed to her as his wife; and the pieces in the third being mainly religious and contemplative. 2, 'The Queen of Arragon, a Tragi-Comedie,' acted both at court and at the Blackfriars theatre against the author's will, printed in 1640, folio, brought again upon the stage in 1666, with a prologue and epilogue by the author of Hudibras, and reprinted in all the three editions of Dodsley's 'Old Plays.' 3, 'The History of Edward IV.,' 1640, folio, said to have been partly written by his father. 4, 'Observations upon History,' 1641, 8vo.

Habington's poems, although infected by the tendency to puerile and abstruse conceit which prevailed in his time, are yet in most parts exceedingly delightful. Their fancy is sweet, especially in rural description; their feeling is refined and ideal; the language is correct and tasteful; and the tone of moral sentiment is everywhere pure and elevated. The romantic and chivalrous cast of thought and sentiment gives much interest to his play, although the story is meagre, and the characters are not vigorously depicted.

HABZE'LIA, a genus of plants belonging to the natural order Anonaceæ. It has a 3-lobed calyx; 6 petals, the inner ones smallest; the stamens very numerous; the torus convex, the carpels distinct, indefinite in number, long, cylindrical, obsoletely ventricose or torulose, smooth, striated lengthwise, becoming many-celled by the pericarp growing together; many-seeded, the seeds elliptical, arillate, somewhat erect, numerous, shining, one in each of the cells of the fruit; tho acillus formed of 2 white unequal obcordate membranes.

H. Æthiopica has ovate-acute leaves, 3 inches long, 12 to 14 lines broad, smooth on the upper surface, and downy beneath; the carpels are pod-shaped, 1-2 inches long, knotted, striated, quite smooth, with the taste of pepper. The fruit has a pungent aromatic taste, and is often substituted for other spices. It is the *Piper Æthiopicum* of the shops, and the Nuona Æthiopica of Duval and other botanists. It is a native of Sierra Leone. *H. aromatica* is another species, yielding a pungent aromatic fruit. It grows in the forests of Guyana, and the fruit is used by the negroes as a condiment.

(Lindley, *Flora Medica*.)

HACKERT, PHILIPP, a celebrated German landscape painter, was born at Prenzlau in Prussia, in 1737. His father was a portrait painter and a native of Berlin, where Hackert spent some time with an uncle who was a decorative painter. He acquired his chief knowledge of painting, however, by copying good pictures; and he derived great benefit also from the acquaintance of Le Sueur, the director of the Berlin Academy, and of Sulzer. In 1765 he visited Paris, and in 1768 he went, with his brother Johann, to Italy. They spent some time in Rome sketching and painting the scenery about Albano and Tivoli: many of their works were purchased by Lord Exeter. Philipp's first works of importance however were the six large pictures of the Russian naval victory of Tschesme, and the burning of the Turkish fleet, by Count Orlow, in 1770, painted for the empress Catherine II. of Russia, and for which he was paid 2950 zecchini, about 16,000 florins, or 1350*l.* sterling. Count Orlow, to whom the works were sent at Leghorn, was upon the whole highly gratified by their successful accomplishment, but he was dissatisfied with the representation of the explosion of a ship, in the picture of the burning of the fleet; and in order to give the artist a proper impression of such a catastrophe, he ordered, with a spirit worthy of an autocrat, one of the frigates of his fleet, an old vessel, to be blown up in the presence of Hackert, in the roads of Leghorn, and he was well satisfied with the results of his experiment, for Hackert greatly improved the picture. These works, with six other similar subjects, are now at St. Petersburg. In 1772, the year in which the first-mentioned pictures were completed, Johann Hackert died at Bath, aged only twenty-nine; he came to England with some pictures which had been ordered by English travellers in Rome. In the meanwhile two other brothers, Wilhelm and Karl, joined Philipp in Rome, but Wilhelm went shortly afterwards to St. Petersburg, and died there in 1780, aged only thirty-two, and Karl settled in Switzerland. Philipp accordingly in 1778 sent for his youngest brother Georg, who was an engraver at Berlin, and they lived together from that time until the death of Georg at Florence in 1805.

Hackert was highly patronised in Rome both by Italians and foreigners; Pius VI. was delighted with his works, and his reputation as a landscape painter was unrivalled by any of his contemporaries, though he was a very inferior painter to Wilson, who was neither appreciated nor known at that time: Wilson left Rome in 1755. In 1777 Hackert made a tuur in Sicily with Richard Payne Knight and Charles Gore; and in 1778 a tour in the north of Italy with Charles Gore and his family. In 1782 he went to Naples and was presented to the king, Ferdinand IV., by the Russian ambassador, Count Rasumowsky. The king took great pleasure in the works of Hackert, and treated him with great kindness and familiarity; he used to style him Don Filippo. In 1786, after the departure of Count Rasumowsky, he appointed Hackert his principal painter, who settled with his brother from that time in Naples. They had apartments in the Palazzo Francavilla on the Chiaja, which they occupied until they were dispossessed by General Rey, the French commandant of Naples in 1799, who took possession of them himself; he however treated the Hackerts with great kindness, gave them passports, and suffered them to depart with all their goods and chattels, with which they arrived safely at Leghorn. Hackert's salary was 100 ducats per month, with his apartments free, both in Naples and at Caserta. In 1787 Hackert painted a large picture of the Launch of the Parthenope, 64, the first ship of war which was built at Castel-a-Mare; it was engraved by his brother Georg; he painted five other large pictures of Neapolitan seaports, which were all enlivened by some historical scene of interest: they are in the palace at Caserta. In 1788 the king sent him to Apulia to make drawings of all the seaports of that coast, which he painted, from Manfredonia to Taranto. In 1790 he visited on a similar mission the coasts of Calabria and Sicily: the king equipped for him a small felucca called a scappavia, manned with twelve men well armed, for the express purpose; he was out about five months, from April to August inclusive.

Hackert lived, after his departure from Naples in 1799, a short time in Leghorn, whence he removed to Florence, where he resided in a villa which he purchased in 1803, until his death in April, 1807.

Hackert's works are not remarkable for any particular quality of art: they are simple portraits or prospects in ordinary light and shade, and their beauty accordingly depends upon the local beauty of the scene. The detail is careful, without being minute, and where a memento of any particular scene is the chief object of desire, his works are calculated to give perhaps complete satisfaction, except in the case of some fastidious connoisseur who might require a bolder and more artistic foreground than those which characterise his works generally. His drawings are extremely numerous, and his paintings are not rare; many of them have been engraved. He painted in oil, in encaustic, and in body water-colours or à guazzo, a species of distemper. He also etched several plates.

Goethe has written a eulogistic Life of Hackert, whose close imitation of nature delighted the German critic, and he has extolled him beyond his merits; while he compares Flaxman with Sabatelli, and damns his noble designs with the faint praise that they have some pretty ideas in them; he condemns them for their want of detail in execution.

(Goethe, *Werke—Philipp Hackert;* and *Winckelmann und sein Jahrhundert.*)

HACKNEY-COACH. The derivation of the word Hackney, as applied to a class of public conveyances, has occasioned much speculation. Bailey, in his Dictionary, adopts what appears to have become a popular notion, that the name is derived from the suburb of London so called; for which supposition however we find no plausible ground; but he adds, 'unless you would rather have it from the French *Hacquenée*,' which is a word of similar meaning. Many curious conjectures on the subject are given in Todd's 'Johnson's Dictionary,' and in the lexicographical division of the 'Encyclopædia Metropolitana.' From these it is evident that a similar word is found in most European languages. Menage traces the French form from the Latin *equus*, a horse, thus:—*equus, akus, akinus, akineus, akinea, haquenée.* Another conjecture derives it from an Anglo-Saxon word meaning to *neigh*, on the supposition that a lively horse, given to neighing, would be the most likely to be lent for hire. Perhaps the most probable derivation is from *haque*, an old French word for a gelding, which would be fitter than a more spirited *neighing* horse for hiring for public use. However this may be, it is sufficiently evident that the term *hackney* was first applied to horses let for hire, and then, by a very natural transition, extended to coaches, and subsequently to sedan-chairs, employed in a similar way.

By the act 1 & 2 Wm. IV. c. 22, by which the laws relating to hackney-carriages in London were consolidated and amended, it is declared that every carriage with two or more wheels, used for plying for hire in any public street at any place within five miles from the General Post-office in London, of whatever form or construction, or whatever may be the number of persons which it shall be calculated to convey, or the number of horses by which it shall be drawn, shall be deemed a *hackney-carriage;* and the distinction between hackney-carriages and *stage-carriages* is further implied, rather than distinctly expressed, by the provision that nothing in the act shall extend or apply to any stage-coach used for plying for passengers to be carried for hire *at separate fares.* A hackney-carriage is one which may be hired at certain regulated fares, calculated either by time or distance, and being the same whether it is hired by one person or by the full number which it is licensed to carry, to run in any required direction, and at any required time, under certain regulations provided by law; while a stage-carriage is one which performs a certain specified journey, at a specified time, carrying passengers only in the line of its specified route, at a certain fare (which is not regulated by act of parliament), for each individual passenger, the amount of such fare being usually, though not invariably, dependent upon distance.

So far as can be gathered from such notices as the writer has met with, this class of public vehicles appears to have originated in London. The rise and progress of their use in London may be pretty distinctly traced from notices in Macpherson's 'Annals of Commerce,' and in Anderson's 'History of Commerce,' of which work the early volumes of Macpherson are a reprint with but few alterations. Under the year 1625 Macpherson, or rather Anderson, observes that 'Our historiographers of the city of London relate that it was in this year that hackney-coaches first began to ply in London streets, or rather at the inns, to be called for as they were wanted; and they were at this time only twenty in number.' In 1634 sedan-chairs appear, for the first time, to have entered into competition with hackney-coaches, the sole privilege being granted in that year to Sir Sanders Duncomb to 'use, let, and hire' a number of 'covered chairs,' such as he represented to be in use in many places beyond sea, for a period of fourteen years; the avowed reason for their introduction being the inconvenience occasioned in the streets of the metropolis by 'the unnecessary multitude of coaches.' In the following year an attempt was made to check the increasing annoyance occasioned by the 'general and promiscuous use of coaches' by a proclamation from the king (Charles I.) that no hackney or hired coach should be used in London, Westminster, or the suburbs, unless it were engaged to travel at least three miles out of the same, and that every hackney-coach owner should constantly maintain four able horses for the royal service when required. Finding it impossible to prevent the use of so great a convenience, a commission was issued to the master of the horse in 1637 to grant licences to fifty hackney-coachmen in and about London and Westminster, and as many others as might be needful in other places in England, each coachman being allowed to keep not more than twelve horses. In 1652 the number of hackney-coaches daily plying in the streets was limited to 200; in 1654 it was increased to 300, allowing however only 600 horses; in 1661 to 400; and in 1694 to 700. By an act of the 9th year of Anne (c. 23) the number was to be increased to 800 on the expiration, in 1715, of the licences then in force, and 200 hackney-chairs were also licensed. The number of chairs was shortly increased to 300, and by the act 12 Geo. I. c. 12, to 400. In 1771 the number of coaches was further increased to 1000.

Notwithstanding this steady increase in the use of hackney-coaches, they were long assailed as public nuisances in a way which it is amusing to look back upon. Some curious details on this subject are given in Knight's 'London,' vol. i. p. 27, &c., from which it appears, by a quotation from a letter of Garrard, that the first hackney-coach *stand* was established in 1634, by one Captain Baily, at the May-pole in the Strand. Even so late as 1660 Charles II. issued a proclamation against hackney-coaches standing in the streets to be hired; but on the very day it was to come into force, Pepys records that he got one to carry him home. The monopoly long enjoyed by the London hackney-coachmen produced great indifference to the increasing wants of the community; and down to the year 1823, while that monopoly was undisturbed, hackney-coaches appear to have sunk lower and lower in the scale of efficiency. 'For some two hundred years,' observes Mr. Knight, in the work above referred to, 'those who rode in hired carriages had seen the hackney-coach passing through all its phases of dirt and discomfort; the springs growing weaker, the 'iron ladder' by which we ascended into its rickety capaciousness more steep and more fragile, the straw filthier, the cushions more redolent of dismal smells, the glasses less air-tight.' So slow, also, were their movements, that it was almost hopeless to think of gaining time by riding in them.

While this was the state of things in London, a lighter kind of vehicle, drawn by one horse, had been brought into extensive use in Paris. In the year 1813, according to a paper on the 'Vehicular Statistics of London,' in No. 78, new series, of 'Chambers's Edinburgh Journal' (to which we are indebted for many of the following particulars), there were no less than 1150 of these vehicles, which were called *cabriolets de place*. Efforts were made to introduce similar vehicles into this country, but, owing to a regard for the 'vested rights' of the hackney-coach owners, it was long found impossible to get licences for them. With great difficulty Messrs. Bradshaw and Rotch (the latter a member of parliament) obtained licences for eight cabriolets in 1823, and started them at fares one-third lower than those of hackney-coaches. The new vehicles were hooded chaises, drawn by one horse, and carrying only one passenger besides the driver, who sat in the cabriolet (or, as more commonly called for brevity, the *cab*), with his fare. An improved build was soon introduced, by which room was provided for a second passenger, and the driver was separated from the fare; and with the rapid extension of this lighter class of vehicles, numerous varieties of construction have been introduced, in most of which the original model is completely lost sight of, but in which comfortable and safe accommodation, with complete shelter from the weather and separation from the driver, is provided for two, three, or, in a few cases, four persons. The name 'cab' is still commonly applied to all hackney-carriages drawn by one horse, whether on two or four wheels. During the first few years of the employment of such carriages their number was restricted to sixty-five, while the number of coach-licences was increased to twelve hundred; but in 1832 all restriction as to the number of hackney carriages was removed, and in the paper above referred to it is stated, on the authority of information received from the registrar of hackney-carriage licences, that the number of hackney-carriages licensed for use during the year ending January 4, 1845, was 2450, all of which, with the exception of less than 200, were cabs, or one-horse vehicles. The number of drivers licensed during the year ending May, 1844, was 4627, besides 371 'watermen,' or attendants upon the 130 regular metropolitan coach-stands.

While the changes above noticed have greatly benefited the public, there is reason to fear that the great increase of accommodation has not been accompanied by any elevation of moral character in the large class of men engaged in this business. Since the year 1822 hackney-carriage drivers have been required to deposit any articles which may be accidentally left in their vehicles with the registrar of licences, to whom the owners of the lost property may apply for its restoration, upon paying for the driver's time and trouble; and, incredible as it may appear, the estimated value of the property thus taken to the office in the first four years and a half after the introduction of this rule is estimated at 45,000*l.*, while very few applications were made for property which was not thus restored. Of late years however the case has been very different, for while from fifteen to sixteen hundred 'strays,' or lost articles, have been taken to the office in twelve months, they are all of small value; and the applications made for lost property are at least fourteen times that number. To lessen the risk in reference to one very important department of hackney carriage business, the great railway companies which have termini in London enter into arrangements by which a limited number of carriages, driven only by men of well attested respectability, are allowed to stand within their stations, to convey passengers arriving by the trains to their respective destinations, under a system of supervision so strict, that any case of misconduct or overcharge is almost certain to be brought home to the guilty party; and it is gratifying to know that this measure has proved productive of the best results in promoting honesty and civility among a most useful class of men. Further than this, much good has been effected by the strictness of the licensing system, and by the various efforts made, especially by the agents of the London City Mission, for their education and religious welfare. The generally low standard of moral character among cab-drivers leads to the (we believe universal) adoption of a system of remuneration which is not calculated to promote honesty and good feeling. 'It appears,' observes the writer of the paper we have quoted above, 'that the masters would have no chance of being honestly dealt with, if they were to pay wages to their servants.' 'They therefore,' he adds, 'lend out the vehicles and horses at a fixed sum per day; or rather, the men are expected to bring home the stipulated amount. Sometimes, in the dull season, they beg off for less, but it was remarked to us by the manager of the largest establishment of cabs in London, that, let the town be ever so full, or the season ever so prosperous, they never produce *more* than the stipulated amount, to make up for former deficiencies.' The experiment of paying liberal wages, and trusting to the honour of the men, is said to have been tried and found utterly impracticable. 'The average produce of each hackney-carriage to the proprietor,' according to our authority, 'may be about ten shillings and sixpence a day, to which, if about three-and-sixpence be added for cash appropriated by the drivers in lieu of wages, the amount (of earnings or receipts) per diem is raised to fourteen shillings.' 'Hence,' he adds, 'we may conclude that there is spent daily by the London public for coach and cab hire 1715*l.*, and yearly almost 800,000*l.*'

Hackney-coaches were, according to Beckmann (*History of Inventions*, English edition of 1814, vol. i. p. 134), first established in Edinburgh in 1673; and on the same authority (p. 131) it appears they were first used at Paris in 1650, although, if this date be correct, he is wrong in stating that the use of hackney-coaches originated there. He attributes their introduction to Nicholas Sauvage, from whose residence, the Hôtel S. Fiacre, such carriages took their common French name of *fiacres*. About 1669 a small kind of hackney carriage, resembling a sedan-chair on wheels, called a *brouette* or *roulette*, or sometimes, by way of derision, a *vinaigrette*, and drawn by men, was brought into use. Cabriolets, as above stated, appear to have originated in Paris.

For an abstract of the law relating to hackney and stage carriages, duties, licences, &c., see METROPOLITAN STAGE CARRIAGE, P. C. S.

HADRAMAUT. [ARABIA, P. C. and P. C. S.]

HÆMANTHUS. [AMARYLLIDEÆ, P. C.]

HÆMATOCOCCUS (from αἷμα, blood, and κόκκος, a grain), a genus of plants belonging to the natural order of Algæ. It is characterised by being composed of spherical or oval cells of various sizes, each cell being invested with one or more concentric vesicles or membranes, multiplied either by division or by granules formed within the parent cells. Several species of this genus have been described. One of the first observed was the *H. sanguineus*, which, like the red-snow plant (*Protococcus nivalis*), has its cells coloured red; hence the generic name. Several of the species however are of a green colour, and Kutzing and others on this account have proposed the name Microcystis for this genus of plants.

The species are found upon moist rocks, on the walls of caverns, and in damp places. Mr. Hassall has recently described several new species of this genus; they belong however to a class of plants in which it is most difficult to discover permanent specific characters. [RED SNOW, P. C.]

(Hassall, *British Freshwater Algæ*.)

HÆRETICO COMBURENDO, WRIT DE. [HERESY, P. C. S.]

HAGUE, ALLIANCE OF THE. As the general war which was terminated by the Peace of Ryswick in 1697 [P. C., xx. 287] was preceded by what is called the First Grand Alliance, concluded at Vienna betwixt the Emperor and the United Provinces, 12th May, 1689, and joined by Great Britain 9th December following, so the next general war, which broke out in 1702, was preceded by the Second Grand Alliance, or Alliance of the Hague, concluded at that town between the Emperor, Great Britain, and the United Provinces, 7th September, 1701, and subsequently joined by Portugal and other European powers. Its object was to resist the seizure of the Spanish crown by the French king Louis XIV. for his grandson the Duke of Anjou, who nevertheless eventually became King of Spain, by the title of Charles III. The Alliance of the Hague was the last political combination arranged by William III. of England, who died 8th March, 1702; and war was declared against France by Queen Anne 4th May following. [PARTITION TREATIES, P. C., xvii. 292.]

HAHNEMANN, SAMUEL, founder of the system of medicine called Homœopathy, was born at Meissen, in Upper Saxony, on the 10th April, 1755. His father, Gottfried Hahnemann, who was an artist of considerable merit, was employed in the painting of china in the celebrated porcelain manufactory of Meissen. He was a clever well-educated man, and to him his son owed the first rudiments of his education. He was afterwards placed at an elementary school, the director of which, Dr. Müller, remarking talents that only required cultivation to raise the boy to eminence, persuaded his father to place him at the High School of Meissen, into which they obtained him a free admission. Hahnemann gladly availed himself of these increased facilities; he made himself master of Latin, Greek, and Hebrew, and evinced a decided bias for the study of the physical sciences, natural history, and medicine. Botany was also a favourite pursuit, and his hours of leisure were devoted to the collection of plants and their systematic arrangement. His intense application and amiable disposition won the goodwill of the head master and teachers, who vied with each other in affording him every facility in the prosecution of his studies; and his progress was so rapid, that in a short time he was appointed an assistant teacher.

Having chosen medicine for his profession, at the commencement of 1775 he left the high school of Meissen, and, assisted by the friendship of his former teachers, he entered the University of Leipzig, having, as a candidate, written a Latin thesis on the construction of the human hand.

Being wholly dependent upon his own exertions for subsistence, he supported himself during his residence at Leipzig by giving lessons in German to foreign students and by the translation of English and French medical authors. The professors of the University, in admiration of his ardent zeal for knowledge and great acquirements, invited him to attend their lectures gratuitously. Having passed two years in the study of the theory of medicine, and saved a small sum of money, he departed for Vienna, there being no clinical lecturer in the University of Leipzig and entered himself at the Hospital of Charitable Brothers, with a view to the completion of his studies and to acquiring a practical knowledge of his profession.

His moderate pecuniary resources were almost exhausted, when his talents and marked attention to his duties gained for him a firm friend in Dr. Quarin, physician to the Emperor of Austria and chief physician to the Hospital, through whose recommendation, although he had not yet graduated, Hahnemann obtained the situation of family medical attendant and librarian to Baron von Brückenthal, Governor of Siebenbürgen, then residing at Hermannstadt. He remained here for two years, and being allowed to attend private practice he saved a small sum of money; with this he removed to Erlangen, where, on the 10th of August, 1779, he took his degree of M.D., and produced his thesis 'Conspectus Adfectuum Spasmodicorum Etiologicus et Therapeuticus.'

In the year 1781 he was appointed district physician at Gomern, near Magdeburg, where he married the daughter of an apothecary named Köhler. Previous to this he had resided some time at Hettstadt and Dessau, diligently pursuing, in addition to his professional labours, the studies of chemistry and mineralogy.

In the year 1784 he removed to Dresden, where he gained a high reputation in the hospitals as a judicious and skilful practitioner, but, struck with the absence of a guiding principle in therapeutics, and the great uncertainty of the healing art, he gradually withdrew himself as much as possible from practice, and endeavoured to support his family by his old resource of translations of English and French medical authors, pursuing at the same time his favourite study of chemistry.

His feelings at this period are best explained in his own words in a letter to the celebrated Hufeland, written many years after he had founded the system with which his name is now so intimately connected. 'Eighteen years have elapsed since I quitted the beaten path in medicine. It was agony to me to walk in darkness, with no other light than could be derived from books, when I had to heal the sick, and to prescribe, according to such or such an hypothesis concerning disease, substances which owe their place in the Materia Medica to an arbitrary decision. I could not conscientiously treat the unknown morbid conditions of my suffering brethren by these unknown medicines, which being very active substances, may, unless applied with the most rigorous exactness (which the physician cannot exercise, because their peculiar effects have not yet been examined) so easily cause death, or produce new affections or chronic maladies often more difficult to remove than the original disease. That I might no longer incur the risk of doing injury, I engaged exclusively in chemistry and in literary occupations.'

About this time he published his pamphlets on Mercurius Solubilis; on the mode of detecting Adulteration in Wine; on Calcarea Sulphurata; and on the Detection of Arsenic in cases of Poisoning: he also contributed many able papers to Crell's 'Chemical Annals,' and gave to the world a number of minor medical works, which have since been collected by Dr. Stapf and published under the title of 'Kleine Schriften,' Dresden and Leipzig, 1829.

In the year 1790, while engaged upon the translation of the 'Materia Medica' of Cullen, he was struck with the different explanations given of the mode of operation of Peruvian Bark, in intermittent fever: and dissatisfied with them, he determined to try its effects upon himself. Finding that powerful doses of this substance produced symptoms strikingly analogous to those of that form of intermittent fever for which it was an acknowledged specific, he determined to try further experiments with other medicinal substances upon himself and upon some medical friends. He obtained similar results: that is, he produced by these agents factitious or medicinal disorders resembling the diseases of which they were esteemed curative; and thus, the first dawn of the law of *Similia Similibus* gleamed upon him. In a work ascribed to Hippocrates (Ed. Basil. ap. Froben., 1538, p. 72) a similar doctrine was enunciated, and the same doctrine has since found advocates in many eminent medical writers; but Hahnemann was the first who assumed it to be *the* guiding principle in Therapeutics, and supported his position by a series of experiments. Confident that he had discovered the long sought for *law*, he assiduously pursued his proving of medicines, and adopted the new principle in the treatment of his patients with (according to his own testimony and that of his disciples) a success fully commensurate with the limited means then at his disposal. Thus encouraged, he ventured, in 1796, to address a paper to Hufeland's 'Journal,' in which he announced his new discovery to the medical world, pointed out the defects of the 'Materia Medica' as then constituted, and the necessity of its reconstruction upon the basis of pure experiment; at the same time he earnestly invited the co-operation of his medical brethren. The attention of the German physicians was then deeply engaged in the investigation of the Brunonian theory, and Hahnemann's suggestions were coldly received.

In 1801 he published a short treatise on the efficacy of Belladonna in the prevention and cure of scarlet fever, and affirmed that its curative properties were based upon the homœopathic law. In 1805 he published the results of a number of experiments in a work in two volumes, entitled 'Fragmenta de Viribus Medicamentorum positivis sive obviis in Corpore Sano;' and in the same year his 'Medicine of Experience,' in which he still more strongly expresses his objection to the old system of medicine. In 1810 he brought out his great work the 'Organon of the Healing Art,' in which he developed his new system of treating disease; and for the first time gave it the name of 'Homœopathy,' by which it has since been distinguished. [HOMŒOPATHY, P. C. S.] In 1811 the first part of the 'Materia Medica Pura' was published, six volumes of which appeared in succession till it was completed in the year 1821, since which time five editions have been published.

In the year 1812 he returned to Leipzig, where he was appointed Magister Legens. To prove his qualifications for this chair, he wrote an excellent treatise on the hellebore of the antients, 'Dissertatio historico-medica de Helleborismo Veterum.' At Leipzig he had an extensive practice, and was assisted by a great number of friends and pupils in the proving of his medicines. The apothecaries of that city, however, rose against him, and appealing to an old law long dormant, that forbade a physician to dispense his own prescriptions, they eventually, after some litigation, succeeded in 1820 in obtaining a decision in their favour. Hahnemann, unwilling to risk his own reputation and that of his system upon medicines prepared and dispensed by individuals avowedly hostile to his medical tenets, had determined to retire from practice, when the Duke of Anhalt Cöthen offered him an asylum in his dominions, with the enjoyment of those privileges of which he had been deprived at Leipzig. It was during his sojourn at Cöthen, in the year 1828, that he published in four volumes his work on 'Chronic Diseases, their Peculiar Nature, and Homœopathic Cure.' In the year 1829 the disciples and admirers of Hahnemann caused a bronze medal to be struck to mark their attachment to the new system and their esteem for its founder. It bore on the face the head of Hahnemann, with the inscription, 'Ssmuel Hahnemsnn natus Misenæ D.X Aprilis MDCCLV. Doctor creat. Erlangæ D.X Augusti MDCCLXXIX.' On the reverse, in the centre, 'Similia Similibus;' the inscription, 'Medicinæ Homœopathicæ Auctori, Discipuli, et Amici, D.X Augusti MDCCCXXIX.' His adherents had at this period greatly increased, and he enjoyed a very extensive practice among his own countrymen and foreignors.

Having been a widower for some years, he married in 1835 a French lady, Melanie de Herville, who had visited Cöthen for the benefit of his advice, and at her desire he removed to Paris. In commemoration of his arrival in the French capital, an admirably executed medal by David was struck, in bronze, silver, and gold, bearing on its face the head of Hahnemann, with the inscription 'Ssmuel Hahnemann.' On tho reverse, in the centre 'Similia Similibus curantur,' encircled by a snake; the inscription, 'Les Homœopathistes Français à leur Maître. Né à Meissen le 10th Avril, 1755, venu en France le 25 Juin, 1835.' He remained at Paris in the active exercise of his profession, and surrounded by numerous followers of his system, of all nations, till the time of his decease, which took place on the 2nd July, 1843, in tho eighty-ninth year of his age.

HAIL. [SNOW, P. C., p. 166, col. 2.]

HAIL-STORMS. [SNOW, P. C., p. 166.] The principle of insurance has been recently applied to indemnify persons for the very heavy losses sometimes occasioned by these meteorological phenomena, both by the Royal Farmers' and General Insurance Institution and by a society connected with the Norwich Union Insurance Company. The uncertainty which exists in reference to tho occurrence of these frequently calamitous storms in any particular locality, and the circumstance that, while no human sagacity can foresee or prevent them, it is utterly impossible to produce them by fraud, appear to render such casualties peculiarly fit, so soon as observation and experience shall have established accurately the average risk, for the application of a principle which has long been applied to casualties of a nature less uncertain, more easily provided against, and which afford greater opportunities for deceit and imposition. The Hail-storm Insurance societies have published chronological lists of the most remarkable hail-storms in this country during the present century, which present an array of destructive calamities far exceeding what might have been expected from their rarity. It is curious also to observe that they appear to have increased in frequency of late years. In one case, which we select solely from the more circumstantial way in which the details are given, many farms of corn were (on the 14th of July, 1824) literally destroyed in Hertfordshire, Middlesex, and Essex; the damage done upon a space of 3487 acres in the last-mentioned county alono was estimated at 14,574*l.*, or about 4*l.* 3*s.* 7*d.* per acre, upon an average. It is stated that this was the third time within a period of thirty years that the crops in the north-western part of that county had been destroyed in like way. During the great hail-storms in the months of July and August, 1843, by which immense damage was done in Cambridgeshire, Norfolk, Suffolk, Essex, Hertfordshire, Berkshire, Kent, Oxfordshiro, Bedfordshire, Gloucestershire, and Yorkshire, several cases of individual loss amounted to upwards of 2000*l.* The breakage of glass in windows and skylights, and more especially in conservatories and hothouses, is one of the most frequent injuries inflicted by hail-storms, the masses of ice which fall being sometimes sufficient to demolish the wooden framework also. Such extraordinary cases of devastation will be fully accounted for if it be considered that, as it is stated in a paper issued by the Farmers' Insurance Institution, on the authority of 'Leslie's Elements,' 'hailstones having a diameter of two inches,' a size which has been exceeded in several well-authenticated cases, 'will fall with a velocity of 113½ feet in a second, or more than 1¼ mile in a minute.' On the 19th of May, 1809, it is estimated that 200,000 panes of glass were broken in London alone, besides great damage being done in fields and gardens, and the foliage and branches of trees being cut off. An equal number of panes is supposed to have been broken in the northern suburbs of the metropolis on the 30th of July, 1826. Hailstones of from six to eight or nine inches in circumferenco are frequently mentioned as having fallen in this country, in the lists referred to, which are compiled from contemporary publications; and on the 3rd of August, 1824, when the eastern part of Suffolk was visited by a violent hail-storm, by which fowls and game, as well as glass and crops, were extensively destroyed, the ice accumulated in some places to a surprising depth. In many cases a considerable extent of ground has been covered to the thickness of several inches. It is worthy of remark how very large a proportion of the destructive storms recorded have occurred in the months of June and July. Without noticing the cases in which two or more storms which occurred about the same time are alluded to as one, which would render this proportion yet more remarkable, the cases recorded in the above-mentioned lists occurred as follows. We have, of course, taken care to count but once those storms of which two separate accounts aro given:—

In the month of	January	0
,,	February	1
,,	March	2
,,	April	3
,,	May	7
,,	June	10
,,	July	17
,,	August	4
,,	September	2
,,	October	0
,,	November	0
,,	December	0
		46

In the article 'Hail,' in Brande's 'Dictionary of Literature, Science, and Art,' are some curious facts collected from various authorities, from which it appears that hailstones have been found weighing from five to twelve or thirteen ounces, and of all sizes up to about fourteen inches in circumference; the largest being frequently of very rugged and irregular form, resembling portions of a great sheet of ice broken to pieces rather than balls of ice. 'Hail,' according to this authority, 'usually precedes storms of rain, sometimes accompanies, but never or very rarely follows them, especially if the rain is of any duration. The time of its continuance is always very short, generally only a few minutes, and very seldom so long as a quarter of an hour.' The writer of the article referred to further remarks, that 'the clouds from which hail is precipitated appear to be of very considerablo extent and depth, inasmuch as they produce a great obscurity. It has been remarked,' he adds, 'that they have a peculiar grey or reddish colour, and that their lower surfaces present enormous protuberances, while their edges exhibit deep and numerous indentations.' Hail is said to be always accompanied with electrical phenomena, and it is generally believed that such are the causo of its formation. The copious list of hail-storms published by the Farmers' Insurance Institution, which gives references to authorities, and in many cases minute details of the damage done, appeared in the advertising sheet of the 'Farmer's Almanac' for 1845.

HAINES is the name given to a river lately discovered in the eastern parts of Africa, in those countries which are comprehended on our maps under the name of Zanguebar. The eastern coast of Africa, from the equator northward to Cape Guardafui, has been considered nearly as a complete wilderness; its aspect from the sea is very unpromising, the coast south of Magadoxo presenting only an uninterrupted series of sand-hills, whilst that north of Magadoxo is formed by rocky masses of moderate elevation. But Lieutenant Christopher, in 1843, discovered, that at the back of the sand-hills there is a considerable river, which waters an extensive valley, filled with alluvial soil and exhibiting a great degree of fertility: this river is the Haines, which probably originates in the high countries which surround the most southern affluents of the Abaï, or eastern branch of the Nile; but as the intervening countries have never been visited by Europeans, we are unable to determine whether any of the rivers rise in these countries and which of them sends its waters to the Haines. Lieutenant Christopher was informed that north of 4° N. latitude the river is already considerable. He visited it at Girédi, a town situated twenty-two miles north-west of Magadoxo, inhabited by more than 7000 individuals, and surrounded by extensive fields, on which Indian corn and millet yield such abundant crops that large quantities are exported to Hadramaut and Oman. The river was here about 200 feet wide, and too deep to be forded in the dry season. From this place the Haines runs nearly parallel to the coast, at a distance varying between twenty and four miles, and numerous villages are found on its banks, surrounded by extensive fields irrigated from the river. The volume of water carried down decreases considerably by this irrigation, and is less at the most southern point where it was seen by Lieutenant Christopher, which was due north of the town of Brava, where it was only from 70 to 150 feet broad, but from 10 to 15 feet deep. From this place the river continues in a south-western direction, and terminates, according to the statement of the natives, in an extensive lake said to be unfathomable. This lake is about sixty miles from the eastern banks of the river Jubb or Gavind, and perhaps not much more than twenty miles from the sea. The inhabitants of the broad alluvial tract traversed by the Haines River are a mixture of Somaulis, Galla, and negroes, among which a small number of Arabs are settled. It appears that the greater part of them are Mohammedans. The chiefs of the country are Somaulis, but their power is limited, as it appears, by a kind of aristocracy.

(Christopher, 'On the East Coast of Africa,' in *London Geograph. Journal*, vol. xiv.)

HAL. [HALLE, P. C. S.]

HALE'SIA (named in honour of Stephen Hales, D.D., author of 'Vegetable Statics,' &c.), a genus of plants belonging to the natural order Styraceæ. It has a monopetalous corolla ventricosely campanulate, with a 4-lobed erect border; the stamens 12 to 16; filaments combined into a tube at the base, and adnate to the corolla; the anthers oblong, erect, 2-celled, dehiscing lengthwise; the ovary inferior; the style single; the stigma simple; the fruit a drupe, which is dry, oblong, with 2-4 winged angles, terminated by the permanent style; the cells 1-seeded, with the seeds at the bottom of the cells. The species are trees with alternate serrated leaves, and lateral fascicles of pedicellate drooping white flowers. This genus has been made the type of an order Halesiaceæ by D. Don, who is followed by Link and others.

H. tetraptera, common Snowdrop-tree, has ovate, lanceolate, acuminated, sharply serrated leaves; the fruit with four wings. This plant is a tree, growing from 15 to 20 feet high, and is a native of South Carolina. It has fine white flowers, from 9 to 10 in a fascicle, drooping and resembling those of a snowdrop. The wood is hard and veined. It is one of the hardest and also one of the handsomest of the American deciduous trees. The rate of growth for the first five or six years is from 12 to 18 inches a-year. It ripens its seeds freely in this country, and it may be propagated from these or imported seeds. There is another species, *G. diptera*, which is also an American plant, but does not attain so great a height as the last, and has much larger species. *H. parviflora* is a native of Florida, and is supposed by some botanists to be merely a small flowered variety of the first. They will grow in any common garden soil, and may be propagated by slips from the root, as well as from seeds.

(Don, *Gardener's Dictionary*; Loudon, *Encyclopædia of Trees and Shrubs*.)

HALFORD, SIR HENRY, was born on the 2nd of October, 1766, and was the son of Dr. James Vaughan, physician to the Infirmary at Leicester, and author of 'Observations on Hydrophobia, on the Cæsarean Section, and on the Effects of Cantharides in Paralytic Affections.' Sir Henry received his early education at Rugby, and was afterwards admitted at Christ Church, Oxford; he graduated in medicine at Oxford in 1794, and was elected a fellow of the College of Physicians in the same year. Having been well introduced into London society, and being distinguished for the elegance of his manners, and having early married a daughter of Lord St. John, it was not long before his practice became considerable. He was appointed by George III. one of his physicians, and in 1809 he became possessed of a large fortune by the death of his mother's cousin, Sir Charles Halford, and changed his name from Vaughan to Halford. He was made a baronet in the same year. Sir Henry continued to hold the office of physician to George III. till the king's death, and subsequently held the same appointment under George IV., William IV., and Victoria I. He was appointed president of the College of Physicians in 1824, and delivered the oration on the occasion of that body removing from their old building in the City to the new one in Pall Mall.

During his professional career Sir Henry was too much occupied with the kind of practice to which his early connexions in life introduced him, to contribute much valuable information to the literature of his profession. His publications consist of essays and orations: the latter were delivered before the college, and are written in Latin, and exhibit a purity of style beyond the average of such productions at the present day. His essays are as follows: 1, 'On the Climacteric Disease.' 2, 'On the Necessity of Caution in the Estimation of Symptoms in the last Stages of some Diseases.' 3, 'On the Tic Douloureux.' 4, 'On Shakspere's Test of Insanity.' 5, 'On the Influence of some Diseases of the Body on the Mind.' 6, 'On the Καυσος of Aretæus.' 7, 'On the Treatment of Gout.' 8, 'On Phlegmasia Dolens.' 9, 'On the Treatment of Insanity.' 10, 'On the Death of some Illustrious Persons of Antiquity.' 11, 'On the Education of a Physician.' 12, 'On the Effects of Cold.' These essays and papers display the elegant scholar and observant physician, and are mostly written in an easy graceful style. In 1813 Sir Henry Halford descended with the Prince Regent into the royal vaults of St. George's Chapel, Windsor, where, amongst other curiosities, they discovered the head of Charles I. Of this visit and discovery Sir Henry has given an account, which is deposited in the British Museum, and is authenticated by the signature of the Prince Regent. He died on the 9th of March, 1844. He had been for more than twenty years president of the College of Physicians, and was mainly instrumental in establishing the evening meetings of that body. His urbanity of manners and devotion to the interests of the college have left behind them a grateful recollection amongst the members of that corporation.

(Pettigrew, *Portraits and Memoirs of Medical Men*; *Transactions of Medical and Surgical Association*, vol. i.)

HALIFAX, GEORGE MONTAGU, EARL OF, was the fourth son of George Montagu, Esq., of Horton in Northamptonshire, who was the fifth son (the eldest by his third wife) of Henry, first Earl of Manchester. He was born at Horton, 16th April, 1661. His education was begun in the country, but he was eventually sent to Westminster School, where he was chosen a king's scholar in 1677, and whence in 1682 he was removed to Trinity College, Cambridge. He had distinguished himself, while a pupil of Busby's at Westminster, by his extemporaneous epigrams; and the same liveliness of talent showed itself in a way to attract wider attention in an effusion of English verse which he produced on the Death of Charles II., in February, 1685, beginning (not at all in jest or satire)—

> Farewell, great Charles, monarch of blest renown,
> The best good man that ever filled a throne;

and proceeding in the same strain till at last the poet exclaims—

> In Charles, so good a man and king, we see
> A double image of the Deity.

This performance, we are told, so charmed the Earl of Dorset that he induced the young poet to come up to town, where he was introduced by his lordship to all the wits of his acquaintance. In 1687 he and Prior brought out in conjunction their burlesque upon Dryden's 'Hind and Panther,' entitled 'The Hind and the Panther transversed to the Story of the Country

Mouse and the City Mouse.' It is for the greater part a dialogue in prose, apparently in imitation of the Duke of Buckingham's 'Rehearsal,' with the parody in verse of portions of Dryden's poem interspersed. The best parts of it are said to be Prior's, as may very well be believed; it is not, however, printed in the common collections of his poetry; but it is preserved in the 'Supplement to the Works of the Minor Poets' (1750), vol. i. pp. 47-82, under the head of 'Additions to the Works of the Earl of Halifax.'

Montagu appears to have some time before this entered upon his career as a politician. Johnson, in his 'Lives of the Poets,' merely says that 'he signed the invitation to the Prince of Orange, and sat in the convention;' but his signing the invitation to the Prince would seem to imply that he had occupied some public post, and he is, therefore, we suppose, the Charles Montagu who is set down as one of the members for the city of Durham in James II.'s parliament which assembled 19th May, 1685. In the convention parliament he sat for Malden; and he was returned for the same place to the next parliament, which met in March, 1690. It is stated to have been about the time of the Revolution that he married the Countess Dowager of Manchester: she was Anne, widow of Robert, third Earl of Manchester, and daughter of Sir Christopher Yelverton, Bart.

According to Johnson, it was his intention when he formed this connexion to take orders; but afterwards altering his purpose he purchased for 1500*l.* the place of one of the clerks of the council. He was also fortunate in his next poetical performance, 'An Epistle to Charles, Earl of Dorset, occasioned by His Majesty's Victory in Ireland,' being a celebration of the battle of the Boyne; for which King William, to whom he was introduced upon the occasion by Dorset, is said to have bestowed upon him a pension of 500*l.* A repartee of his majesty's, who when Dorset presented the poet as a mouse is said to have replied that he would make a man of him, is upon good grounds discredited by Johnson. His Epistle on the Victory of the Boyne, which extends to above two hundred lines, is Montagu's greatest effort in verse.

The rest of his history is that of a political character, and only a patron of poets. Johnson relates a well known anecdote of a speech he made in one of the debates on the Trials for Treason bill, in 1691, in the midst of which he is said to have fallen into confusion, and then, when he recovered himself, to have ingeniously turned the circumstance into an argument for what he was urging, the allowance of counsel to the prisoner. There is no notice of this speech in the Parliamentary History. He had already, however, raised himself by his speaking to great distinction; and on the 21st of March in this year he was taken into office as one of the lords of the Treasury. Burnet first notices him as making a great figure in the House under date of the year 1693. 'He had,' he says, 'great vivacity and clearness, both of thought and expression. His spirit was at first turned to wit and poetry, which he continued still to encourage in others when he applied himself to more important business. He came to have great notions with relation to all the concerns of the treasury and of the public funds, and brought those matters into new and better methods: he showed the error of giving money upon remote funds, at a vast discount, and with great premiums, to raise loans upon them; which occasioned a great outcry at the sums that were given, at the same time that they were much shrunk before they produced the money that was expected from them. So he pressed the king to insist on this as a maxim, to have all the money for the service of a year to be raised within that year.' But part of this applies to what was done by Montagu after he became chancellor of the Exchequer, to which office he was appointed on the 1st of November, 1695, and to which on the 1st of May, 1697, he conjoined that of first lord of the Treasury. In 1695 and 1696 he obtained great credit by his management of the operation of the general recoinage of the silver money. It was in the latter of these years that, to supply a temporary circulating medium, he contrived what are called Exchequer Bills, the convenience of which species of paper, both for the government and the public, has kept it in use ever since. Many of Montagu's Exchequer bills, however, were for sums much lower than any for which such bills are now issued. After he became first lord of the Treasury he was appointed one of the lords justices on the king going abroad, both in July, 1698, and again in May, 1699. 'In the House of Commons,' says Burnet under the year 1698, 'Mr. Montagu had gained such a visible ascendant over all that were zealous for the king's service, that he gave the law to the rest, which he did always with great spirit, but sometimes with too assuming an air;' 'which,' subjoins Mr. Speaker Onslow, in a note, 'did him infinite hurt, and lowered at last his credit very much in the House of Commons.' Lord Hardwicke, in a note on the same passage, affirms, that for two sessions together Montagu did not exert himself in the House (for what reason Hardwicke does not know); but suffered Mr. Harley and his friends to take the lead, even while he continued in the king's service. He is also asserted to have lost some credit about this time, and to have been thought to have behaved meanly, by stating in the House, in one of the debates on the Irish grants, some information which had been communicated to him in confidence. On the modification of the ministry in November, 1699, Montagu was removed to the auditorship of the Exchequer, and his places of first lord and chancellor were given, the former to Lord Tankerville, the latter to Mr. John Smith. In the end of the following year, on the acquisition of the complete ascendency by the Tories, he was removed from the House of Commons by being created Baron Halifax (with remainder, failing his own issue male, to George Montagu, son and heir of his eldest brother Edward Montagu). This, it seems, was insisted upon by Harley, the new manager of the House of Commons. The title of Marquis of Halifax had just become extinct by the death of the son of the first marquis [SAVILE, GEORGE, P. C.]; and according to Lord Dartmouth, in a note on Burnet ('Own Times,' ii. 108), Montagu took his title in grateful remembrance, as he pretended, of the old marquis, who, Dartmouth says, had first brought him into business by recommending him to be a clerk of the council; 'but,' he adds, 'generally thought more out of vanity (of which he had a sufficient share), in hopes of raising it to as high a degree as his benefactor had done.'

Lord Halifax was impeached by the new House of Commons in April, 1701, along with Lord Somers [P. C., xxii. 217] and the Earls of Portland and Orford. The question was carried in the House by a vote of 186 against 163; but the impeachment was not prosecuted, and on the 24th of June the charges were dismissed by the Lords. (See the proceedings in the 5th volume of the 'Parliamentary History,' and in the 14th volume of Howell's 'State Trials.') The articles exhibited against Halifax were six in number:—1, That he had directed a grant to the value of 13,000*l.* to pass to Thomas Railton, Esq., in trust for himself, out of the forfeited estates in Ireland; 2, That he had received to his own use 1000*l.* a year out of tho said grant; 3, That, while chancellor of the Exchequer, he had obtained and accepted of several other beneficial grants to or in trust for himself; 4, That in 1697 he had procured a grant to Henry Segur, gent., in trust for himself, of wood from the Forest of Dean, to the value of 14,000*l.*; 5, That while he was chancellor of the Exchequer he had obtained for his brother Christopher the office of auditor, in trust, as to the profits thereof, for himself; 6, That he had advised his majesty to enter into the two Partition treaties. [P. C., xvii. 293.] In his answer Halifax maintained that the grants from the Irish estates and the Forest of Dean were legal, and were also not of the value charged; that there was nothing wrong in procuring the auditorship of the Exchequer for his brother, to be held by him till he should himself be ready to step into the office; and that, as to the Partition treaties, he was rather opposed to than in favour of them.

In 1703, after the accession of Queen Anne, Halifax was again attacked by the Commons on the charge of having been guilty of breach of trust in the management of the public accounts while he was chancellor of the Exchequer; and an address was voted to the queen requesting that she would be pleased to give directions to the attorney-general to prosecute him. But he was again protected by the Lords; and after some altercation between the two houses the matter was dropped. The proceedings are given in the 'Parliamentary History,' vi. 127, &c. Though out of office during this reign, he continued to take an active part in the debates of the House of Lords, especially distinguishing himself in 1707 in the defence of the union with Scotland. Lord Dartmouth, however, complains (note on Burnet, 'Own Times,' ii. 431) that he and Lord Wharton brought up a familiar style with them from the House of Commons, 'that has,' says his lordship, 'been too much practised in the House of Lords ever since, where everything formerly was managed with great decency and good manners.' To Halifax also belongs the credit of having first moved, and taken the most active part, in the project for the purchase of the Cotton manuscripts and the establishment of a public library, out of which eventually came the British Museum. (Burnet, 'Own Times,' ii. 440.)

Having always kept up a connexion with the Hanoverian family, Lord Halifax was found, on the death of Queen Anne, to be one of the nineteen persons appointed by the new king to hold the government along with the seven great officers of state till his majesty should come over. On the 14th of October, 1714, he was raised to the dignities of Earl of Halifax and Viscount Sunbury, and was restored at the same time to his former post of first lord of the Treasury, his office of auditor of the Exchequer being given to his nephew. But he died of an inflammation of the lungs on the 19th of May in the following year. He left no issue, so that his earldom and viscounty became extinct; but he was succeeded in his barony according to the limitation by his nephew George Montagu, who a few weeks after was made Earl of Halifax and Viscount Sunbury by a new creation. The son of the second Earl of Halifax died without issue in 1772, when all the honours became extinct.

Halifax was one of the most consistent of the Whig party to whom we are indebted for the Revolution, the Hanoverian Succession, and the Union with Scotland. It is evident also, from the detail that has been given, that he was a person of great general ability. But he was much more a man of action than of any remarkable powers of thought; and what he has written, whether in verse or prose, is of very little value. A list of his pieces is given by Walpole in his 'Royal and Noble Authors.' His character as a patron of literature has been drawn with some severe satiric touches, under the name of 'Full-blown Bufo,' by Pope, in his 'Prologue to the Satires.'

HALL, REVEREND ROBERT, was born the 2nd of May, 1764, at Arnsby in Leicestershire, where his father, of the same names, had been settled since 1753 as pastor of a congregation of Particular Baptists. He had come from Northumberland, where his forefathers belonged to the class of yeomanry; and he is stated to have been a man, though not of much learning, of considerable native power of mind. He is the author of several short religious publications: one of which, entitled 'A Help to Zion's Travellers,' was several times printed.

The subject of this notice was the youngest of fourteen children. It is related that he was two years old before he learned to speak: but after this, the progress he made in all branches of his education was very rapid. Though the circumstance is absurd, it is an evidence of the impression he had made by his precocity—that when he was only eleven years old, a fellow-clergyman of his father's (Mr. Beeby Wallis, of Kettering), to whom he had been taken on a visit, seriously set him to preach to a select auditory assembled in his house. His gift of ready expression had, it would appear, already strongly developed itself. He used to attribute much of his early intellectual excitement to the conversation of a metaphysical tailor in his native village, a member of his father's congregation.

He lost his mother in 1776, and it appears to have been after this that he was sent to board at a Baptist school in Northampton, kept by the Rev. Dr. John Ryland. Here he remained for a year and a half, after which he was placed, in October, 1778, at the Bristol Academy, with the view to his becoming a Baptist clergyman. It is the practice, it seems, for such students to commence preaching before they have finished their education; and Hall was, as it is expressed, set apart as a preacher by his father's congregation in August, 1780. In the autumn of 1781 he was selected by the authorities of the Bristol Academy to be sent to King's College, Aberdeen, on what is called Dr. Ward's exhibition; and here he studied for the usual period of four winter sessions; preaching, at least occasionally, in the intervening summers. It was at Aberdeen that Hall and the late Sir James Mackintosh, then also a student at King's College, became acquainted. They bore a close resemblance in intellectual character, in their powers of mind as well as in their tastes, and the intimacy which now sprung up between them led to an affectionate friendship, which lasted while they both lived.

Hall did not finally leave Aberdeen till May, 1785; but he had already, during the preceding summer, officiated as one of the regular pastors of the Baptist congregation at Broadmead, Bristol, in association with Dr. Caleb Evans; and in August, 1785, he was also appointed classical tutor in the Bristol Academy. His father died in 1791, and the same year a difference with Dr. Evans led to his removing from Bristol and accepting an invitation to become pastor of the Baptist congregation at Cambridge on the departure of the Rev. Robert Robinson to be successor to Dr. Priestley at Birmingham.

He had already acquired considerable celebrity as a preacher, but it was not till now that he appeared as an author; and the impulse that sent him to the press was rather political than theological. His first publication (unless we are to reckon some anonymous contributions to a Bristol newspaper in 1786-7) was a pamphlet entitled 'Christianity consistent with a Love of Freedom, being an Answer to a Sermon by the Rev. John Clayton,' 8vo., 1791. Like most of the ardent minds of that day, he had been strongly excited and carried away by the hopes and promises of the French Revolution, and he appears to have retained his first faith without much alteration for some years. In 1793 he published another liberal pamphlet, entitled 'An Apology for the Freedom of the Press, and for general Liberty, with Remarks on Bishop Horsley's Sermon preached 31st January, 1793.' This was largely diffused, and brought him much reputation. The impression that had been made upon him, however, by the irreligious character of the French revolutionary movement was indicated in his next publication, 'Modern Infidelity considered with respect to its Influence on Society, a Sermon,' 8vo., 1800. It was the publication of this able and eloquent sermon which first brought Hall into general notice. From this time whatever he produced attracted immediate attention. The Sermon on Modern Infidelity was followed in 1802 by another on the Peace, which also brought him great reputation.

In November, 1804, Hall was visited by an attack of insanity, the violence of which did not last long, but from which he did not entirely recover for some years. His state of health made it necessary for him to resign his charge at Cambridge; but, apparently about 1807, he became minister of the Baptist chapel in Harvey-lane, Leicester, and this situation he held for nearly twenty years. He married in March, 1808. At last, in 1826, he removed to the pastoral care of his old congregation at Broadmead, Bristol; and here he remained till his death, which took place at Bristol, on the 21st of February, 1831.

Besides occasional contributions to various dissenting periodical publications, Hall published various tracts and sermons in the last twenty years of his life, which, along with those already mentioned, have since his death been collected and reprinted under the title of 'The Works of Robert Hall, A.M., with a brief Memoir of his Life by Dr. Gregory, and Observations on his Character as a Preacher by John Foster; published under the superintendence of Olinthus Gregory, LL.D., professor of mathematics in the Royal Military Academy,' 6 vols. 8vo., London, 1831-2. It was intended that the Life should have been written by Sir James Mackintosh, but he died (in May, 1832) before beginning it. Dr. Gregory's Sketch, from which we have abstracted the materials of this article, is contained in the last of the six volumes. The first contains sermons, charges, and circular letters (or addresses in the name of the governing body of the Baptist church); the second, a tract entitled 'On Terms of Communion,' in two parts, 1815; and another entitled 'The Essential Difference between Christian Baptism and the Baptism of John' (a defence of what is called the practice of free communion), in two parts, 1816 and 1818; the third, political and miscellaneous tracts, extending from 1791 to 1826, and also the Bristol newspaper contributions of 1786-7; the fourth reviews and miscellaneous pieces; the fifth, notes of sermons, and letters. The sixth, besides Dr. Gregory's memoir, contains Mr. Foster's observations, and notes taken down by friends of twenty-one sermons.

Hall was a man of many virtues, and of intellectual powers which placed him in the first class of mere men of talent. His acquirements were very considerable, and he appears to have kept up the habits of a studious man to the end of his life. But the great temporary impression that he made as a preacher and as a writer is to be attributed chiefly to general force and fervour of mind, and not much to any higher or rarer faculty. He was more of an orator or of a rhetorician than of a thinker. His greatness lay in expression and exposition, not in invention; and even his eloquence was rather flowing and decorative than either imaginative or impassioned. His mind was not in any sense an original or creative nor even a subtle or a far-seeing one. It may be predicted, therefore, that the six volumes of his writings, with all their general finish and elegance, and occasional brilliancy, although they may preserve his name from being forgotten, will not greatly interest posterity. They do not contribute anything to the world's stock of thought or even of knowledge; and are therefore nothing more than a record or memorial of what their author was.

HALL, BASIL, CAPTAIN, R.N., was born at Edinburgh in 1788. His father Sir James Hall, Bart., of Dunglass, was President of the Royal Society of Edinburgh. He was the author of an 'Essay on the Origin, Principles, and History of Gothic Architecture,' published in 1813, and a frequent contributor of scientific papers, chiefly on geological subjects, to the Royal Society of Edinburgh. Sir James Hall was married to Helen, a daughter of the fourth Earl of Douglas.

Basil Hall entered the Royal Navy in 1802; in 1808 received his first commission as lieutenant; in 1814 was promoted to the rank of commander; and in 1817 he was made a post-captain. The opportunities which the naval profession affords both for scientific pursuits and the study of men and manners in various climes happened in Captain Hall's case to lead him into scenes of more than usual interest; or perhaps it would be more correct to state that his eager and indefatigable pursuit of knowledge induced him to seek every means of extending the sphere of his observations. In 1813, when acting commander of the Theban on the East India station, he accompanied Sir Samuel Hood, the admiral, in a journey over the greater part of the island of Java. Soon after his return to England, he was appointed to the command of the Lyra, a small gun-brig, in which he accompanied the expedition which took out Lord Amherst as ambassador to China. While the ambassador was pursuing his journey inland to Pekin, Captain Hall in the Lyra visited the places of greatest interest in the adjacent seas, and on his return to England in 1817 he published 'A Voyage of Discovery to the Western Coast of Corea, and the Great Loo Choo Island in the Japan Sea.' There is an appendix to the work, which contains charts and various hydrographical and scientific notices. A second edition was published in 1820, in which the scientific details are omitted; and in 1827 the work appeared in a still more popular form as the first volume of 'Constable's Miscellany.' In this edition there is an interesting account of Captain Hall's interview at St. Helena with the ex-Emperor Napoleon. Sir James Hall (Captain Hall's father) had been the emperor's fellow-student at Brienne, and was the first native of Great Britain whom the Emperor recollected to have seen. Captain Hall was next employed on the South American station in command of the Conway. The period was one of great interest to the Spanish colonies of South America.

Having returned to England early in 1823, Captain Hall published 'Extracts from a Journal written on the Coasts of Chili, Peru, and Mexico, in the years 1820, 1821, and 1822,' with an appendix containing a memoir on the Navigation of the South American station. There are also appendices which contain various scientific notices; and a paper by Captain Hall 'On the Duties of Naval Commanders-in-chief on the South American Station before the appointment of Consuls.' In 1825 he married Margaret, youngest daughter of the late Sir John Hunter, Consul-general for Spain; and in April, 1827, he and his wife and child sailed from Liverpool for the United States, where they remained above a year, during which Captain Hall travelled nearly nine thousand miles by land and water conveyances. In 1829 he published his 'Travels in North America,' 3 vols. 8vo. He next published 'Fragments of Voyages and Travels.' They form three series, each of three volumes, 12mo. In 1834 he met at Rome with a sister of Mrs. Dugald Stewart, who having married Count Purgstall, an Austrian nobleman, had resided many years at her schloss or castle of Heinfeld, near Gratz, in Styria. He accepted an invitation to visit the countess, and his book 'Schloss Heinfeld, or a Winter in Lower Styria' was the result of his notes during his residence there. Captain Hall supposes that Die Vernon, in Sir Walter Scott's novel of 'Rob Roy,' was sketched from Miss Craunston, which was the maiden name of the countess. Captain Hall's last work was published at the end of the year 1841, in three volumes, under the title of 'Patchwork.' It consists of detached papers, which embrace recollections of foreign travel, incidents worked into short tales, and a few essays.

Captain Hall was a Fellow of the Royal Societies of London and Edinburgh, and a member of the Astronomical Society of London. The following is a list of some of his scientific papers:—An Account of the Geology of the Table Mountain; Details of Experiments made with an invariable Pendulum in South America and other places for determining the Figure of the Earth; Observations made on a Comet at Valparaiso. The above three papers are published in the Transactions of the Royal Society. A Sketch of the Professional and Scientific Objects which might be aimed at in a Voyage of Research. A Letter on the Trade Winds, in the Appendix to Daniell's Meteorology; with scientific papers in Brewster's Journal, Jamieson's Journal, and the Encyclopædia Britannica.

Captain Basil Hall having been unfortunately seized with mental alienation, was placed in the Royal Hospital, Haslar, Portsmouth, where he died on the 11th of September, 1844.

HALLE, a flourishing town with a population of above 5000 inhabitants, is situated on the river Senne, in the province of South Brabant, in the kingdom of Belgium, ten miles south-west of Brussels. The town has several breweries, distilleries, tanneries, saltworks, and a paper-mill. It is celebrated for the manufacture of beautiful articles of wood, of which considerable quantities are exported.

(Hassel, *Handbuch*; Cannabich, *Lehrbuch*; Stein, *Handbuch*, by Hörschelmann.)

HALLER, JOHANN, a distinguished German sculptor, was born at Innsbruck in 1792. He studied in the academy of Munich, and in his third year obtained the prize in sculpture, for a statue of Theseus raising the Rock to discover the Sandals of his Father. He executed many works in Munich for the present king of Bavaria, both as prince and king; the principal of which are the models of the sculptures for the pediment of the Glyptothek, representing Pallas Ergane (Ἐργάνη, the 'worker'), from a design by Wagner; the six colossal statues of the niches in the front of the same building, namely Hephæstus, Prometheus, Dædalus, Phidias, Pericles, and Hadrian; and the Caryatides of the royal box of the great theatre at Munich; besides a basso-rilievo in the interior of the Glyptothek after a design by Cornelius, representing the Fall of the Giants; and many busts of eminent men, some of a colossal size. He executed the bust of William III. of England for the Walhalla. He died in 1826, aged only thirty-three. He studied some time in Rome.

(Nagler, *Allgemeines Künstler-Lexicon*.)

HALO is a circular band of faintly coloured light which is occasionally seen surrounding the disk of the sun or moon at a distance from it equal to 22 or 23 degrees, measured on a great circle passing through the luminary. The colours of the solar halo are such as are observed in the rainbow, but they are less bright, and they do not always, in the halo, follow the same order as in the bow. Generally the red is nearest to the sun, the exterior of the band being a pale indigo or violet, and sometimes white; but occasionally the interior edge appears to be white, and beyond this, in succession, are green, yellow, and a pale red. The lunar halo in general appears to be white, but it is at times tinted with pale green or red. Often about either luminary the halo is double, consisting of two concentric circular bands, the exterior one being broader than the other, but its colours paler, and its distance from the luminary being twice as great as that of the interior band. Between either halo and the luminary the sky is frequently grey, on account of a thin veil of clouds which covers it, but sometimes its colour is a deep blue.

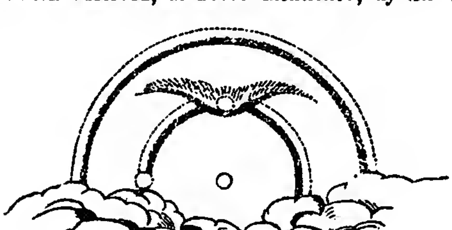
When a mist or a thin cloud is between the sun or moon and a spectator, there is frequently observed an ill-defined circle of coloured light immediately surrounding the disk of the luminary: this is called a corona; it sometimes appears when a halo is also seen, but it is more commonly observed without such accompaniment. The solar corona generally consists of three concentric bands variously coloured; and in one which was seen by Newton the colours of the three bands were successively, proceeding from the sun outwards, blue, white, and red; purple, blue, green, and pale red; pale blue and pale red. The semi-diameter of the exterior circumference was about six degrees. The coronæ are supposed to be produced by the refractions of light in the globules of water which are suspended in the atmosphere between the spectator and the luminary.

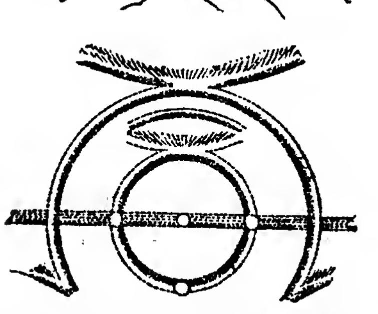
It may be observed in this place that images of the sun have been occasionally seen as if by reflexion from some cloud, the sun being near the horizon: these are called anthelia; and Mr. Swinton, from the top of a hill near Oxford, saw one which was for a short time as bright as the true sun and equal to it in magnitude. The cause of these phenomena is yet uncertain; but such an image may be produced when in the lower part of the atmosphere there exist innumerable prisms of ice with their axes in vertical positions and so situated that the rays of light falling on one side of each prism may enter the eye of the spectator after two refractions with one intermediate reflexion; or after two refractions with two intermediate reflexions. The index of refraction in ice being 1·31, and the prisms equilateral; it may be proved that, in the first case, the false sun will appear to be at a distance from the true sun equal to 142 degrees, and in the latter case at a distance equal to 82 degrees.

Halos are frequently accompanied by a horizontal ring or band of whiteish light passing through the sun or moon, appearing to ascend as the luminary rises, and having its apparent semi-diameter equal to the zenith distance of the latter; and at times a similar band appears in the direction of a diameter perpendicular to the horizon. At the intersections of these bands with the halo (but in a few instances a little beyond such intersections) are sometimes seen images of the sun or moon, which are ill defined and less bright than the true disc of the celestial body: these, when the halo is formed about the sun, are called parhelia; and when about the moon, paraselenæ. Occasionally also segments of circles, or branches of curves of contrary flexure, proceed from these images of the sun or moon so as to assume the appearance of wings or tails.

Many remarkable phenomena of this kind have at various times been observed: in the History of England, by Matthew Paris, there is a description of a halo which is stated to have been seen in the year 1233, on the borders of Herefordshire and Worcestershire: it is related that on each side of the halo was a semicircle which intersected the halo in two places; and that at the four intersections were as many false suns. In 1586 Rothman observed at Cassel, soon after sun-rise, a false sun above, and one below the true sun, all being in one vertical line; and in 1629 Scheiner observed a remarkable halo at Rome. In 1660 Hevelius, at Danzig, observed a single halo, and in 1661 a double halo; the former was accompanied by two false suns at the extremities of a horizontal diameter; and another at the upper extremity of a vertical diameter; the two horizontal suns had tails tending away from the true sun: the latter halo was accompanied by three false suns like the other, and by several segmental bands of light, two of which had false suns at their places of intersection. In the last-mentioned year Hevelius observed also a halo with two paraselenæ and a double corona about the body of the moon. Dr. Halley observed a halo with parhelia in 1702; and a very remarkable one was seen by Sir Henry Englefield at Richmond, in 1802 (*Journal of the Royal Institution*, vol. ii). Besides these, many such phenomena have been observed in Europe, in the United States, and in Canada; and Captain (Sir Edward) Parry observed and measured several during his voyages to the arctic regions.

The first of the subjoined figures is a representation of the phenomenon observed, as above mentioned, by Sir Henry





Englefield. The sun being about 14 degrees above the horizon, portions of two halos were seen, one at 24 degrees, and the other at 48 degrees from it; the interior portion was of a pale yellow, and a degree broad; and the other, which was about 1½ degree broad, was tinted with prismatic colours, the red being nearest to the sun. On the left hand side of the interior ring, and in a line imagined to be parallel to the horizon, was a faint parhelion; and vertically above the sun, in the same ring, was a very remarkable parhelion rather brighter than the true sun: it had a pearly appearance, was ill defined, and about two degrees broad. From each side of this image proceeded a bright curve of contrary flexure, being first convex and then concave towards the sun. It extended nearly to the outer circle, and its lower side was tolerably defined; but the upper side melted, with streaks of light, into the sky: the parhelion with its curved prolongations is said to have had very much the appearance of a vast bird hovering over the sun.

The second figure is a representation of a great double halo which was observed by Captain Parry: in this, a horizontal circle of light, at the intersections of which with the interior halo were parhelia, passed through the true sun; and there were segments of circles both at the upper extremities of the two halos and at the lower extremities of the exterior one, the latter being incomplete. The altitude of the true sun was about 23 degrees; and the radii of the two circles were, respectively, 22½ degrees and 45 degrees. The lowest parhelion was very bright, but had no colours, while all the segments were strongly tinted with colour. Above the sun, at about 26 degrees from it, and between the two halos, was a small portion of a third halo, which appeared to be elliptical; and the space between the two segments was extremely brilliant, in consequence of strong reflexions of the sun's rays from the snow which floated in the atmosphere.

In the tropical regions coloured halos are frequent and brilliant; and, near the equator, Humboldt has observed small ones surrounding the planet Venus.

The explanation which has been given of the halo by Mariotte and Dr. Young, is nearly as follows:—Between the spectator and the sun innumerable crystals of snow or ice, having the form of equilateral prisms, may exist in the air, in all possible positions: of these probably one half will be so situated as to be incapable of transmitting any refracted light to the eye, but vast numbers may have their transverse sections in planes nearly passing through the sun and spectator; and it will follow (the index of refraction in ice being about 1·31 and assuming the angles of incidence to be such that the incident and emergent rays may make equal angles with the surfaces) that the deviation of the refracted from the incident ray, at the eye of the observer, is about twenty-two degrees. Hence, the incident rays being considered as parallel to one another, there must appear to be formed a circle of light about the sun at a distance from the latter equal to that number of degrees. The semidiameter of the common halo is rather greater than this quantity; but the index of refraction in ice or snow is uncertain, and the angles of the prisms may, from partial meltings, be rather greater than sixty degrees.

Dr. Young supposes that the rays refracted from prisms so situated may fall on other prisms similarly situated, and may thus suffer two additional refractions at their surfaces; by which means the rays entering the eye of a spectator would form angles of twice the above quantity, or nearly forty-four degrees with the direct rays from the sun; and this may account for the exterior halo. Mr. Cavendish, however, suggested that the latter may be produced by the two refractions which a ray would undergo in passing through a face and one end of a prism; that is, through two surfaces which are at right angles to one another. Such refractions would cause the incident and emergent rays to make with one another an angle of about 45° 44′; and this is, nearly, the distance of the exterior halo from the sun. The red rays of light, being those which suffer the least refraction, come to the eye from the interior edges of the rings; and hence those edges generally appear of a red colour: the exterior parts should be blue, and they frequently are so; but it may be readily imagined that, with such prisms, considerable irregularities in the order of the colours must take place.

Immense numbers of very short prisms, or thin triangular plates, of ice will assume, in the air, vertical positions by the action of gravity; and Dr. Young conceives that horizontal rays from the sun falling on their flat surfaces may be reflected from thence to the eye of the observer, so as to produce the appearance of the horizontal circle, or band, of light which so frequently accompanies the halo. Plates of ice disposed so as to reflect the sun's light in a vertical plane may be the cause of the column which is sometimes seen to form a vertical diameter of a halo; and a similar explanation may be given of the bands forming oblique diameters such as, on one occasion, were observed by Captain Parry, when the halo had the appearance of a great wheel in the heavens, the sun being in its centre. The blending of the reflected rays above mentioned with the rays refracted from the sides of the prisms, at the places where the horizontal and vertical bands of light intersect the halo, is, apparently, the cause of the parhelia which are very generally observed in those parts of the halo; and, when the transverse sections of the refracting prisms deviate from a plane passing through the observer, towards the right or left, the axes being horizontal, there will be produced a curvilinear band of light, like a wing, inclining upwards on either side of a parhelion.

HALO'NIA, a genus of fossil plants, allied to Lepidodendron, and occurring in the coal formation.

HAMILTON, DAVID, a Scotch architect, to whom Glasgow is indebted for its chief modern edifice (the Exchange) and some other buildings, was born in that city, May 11, 1768. Of his professional education and earlier studies little is known. We must therefore content ourselves with enumerating some of his principal works, which alone will show that he was extensively employed. At Glasgow, besides the Exchange, he erected the Theatre (1804), the Western Club House, the Glasgow, the British, and some other banks; and in the West of Scotland several private mansions of a very superior class, viz. Hamilton Palace, the princely seat of the Duke of Hamilton; Toward Castle, that of the late Kirkman Finlay, Esq.; Dunlop House, Ayrshire, for Sir John Dunlop; and Lennox Castle, for John Kincaid, Esq. of Kincaid, which last is considered one of his best works. Among the structures above named, the one by which he will be most generally known is the Glasgow Exchange (erected about 1837-40), an insulated edifice (200 by 76 feet) standing in the centre of a regular *emplacement* or area of 300 by 200 feet. That end of the building which faces Queen Street is entirely occupied by an octastyle Corinthian portico, which besides being diprostyle has two inner columns behind the second and the seventh of those in front, consequently although there is exactly the same number of columns (twelve) as in the portico of the Royal Exchange, London, there is considerable difference of plan as regards the interior. Still more does the Exchange itself differ from the London one, since instead of being an open cortile like the latter, it is covered over, and forms a spacious room of about 100 by 65 feet, divided into three spaces on its plan by a range of seven columns on each side.

Hamilton was one of the few architects at a distance who entered into the competition for the New Houses of Parliament, on which occasion he so distinguished himself that one of the four 500*l.* premiums was awarded to him for his designs. On another occasion (the completion of the Exchange) he was complimented, in July, 1840, by a public dinner, and the present of a service of plate, and gold box, &c., from the citizens of Glasgow. He was in fact universally respected no less for his probity and excellence of character than for his abilities.

He died at Glasgow, December 5, 1843, in his seventy-sixth year, leaving a son in the same profession whom we conjecture to be the present Mr. Thomas Hamilton of Edinburgh, architect of two of the most tasteful structures in that city; the High School, a happy application of Grecian Doric; and the new Physicians' Hall just completed (1845), which though a small façade, exhibits some freshness of design, and is remarkable for the novel and effective manner in which the two statues are introduced.

HAMPTON COURT PICTURE GALLERY. This historically highly interesting collection, which occupies the state apartments of Hampton Court Palace [MIDDLESEX, P. C., p. 195], is open to the public gratuitously on every day of the week except Friday, when it is closed for the purpose of being cleaned. It is open from ten in the morning until six in the evening, from April 1 to October 1; and from ten until four for the remainder of the year.

The present collection, which has been lately re-arranged, has been chiefly formed within the last few years from the royal collections at Kensington Palace, Buckingham House, and Windsor Castle. It contains, besides tapestries and other mural decorations, 1025 pictures and drawings of various descriptions, by 256 different masters; but the good works are numerically a small proportion of the whole, notwithstanding the great names inscribed upon the frames, which are distributed with a recklessness certainly unparalleled in any other collection. The arrangement of the whole collection, also, though much improved of late, is extremely bad; several distinct and highly interesting galleries might be formed by judicious selection and arrangement out of the present incongruous mass: there is material for an excellent historical portrait gallery in the many interesting works which are at present scattered about in the thirty-one apartments which compose the gallery. In their present scattered condition, their pictorial value is the chief attraction of these portraits, and this, in most cases, is of a very low degree; but were they arranged according to their ages and characters, they would obviously have a great historical interest for multitudes who would scarcely glance at them as mere paintings.

The old royal collection of Hampton Court was a comparatively small collection; but it contained a large proportion of interesting works, including many that were in the collections of Charles I. and James II., of which some still remain; but the best were removed by George IV. to Windsor Castle, when that palace was repaired and enlarged by Sir Jeffrey Wyatville in 1828. The original collection of Charles I. consisted of 332 pictures, which were valued at 4675*l.* 10*s.* by the appraisers of the Council of State previous to the sale of Charles's effects. Charles possessed altogether 1387 pictures and 399 pieces of sculpture, which were valued by the same party at 31,913*l.* 12*s.* and 17,989*l.* 10*s.* 6*d.* respectively. (*A Catalogue and Description of King Charles the First's capital Collection of Pictures, &c.*, London, 1757.)

The following are the principal works of the present collection at Hampton Court:—

1. *The Guard Chamber*, containing numbers 1 to 17 inclusive: Zucchero's portrait of Queen Elizabeth's giant porter who was seven feet six inches high. 2. *The King's first Presence Chamber*, 18-61, contains Queen Mary's Beauties, by Kneller, known as the Hampton Court Beauties; a wooden Equestrian portrait of William III., by Kneller; an excellent portrait of the first Marquis of Hamilton by Mytens; an extravagant allegory of Calumny, by Zucchero, which, though founded upon the story of Lucian [ANTIPHILUS, P. C. S.], is not painted from his description of the picture of Apelles of Ephesus; a portrait by Dobson, and one by Riley; an Italian lawyer by Bordone, and a portrait by Titian, both good pictures; a well-painted picture of the painter De Bray and his family, by himself; and a copy of a Venus by Titian, in the Pitti Palace, attributed to Titian; there are also several inferior portraits and others in this room which are attributed to great masters, particularly a Man showing a Trick, attributed to Da Vinci, which is evidently not by that master. 3. *The second Presence Chamber*, 62-106, contains an admirably painted picture described in the catalogue as 'The Sculptor Baccio Bandinelli, by Correggio;' but the head is not like the authentic portrait of Bandinelli, and the painting, though in the style of Correggio, is more probably a later imitation; a finely-painted head of Alessandro de' Medici, by Titian; a copy of the large picture at Windsor of Charles I. on horseback, by Vandyck; a copy by Sir J. Reynolds of Guido's St. Michael; a Dutch gentleman, by Vanderhelst; Christian IV., King of Denmark, by Vansomer; and Philip IV. and his queen, two portraits by Velazquez. 4. *The Audience Chamber*, 107-149, contains five Scripture pieces by Sebastian Ricci, which are elevated in sentiment and beautiful in colour; Ignatius Loyola, by Titian, a very sinister-looking countenance; a portrait of the Queen of Bohemia, the daughter James I., by G. Honthorst; and several bad pictures attributed to great masters, especially a Venus and Cupid said to be copied by Rubens after Titian. 5. *The King's Drawing-room*, 150-172, contains the Cornaro Family, by Old Stone, after the original by Titian in Northumberland House; Joseph and Potiphar's wife, by Gentileschi; and the family of Pordenone, by himself, an extremely bad composition. 6. *King William III.'s Bed-room*, 173-206. In this room are the beauties of the court of Charles II., or the Windsor Beauties, painted chiefly by Lely: as pictures, they are dry, cold, monotonous and formal, and as portraits, so much alike that it is difficult to believe in a resemblance to the originals: the Duchess of Portsmouth, by Gasker, has a very different physiognomy from those by Lely, which are absolutely void of individuality; of Lely's the best in the room is the Princess Mary as Diana. 8. *The King's Writing-Closet*, 225-246, contains a good drawing, by Gibson the dwarf, of the queen of Charles I. 10. *Her Majesty's Gallery*, 272-448, contains many old portraits, some of which are among the historically most interesting works in the collection—Henry VIII., Queen Elizabeth, &c., by Holbein and others, though all the pictures attributed to Holbein in this gallery are certainly not by that master: the best works of this room are the children of Henry VII., by Mabuse, painted in 1495; and the portraits of Fro-

benius the printer and two of Erasmus, by Holbein. 12. *The Queen's Drawing-room*, 490-504, all by West, among them a duplicate of the death of Wolfe. 13. *The Queen's Audience Chamber*, 505-541, contains two excellent paintings, in their style, of James IV. of Scotland, with his brother Alexander and St. Andrew; and his queen, the daughter of Henry VII., with St. George, by Mabuse, attributed by Passavant to Hugo Vander Goes, but certainly erroneously [GOES, HUGO VANDER, P. C. S.]: in this room also are the three curious large pictures of the Battle of Spurs, the Embarkation of Henry VIII. at Dover, and the Field of the Cloth of Gold, attributed to Holbein, for the reason probably that Holbein was painter to Henry VIII.; but there is not in all three pictures the slightest evidence of the hand or style of Holbein; the execution is minute, but it is at the same time coarse and dirty. 15. *The Prince of Wales's Presence Chamber*, 546-589, contains Adam and Eve, by Mabuse; Walker's portrait, by himself; and two drawings by Isaac Oliver. 20. *The private Dining-room*, 668-690. In this room is a richly-coloured portrait of Fisher the composer, by Gainsborough. 26. *The Cartoon Gallery*, 769-775. This gallery is occupied entirely by the seven cartoons of Raphael [CARTOONS, P. C.], for which it was expressly built by Sir Christopher Wren, and perhaps there never was a building so ill adapted to its purpose; it is too narrow, the cartoons are placed much too high, and the light is wholly bad; the windows are actually below the pictures which they are intended to light. 27. *The Ante-room*, 776-797. In this room is an admirable drawing in chalk upon paper of Raphael's Transfiguration, from the original in the Vatican at Rome: it was drawn by Giambattista Casanova for Lord Baltimore, who presented it to George III.: this drawing and the cartoons together show Raphael to full advantage. 28. *The Portrait Gallery*, 798-855. This apartment, though styled the portrait gallery, is chiefly occupied by the nine large distemper paintings of the Triumph of Julius Cæsar, painted on canvas by Mantegna for the Marchese Ludovico Gonzaga of Mantua, about 1490, after Mantegna's return from Rome: there are some well-known woodcuts of them by Andrea Andreani. These works are Mantegna's masterpiece, and are among the greatest works of the fifteenth century: they are unfortunately in a very bad condition, and what is still more to be regretted, William III. had them restored by Laguerre in 1690: they were purchased by Charles I., with the collection of the Duke of Mantua, for about 20,000*l.*, and were sold at the state sale for 1000*l.*, while the cartoons of Raphael were sold for 300*l.* only. In this room is also a portrait of William of Nassau, Prince of Orange; Dobson and his wife, by Dobson; and a picture of the dwarf Sir Jeffrey Hudson, by Mytens. 29. *The Queen's Guard Chamber*, 857-928. This room contains several portraits of painters; Henry IV. and Mary de' Medici, by Pourbus; an excellent copy by Romanelli of Guido's triumph of Bacchus; and a Samson and Delilah, attributed to Vandyck, which is a copy of the original picture at Munich. 30. *The Ante-room*, and, 31, *the Queen's Presence Chamber*, 929-1025, are devoted to naval battles, marine views, and shipping generally, including several pieces by Vandevelde, and many beautifully painted hulls of ships of war, by Marshall, and three large pictures of the Battle of Trafalgar by Huggins.

The great hall is decorated with tapestries of the story of Abraham, said to be made from designs by Bernard van Orlay, a Fleming who studied under Raphael at Rome. They are certainly of the style of the sixteenth century, but are charged in manner; many of the heads however are full of character, and the composition is in many parts natural and effective. The colours are much faded, but as tapestries they are of a very superior class: Evelyn says of them in his Diary—'I believe the world can show nothing nobler of the kind than the stories of Abraham and Tobit.' They were estimated in the parliamentary inventory at 8200*l.*; but they were reserved by Cromwell for the state: the whole history is told in ten compartments, eight of which are in the hall, and two in *the public dining-room* (14), where there is also a tapestry of Tobias, with the angel, taking leave of his father Tobit, and his mother grieving for his departure. In the large apartment next to the hall, called *the Withdrawing-room*, are some much older tapestries, in a barbarous style of composition; their subjects are allegorical, but the colours are so faded that they are almost obliterated. Above the tapestries are some freely executed and beautiful drawings by Cignani: they are the cartoons of some frescoes painted by him in the ducal palace at Parma.

Every facility is afforded for students desirous of copying in the gallery; but permission must first be procured of the Chief Commissioner of her Majesty's Woods and Forests, or of the Deputy Surveyor; for without permission no person is allowed to make even the slightest sketch in a pocket-book, or in any way to make a *graphic* note of what he has seen—an injurious and extremely absurd regulation; for if an artist should wish to sketch a Tudor ruff, or a Stewart tie, or any thing else of as much importance, he must first forward a petition to her Majesty's Chief Commissioner of Woods and Forests.

Hampton Court is a very favourite resort in the summer; there have frequently been as many as 5000 visitors in a single day. Guides and catalogues may be had at the palace; there are catalogues also in Mrs. Jameson's 'Hand-Book to the Public Galleries of Art in and about London;' and in 'The Environs of London,' by John Fisher Murray.

HANDWRITING, PROOF OF. [EVIDENCE, P. C.]

HAREBELL. [CAMPANULA, P. C. S.]

HARLOW, GEORGE HENRY, was born in London in 1787. He was the only son of his parents; his father, who was a merchant, died while he was an infant, and he was brought up by his mother, who watched with interest and anxiety the early development of her son's talent for drawing. He was educated for a few years at Westminster school; but when about sixteen he was placed with a Flemish landscape painter of the name of De Cort, whom he left for the late Mr. Drummond, A.R.A., the portrait-painter; and he was finally placed in the studio of Sir Thomas (then Mr.) Lawrence, in Greek Street, with the privilege of copying pictures there, from nine until four o'clock, but with an especial proviso that he should receive 'no instruction of any kind:' for this privilege he paid one hundred guineas per annum. At the expiration however of a year and a half, the master and pupil quarrelled. Lawrence used to employ Harlow to dead-colour, and Harlow had so far a share in painting a much admired dog in a portrait of Mrs. Angerstein, which, at the Angerstein's, he had the imprudence to claim as his own. This came of course to the ears of Lawrence, who in consequence said to his pupil, 'As the animal you claim is among the best things I ever painted, of course you have no need of further instruction from me. You must leave my house immediately.' Harlow has the credit of having revenged Lawrence's resentment by painting a caricature of his style, upon a sign-board at Epsom, in one corner of which he wrote, 'T. L., Greek Street, Soho.'

Harlow, however, had little need of any man's assistance or instruction; he possessed a fine feeling for colour, a tolerably correct eye for form, and great facility of execution, especially in portraiture in small, whether in pencil, crayons, or oil-colours; and he was the rival of Lawrence at the age of twenty-two. He never studied at the Royal Academy: he professed to consider study in schools and academies as so much time spent in the destruction of originality. His first picture of note was Hubert and Prince Arthur; but he painted few historical pieces; the most celebrated of them is the Trial of Queen Catherine, of which the principal characters were portraits of the Kemble family; Mrs. Siddons as Queen Catherine. Harlow painted many portraits, of which the best is certainly that of Fuseli, painted for Mr. Knowles, Fuseli's biographer; it is a work of the highest merit in every respect. The portraits of Northcote and Nollekens are also among his best works.

Having already obtained a considerable reputation and some means, Harlow set out, in June, 1818, upon a visit to Rome, where he attracted great notice and excited some wonderment by completing an effective copy of the Transfiguration, by Raphael, in eighteen days. Canova was much pleased with it, and told Harlow that it looked like the work of eighteen weeks; he exhibited one of Harlow's pictures at his house, and it procured him his election as a member of the Academy of St. Luke, where it was also exhibited. The only English artists that had been elected members of St. Luke's besides himself were West, Flaxman, Fuseli, and Lawrence. Harlow, before he left London, was a candidate for the degree of associate in the Royal Academy, but he had only one vote, that of Fuseli. He wrote a most sanguine letter from Rome on November 23, 1818, full of hopes and plans for the future; but in less than ten weeks from that date his body was borne to its final abode; he died in London of a virulent attack of cynanche parotidea (mumps), on the 4th of February, 1819, in the thirty-second year of his age, and shortly after his return from Italy. He was elected a mem ber of the academy of Florence on his passage home through that city. His biographers describe him as having been frivolous in character and prodigal in his habits; he was, however, little more than a youth when he died. As a painter he had great merit: Lawrence said of him, 'He was the most promising of all our painters.'

(Smith, *Nollekens and his Times*; Cunningham, *Lives of British Painters*, &c.)

HARPES, a genus of fossil Crustacea (Trilobites), from the Devonian strata.

HARRIS. [MALMESBURY, EARL OF, P. C. S.]

HARRISON, THOMAS, generally called 'Harrison of Chester,' although he was not a native of that city, for he was born at Wakefield in Yorkshire, in 1744. While yet little more than a mere lad, he was sent to Italy, then considered almost the only efficient school for architectural study; and during his stay at Rome, where he remained for several years, he made designs for improving and embellishing the Piazza del Popolo, which obtained for him both a gold and silver medal from Pope Ganganelli; and he was also complimented by being elected a member of the Academy of St. Luke. On his return, one of his first works was a bridge of five arches over the Lune, at Lancaster, at which place he was subsequently employed upon various alterations and improvements in the castle. At Chester, he erected the gaol, and the county courts, which last was considered at the time a very fine and correct specimen of the Grecian Doric style, and the portico certainly does produce more effect than ordinary in regard to columniation, for though only hexastyle, it has twelve columns, there being a second row of six columns behind those in front. He executed several works at both Liverpool and Manchester; in the former place the Athenæum, and the tower of St. Nicholas' church; in the latter, the Exchange buildings (since greatly enlarged and altered), the theatre (burnt down in 1843, and now succeeded by the new structure by Messrs. Irwin and Chester, opened September 29, 1845); and the library and reading-room called the portico. The Hill column at Shrewsbury, the triumphal arch at Holyhead, and the jubilee tower erected on Moel Famma in commemoration of the fiftieth year of the reign of George III. are all by Harrison. He also built for the Earl of Elgin his new mansion of Broome Hall, in Scotland, in the Grecian Doric style, which seems to have been equally the favourite one of his noble employer and himself. Cumberland in his 'Observer' has complimented Harrison in very high terms for the pure classicality of his taste.

Harrison died at Chester, March 29, 1829.

HARRISON, WILLIAM HENRY, late President of the United States, was born in Virginia, 9th February, 1773. His father was Benjamin Harrison, who was a member of the first Congress which met at Philadelphia in 1774, was one of those who signed the Declaration of Independence, and was afterwards governor of Virginia, his native state. He died in 1791. William Henry was educated at Hampden Sydney College, in Virginia, for the medical profession; but soon after the death of his father he joined a force which was raised to defend the Ohio territory against the Indians; and the next six years of his life were spent in military service. In 1791 he received a commission as ensign in the United States' artillery; he was soon after raised to the rank of lieutenant, and in that capacity he was present and distinguished himself at what is called the battle of the Miami, in which a signal victory was obtained over the Indians. After this he was placed in command of Fort Washington, one of the most important defences of the western frontier. In 1797, this war having been brought to an end, he resigned his commission, and was appointed secretary and *ex officio* lieutenant-governor of the north-western territory, then comprehending all the country to the north-west of the river Ohio. In 1799, when the north-western territory was admitted to what is called the second grade of territorial governments, entitling it to a legistive body composed of representatives chosen by the people, he was elected a member of the territorial congress. In 1801, when Indiana was erected into a territorial government, Harrison was appointed governor, and this situation he appears to have held till the erection of Indiana into a state in 1816. He greatly distinguished himself both in the war with the Indians under Tecumseh in 1811, and in that with the English in 1812 and 1813. In both these wars he held the rank of a general. In 1816 he was returned to the House of Representatives as one of the members for Ohio. In 1828 he was sent as minister from the United States to Columbia. By all these military and civil services General Harrison had acquired great popularity; and in 1840 he was elected president; but he died, at the official residence in Washington, on the 4th of April, 1841, being the first president who had died in office. Harrison was a valuable public servant and an able man; but he did not belong to the same class of minds with his predecessors Washington, Adams, Jefferson, and Madison. In his Essay on the Aborigines of the Ohio valley, which was published in the 'Transactions of the Historical and Philosophical Society of Ohio,' vol. i. 1839, he has made some interesting remarks on antient Indian mounds and on the original state of the forests of America. (See Lyell's 'Travels in North America,' vol. ii. p. 34.)

(*Gentleman's Magazine* for June, 1841.)

HARTSHORN, SPIRIT OF. [AMMONIA, P. C. S.]

HARTSOEKER, NICOLAS, a Dutch natural philosopher, was born at Gouda in 1656: his father, who was a minister of the Reformed religion, intended that he should enter the church as a profession; but a taste for the sciences, which the youth early evinced, prevented this intention from being carried into effect.

From the money which was allowed him by his father, young Hartsoeker saved enough to pay the fees of a teacher of mathematics; and he passed the greater part of each night in studying the subjects connected with the instruction which he received by day.

An accidental circumstance is said to have directed his attention to the construction of optical instruments: having presented a filament of glass to the flame of a candle, he was surprised to observe that the extremity, when melted, assumed a spherical form; and he immediately conceived the idea of using such spheres as object glasses for microscopes. In an account, which he published in 1678, of the instruments thus formed, he asserts that he discovered the animalcules which exist in animal fluids [LEEUWENHOECK, P. C.]; and, with the like instruments, Latorre is said to have, first, perceived the red globules in blood.

In 1674 Hartsoeker was sent to pursue his theological studies at Leyden; and, in that city, he became known to Huyghens, who encouraged him in the prosecution of his microscopical observations: the two philosophers subsequently went together to Paris, where Hartsoeker was introduced to Cassini, who recommended him to exercise his ingenuity in the formation of object-glasses for telescopes; and it appears that, after several fruitless essays, he succeeded in obtaining some which were superior to any that had been before executed. These were of about 600 feet focal length; and in order that they might have truly spherical forms, he first, by means of sand, made a very shallow excavation in a plate of glass; then giving, by the like means, a slight convexity to one side of the plate of which the intended object-glass was to be formed, he placed the convex side of the latter in the concavity of the other, and, by friction, brought the contiguous surfaces of both plates to equal and consequently spherical figures. In 1694 he published his 'Essai de Dioptrique;' (Paris, 4to.) in which, besides treating of the science, he attempted to give a general theory of the laws of nature respecting the hardness, elasticity, transparency, &c. of bodies. These subjects were, afterwards, explained in detail in his 'Principes de Physique,' which he published in 1696. The work was criticised by a writer in the 'Journal des Savans,' in the same year; and Hartsoeker seems to have revenged himself by making a violent attack on the 'Mémoires de l'Académie des Sciences.' The attack, however, remained unnoticed. It appears to have been the character of Hartsoeker to seek occasions of entering into discussions with his friends; and he, at length, lost the good opinion of the patient Leuwenhoeck by urging captious objections to the results of some of his experiments.

Having become embarrassed in his circumstances, Hartsoeker was obliged, in 1696, to quit Paris: he retired to Rotterdam, where he published the work above mentioned; and he afterwards removed to Amsterdam. At this time he was introduced to the Czar Peter, then travelling incognito, and he was appointed to give the monarch lessons in mathematics: his conversation was so agreeable to the Czar that the latter invited him to Russia. Hartsoeker however declined leaving Amsterdam, and the magistrates of the city built for him an observatory in one of the bastions.

The Elector Palatine having repeatedly offered Hartsoeker the place of professor of mathematics and philosophy at Düsseldorf, he at length accepted it; and, in the year 1704, he went to reside in that city: while he held this post he made several journeys to different parts of Germany in order to visit the learned men of the country; and at Hanover he was presented to the elector by the celebrated Leibnitz. On his return to Düsseldorf he caused three burning-lenses similar to those of Tschirnhausen to be executed. On the death of the Elector Palatine, Hartsoeker, declining the solicitation of the Landgrave of Hesse-Cassel that he would reside in that city, retired to Utrecht, where he died, in 1725. He had been admitted a foreign associate of the Académie des Sciences of Paris in 1699; and he was also a member of the Academy of Berlin.

Hartsoeker is said to have entertained, at one time, an opinion that there existed in every animal a plastic soul which was charged with the preservation and development of the individual: he is said to have maintained also, and the opinion was probably founded on a more refined idea expressed by Plato in the Timæus, that, from the divinity descended a succession of intelligent beings, the lower orders of which directed and preserved the universe; he had moreover some wild notions respecting an empire which he imagined to exist in the interior of the moon.

In 1722 Hartsoeker published a work entitled 'Recueil de plusieurs Pièces de Physique, où l'on fait principalement voir l'Invalidité du Système de Newton:' he also caused a letter to be printed in the 'Journal des Savans,' containing some absurd remarks on the hypothesis of the English philosopher. He treated Leibnitz no better, attacking with great violence his system of 'monads' and of a 'pre-established harmony.' He would never admit the advantages of the 'Infinitesimal Calculus,' and persisted in considering it as an unintelligible jargon by the aid of which certain learned men sought to increase their reputation. He is characterized by J. Bernoulli as a superficial and an arrogant man; but his violence is supposed to be less owing to envy than to a morbid taste for dispute.

HARTZ. [Germany, P. C., p. 186.]

HASSELQUISTIA, a genus of plants named by Linnæus in honour of Fred. Hasselquist, M.D., his pupil, who travelled in the Holy Land. It belongs to the natural order Umbelliferæ, and to the tribe Tordylineæ. The species closely resemble those of Tordylium, and are regarded by some botanists as monstrous forms of this genus.

HAUGHTON, WILLIAM, a dramatic writer, was probably somewhat the junior of Shakspere. In Henslowe's Diary, under the date of November, 1597, he is called 'Young Haughton:' and his name occurs frequently in that curious record, till the end of the year 1600, but not later. In March, 1599, Henslowe lent him ten shillings to pay a debt, for which he then lay in the Clink prison; and constant advances of small sums, in earnest of the price of dramas which he was writing for the old manager, show him to have been as poor or improvident as most of his fellow-playwrights. He wrote several plays unassisted; in others his coadjutors were Chettle, Day, and still more frequently Dekker, with whom indeed he seems to have stood in particularly close relations. In 1600 there was licensed a tragedy of his, not preserved, called 'Ferrex and Porrex;' and Mr. Collier has conjectured that Haughton's 'Devil and his Dam,' described as in progress about the same time, may have been an alteration of 'Grim, the Collier of Croydon.' The same critic is more confident in believing that 'The Spanish Moor's Tragedy,' for which, in February, 1600, Henslowe made to Dekker, Haughton, and Day a payment of three pounds to account, was the wild tragedy called 'Lust's Dominion,' which was printed for the first time in 1657, and has been inserted (without reason) in the recent edition of Marlowe's works. But the only extant plays in which Haughton was certainly concerned are two. 1, He was sole author of the lively comedy called 'Englishmen for My Money; or, a Woman will have her Will,' which (under the latter title) appears in Henslowe's book in 1598. It was printed in 1616, 1626, and 1631, and has been reprinted in a small collection called 'The Old English Drama,' 1830, 4 vols. 12mo. 2, Dekker, Haughton, and Chettle were jointly the authors of 'The Pleasant Comodie of Patient Grissill,' entered at Stationers' Hall in March, 1600, printed in 1603, and reprinted from a very rare copy by the Shakespeare Society in 1841.

HAUTEFEUILLE, JEAN DE, a French mechanician, was born at Orleans, March 20, 1647. His father, who was a baker, being accustomed to supply with bread the master of the house at which the duchess of Bouillon then resided, prevailed on this person to recommend the youth to the notice of that lady. The duchess having consented to see him, an interview took place, when the lady was so well satisfied with the young man that she engaged to pay the expense of his education; and, on his entering into the ecclesiastical state, she retained him in her service. He never afterwards quitted his benefactress, who conferred upon him several benefices, and at her death she bequeathed to him a pension.

The Abbé Hautefeuille, such was his designation, devoted himself to the study of subjects connected with physical science, and to the construction or improvement of instruments; but he is distinguished chiefly by the claims which he advanced in 1675 to the honour of having invented a spring-balance for watches. This contrivance consisted of a straight spring of steel which he applied so that it served to regulate the movements. About the same time Huyghens invented, for the like purpose, a spring, which he made of a spiral form: it happened however that Hautefeuille had communicated his invention to the Académie des Sciences of Paris in the preceding year; therefore when Huyghens applied to the French Government to be allowed the exclusive privilege of using it, he was opposed by Hautefeuille, and he subsequently withdrew his application. It is remarkable that Dr. Hooke had, about the year 1658, invented a balance-spring for watches, but he spent several years in improving his escapement, and his watches were not made public till about the same year that the inventions of Hautefeuille and Huyghens were in use in Paris.

The other inventions, or rather the projects, of Hautefeuille are numerous, but few of them appear to have been brought to perfection. He published in 1692, at Paris, a work entitled 'Recueil des Ouvrages de M. de Hautefeuille,' which contains an explanation of the effects of speaking-trumpets; an account of a pendulum clock in which the weight was to be raised by the action of the atmosphere; a method of raising water by means of fired gunpowder; and an account of some improvements in telescopes in which the field of view was to be increased by means of a concave mirror; also some observations on machines for raising water; a description of a pump which was to act without friction; and an account of a contrivance for mounting telescopes of great length.

Hautefeuille published a method of finding the declination of a magnetic needle (1683); an account of a magnetic balance (1702); with accounts of a micrometrical microscope, and of an instrument for observing the altitudes of celestial bodies. He also published, in 1719, a work entitled 'Nouveau Système du Flux et Reflux de la Mer,' in which the phenomena of the tides are made to depend upon a particular motion which he ascribes to the earth; but the best of his works is his 'Dissertation sur la Cause de l'Echo,' which had been read before the Academy of Bordeaux in 1718, and was published in that city in 1741.

Hautefeuille appears to have been in haste to publish his ideas as soon as they arose in his mind, without waiting to put them to the test of experiment; and consequently most of his projects are crude conceptions which have not led to any object of practical utility. The opinion entertained of him by his countrymen is manifest from the fact that he was never admitted a member of the Académie des Sciences though he ardently desired that honour. He died October 18, 1724, being then seventy-seven years of age.

(*Biographie Universelle.*)

HAWKER. [Pedlar, P. C.]

HAYMAN, FRANCIS, R. A., the best historical painter in England before the arrival of Cipriani, was born at Exeter about the commencement of the eighteenth century. He was the scholar of Robert Brown, and was in early life much employed by Fleetwood, the proprietor of Drury Lane old theatre, and by Tiers, the proprietor of Vauxhall. He also made many designs for booksellers, the best of which are the illustrations to Sir Thomas Hanmer's 'Shakspere.' He was the first librarian to the Royal Academy: he died in 1776. (Edwards, *Anecdotes of Painters*, &c.; *Somerset House Gazette*, 1824.)

HEADBOROUGH. [Constable, P. C.]

HEALTH, PUBLIC. [Public Health, P. C. S.]

HEARSAY. [Evidence, P. C.]

HEAT. [Abstraction and Absorption of Heat, P. C. S.; Conductors of Heat, P. C. S.]

HEAT, ANIMAL. The conversion of the food of man and the higher animals into nutriment for the body is attended with changes which produce an evolution of heat which constantly maintains the temperature of an animal at a point above or below, according to circumstances, the temperature of the medium in which it exists. The degree of heat possessed by animals not gifted with the power of locomotion is very small above that of surrounding media, and in this respect resembles the heat given off by plants. [TEMPERATURE OF PLANTS, P. C.] In proportion as animals possess the power of locomotion they evolve heat from their bodies. This arises from the fact that where the muscular system is most exercised there is greatest demand made upon the nutritionary processes going on in the system. We should therefore expect to find that the quantity of heat developed in the invertebrate animals was less than that in the vertebrate class. Infusoria are for a time capable of resisting cold; for when the water in which they are contained is frozen, the animalcule is observed to live for a time in a little uncongealed space which the caloric from its body prevents freezing. John Hunter found that various forms of Annelida, as leeches and worms, and several of the Mollusca, exhibited temperatures higher than the surrounding media. As might have been anticipated from their activity, the insects of all the invertebrate animals exhibit the highest temperature. They have been lately the subject of experiment by Mr. Newport. He found that they possessed a temperature above that of the medium in which they lived, varying from 2° to 9°. With respect to the temperature of the different tribes, Mr. Newport observes, 'Our previous observations lead us to anticipate the fact, that the volant insects, in their perfect state, have the highest temperature, while, on pursuing the inquiry, it is found that those species which have the lowest temperature are located on the earth. Among the volant insects, those hymenopterous and lepidopterous species have the highest temperature which pass nearly the whole of their active condition on the wing in the open atmosphere, either busily engaged in the face of day despoiling the blossoms of their honied treasures, or flitting wantonly from flower to flower, and breathing the largest amount of atmospheric influence. Of these the hive-bee, with its long train of near and distant affinities, and the elegant and sportive butterflies, have the highest. Next to these are probably their predatory enemies the hornets and wasps, and others of the same order; and, lastly, a tribe of insects which have always attracted attention, and in general are located on the ground, but sometimes enjoy the volant condition—the ants, the temperature of whose dwelling has been found to be considerably above that of the atmosphere. Next below the diurnal insects are the crepuscular, the highest of which are the sphinges and moths; and almost equal with them are the Melolonthæ.' In insects which live in societies the temperature is still greater. Mr. Newport found that a bee's-nest in a chalk bank had a temperature 14° to 16° above that of the atmosphere, and 17° to 19° above that of the bank.

Amongst the vertebrate animals, fishes and reptiles have the lowest temperature. Dr. Davy, John Hunter, and others, have found that fishes have a temperature of from ·7° to 2·7° above the surrounding medium.

In man the temperature of the accessible parts of the body, as the mouth, axilla, &c., is usually between 97·7° and 98·6°. The human blood is found to have a temperature in health varying from 100·6° to 101·75°; in disease it rises to 106° or 109°. In healthy persons the temperature is said to attain its maximum during the day, and to fall from 1·8° to 2·7° during sleep. Dr. Davy has also found that the temperature of the interior of the body is 2·7° to 3·6° higher in tropical than in temperate climates. Most of the Mammalia have a higher temperature than man, and birds develop a greater quantity of heat than any other class of animals. This arises from the nutritionary changes going on in the bird in order to support the enormous muscular power which it is compelled to exert during flight. The following is a table of temperatures, as given by Rudolphi and Tiedemann, for several birds and Mammalia:—

Birds.

	Degrees.
Great Titmouse	111·25
Swallow	111·25
Fringilla, different species	111·25 to 107
Anas, different species	111 to 106
Common Hen	109·94 to 102·99
Falco, different species	109·74 to 104·5
Pigeon	109·58 to 106·7
Raven	109·23 to 105·99
Vulture	107·49
Common Cock	103·78 to 102·99
White Game	102
Gull	100

Mammalia.

	Degrees.
Bat (Vespertilio pipistrellus)	106 to 105
Squirrel	105
Sheep	104 to 100·4
Ox	104 to 99
Rabbit	104 to 99·46
Ape	103·86
Cat	103·6 to 98·6
Bat (Vespertilio noctula)	102
Dog	101·3 to 99·3
Guinea Pig	100·4 to 96·37
Hare	100
Elephant	99·25
Horse	98·24 to 97

There is now no question that the cause of animal heat is the chemical changes which are going on in the nutrient fluid of the body. During the act of respiration a large quantity of oxygen gas is taken into the lungs, which is absorbed by the blood. In this fluid it meets the various compounds of carbon which have been taken in with the food; and the consequence is a union of the oxygen with the carbon, and the formation of carbonic acid gas, which gas is given out when the blood again reaches the lungs during expiration. When carbon and oxygen unite out of the body, heat is the result, and the same thing occurs when they unite in the body; and it is through the medium of this change that the bodies of animals are raised to a given temperature by the circulation of the blood through the system. It has been calculated that there is more oxygen absorbed than is given out of the system in the form of carbonic acid gas: it is probable that this enters into combination with hydrogen and compounds of hydrogen, nitrogen, and carbon, and thus contributes to the raising of the animal heat.

This theory of animal heat explains many well-known phenomena; as for instance, the slight independent warmth of the fœtus, and of those young animals which are born in an imperfectly developed condition. The low temperature of persons with *morbus caeruleus*, where the blood is only imperfectly oxygenated, and the cold experienced by aged and debilitated persons in whom a small quantity of blood circulates slowly; as also the increased temperature observed in persons labouring under attacks of inflammatory disease where the blood circulates rapidly, are also confirmatory facts. The phenomena also exhibited by the *hybernation* of animals are explained by this theory. During the period of hybernation, when the blood is circulating only slowly and respiration is almost suspended, and the oxygenation of the blood is feebly performed, the temperature of the animal is low. The observations of Pallas and others show that hybernation is prevented by a temperature of from 50° to 80°, whilst it is induced in those animals which exhibit it even in summer by the application of artificial cold.

The production of heat is also dependent on the mass of the globules of the blood and the rapidity with which they circulate. When there are few blood-globules the necessity for the absorption of oxygen is diminished in the same ratio, and the circulation becomes slower, and the consequence is that there is less heat developed. On the other hand, blood containing an excess of globules, but which is circulated less slowly, develops less heat than blood which contains a smaller proportion of globules but which is more rapidly circulated, for more oxygen may be consumed in the latter than in the former case.

'The metamorphosis of the blood and the general change of matter lead to still another secondary source of heat. It has been shown by Pouillet that all solid bodies, organic and inorganic, undergo an elevation of temperature when moistened with different fluids. In organic substances it may amount to from 11° to 18°. Since the act of metamorphosis is always effected through humid membranes, this source of heat must be regarded as of great importance, even if it be not actually identical with the catalytic metamorphosis of the cells themselves.' (Simon.)

(Carpenter, *General and Comparative Physiology*; Simon, *Medical Chemistry*, by Day.)

HEBER, REGINALD, second Bishop of Calcutta, was born April 21, 1783, at Malpas, Cheshire, of which place his father was for many years co-rector. The family was of considerable antiquity in the county of York, and on the death of an elder brother without heirs-male, the father of Reginald Heber succeeded him as lord of the manor of Marton, Yorkshire, and patron of the rectories there, and to estates at Hodnet, Shropshire, which had come into the possession of the family by intermarriage. By his first marriage, with Mary, co-heiress of the Rev. Martin Baylie, rector of Wrentham, Suffolk, he had one child, Richard, who for some time was representative in Parliament of the University of Oxford, and is known as a great collector of books; and by his second marriage, with Mary, daughter of Cuthbert Allanson, D.D., he had three children—Reginald, the subject of the present notice, Thomas Cuthbert, and Mary.

At a very early period of his childhood Reginald Heber was remarkable for his piety and for his eager thirst for knowledge. An excellent memory enabled him to recollect through life whatever he read with almost verbal accuracy. He gave early indications of his poetical talents, and at seven years old he had translated Phædrus into English verse. At eight he was sent to the grammar-school of Hawkhurst under Dr. Kent, and in his thirteenth year he was placed in the school of a clergyman near London. He remained here about three years, and in November, 1800, was entered at Brasenose College, Oxford. In his first year at the University he gained the prize for Latin verse, the subject of his poem being on the commencement of the new century. In the spring of 1803 he wrote his prize poem, 'Palestine,' which has obtained a permanent place in English literature. His career at Oxford was one continued course of success. From the winning modesty of his manners, his gentleness of disposition, and the charm of his conversation, his society was courted by persons of all ages. In his studies he evinced no taste for the exact sciences, but the antient languages he studied with larger views than is usual with most young men at the universities. In 1804 he became a Fellow of All Souls. The year after he had taken his degree he gained the Bachelors' prize for an English prose essay on the 'Sense of Honour.' About the middle of 1805, in company with his friend Mr. John Thornton, son of the member for Surrey, he set out on a continental tour. They proceeded through Russia, the Crimea, Hungary, Austria, and Prussia, and returned to England in October, 1806. In 1807, before he had obtained his degree of M.A., he took orders, and was instituted by his brother Richard to the family living at Hodnet. Here, as he himself described, he was in 'a half-way situation between a parson and a squire.' Never however were the duties of a parochial clergyman discharged with more exemplary zeal and benevolence; and Heber's conduct n his parish has often been pointed at as displaying in the greatest perfection all the best characteristics of a Church of England priest. In April, 1809, he married Amelia, youngest daughter of Dr. Shipley, Dean of St. Asaph. While discharging the dnties of his parish with so much earnestness he was ardently attached to the pursuits of literature. He was a frequent contributor to the 'Quarterly Review' from its commencement. In 1812 he commenced the preparation of a 'Dictionary of the Bible,' on which he laboured with much delight, bnt other duties compelled him to suspend this work, and no part of it was ever published. In the same year he published a small volume of 'Poems and Translations for Weekly Church Service.' The composition of his 'Hymns,' with a view of improving the psalmody and devotional poetry used in churches, was also a favourite recreation. He was an elegant versifier, and continued to indulge his poetical talents even while engaged in visiting his diocese in India. He had a great distaste for controversial theology, and only once was engaged in a discussion of this kind, in reply to what he conceived were the unwarrantable imputations of a writer in the 'British Critic.' His life was diversified by an occasional visit to his friends in other parts of England, or to his father-in-law in Wales, and by correspondence with a few friends. His political views were those of the High Church and Tory party, but devoid of all bitterness. He was well content with things as they were, and apparently had no perception of those abuses which have been swept away within the last thirty years. In 1815 he was appointed Bampton lecturer, and the subject he selected was 'The Personality and Office of the Christian Comforter.' In 1817, Dr. Luxmore, the Bishop of St. Asaph, appointed Heber to a stall in that cathedral, at the request of his father-in-law, tho Dean. In 1819 he edited the works of Bishop Jeremy Taylor. His other works consist of 'Parish Sermons' preached at Hodnet; and Sermons preached in India. In April, 1822, he was elected preacher of Lincoln's Inn, for which he had formerly been an unsuccessful candidate. On the 2nd of December, in the same year, his friend and connection, the Right Honourable Charles W. Williams Wynn, who was at the time President of the Board of Control, consulted him confidentially respecting the appointment to the vacant see of Calcutta, but did not offer him the appointment. There was every probability in fact that in the course of a few years Heber would obtain a mitre at home. But in another communication the vacant see was offered to him, and, without pressing him to accept it, Mr. Wynn expressed the opinion that in no position would Heber's talents find so ample a field or be so beneficial as in India. Twice the offer was declined, on account of his wife and child, but immediately after the second refusal he wrote (12th Jan. 1823) stating his willingness to go to India. He congratulated himself upon the fact that no worldly motives led him to this decision. The prospects of usefulness in so grand a field as India overbore all pecuniary considerations, and they had no influence in determining his conduct when the proposition of going to that country was first made to him. Besides, he had often expressed his liking for such a sphere of action, and he had 'a lurking fondness for all which belongs to India or Asia.' On the 22nd of April he saw Hodnet for the last time, and after having been consecrated, he embarked for his diocese, June 16, 1823. The diocese of Calcutta extended at this time over the whole of India, and embraced Ceylon, the Mauritius, and Australasia. In India the field of the bishop's labours was three times larger than Great Britain and Ireland. The number of chaplains who constituted his staff in Bengal was fixed at twenty-eight, but this number was never completed, and of the number who were appointed several were on furlough. The Bishop had no council to assist him, was required to act on his own responsibility, and to write almost every official document with his own hand. On the 15th of June, 1824, Bishop Heber began the visitation of his vast diocese. He visited nearly every station of importance in the upper provinces of Bengal and north of Bombay, and after an absence from Calcutta of about eleven months, during which he had seldom slept out of his cabin or tent, he arrived at Bombay. The Journal which he kept during his visitation, and which has been published in three octavo volumes, shows the extent of his observations on general subjects and the graphic power which he possessed of describing the novel scenes in which he was placed. From April to August he remained at Bombay to investigate and superintend the interests of the western portion of his diocese. Ou the 15th of August he sailed for Ceylon, and after remaining there some time he proceeded to Calcutta, which he reached on the 21st of October. If it had been possible to have educated his children in India, he was now prepared, he states, to end his days amongst the objects of his solicitude. In February, 1826, he left Calcutta for Madras to visit the southern provinces. On the 1st of April he arrived at Trichinopoli, and on the 3rd, after investigating the state of the mission and confirming fifteen natives, on whom he bestowed the episcopal benediction in the Tamul language, he retired to use a cold bath, in which he was found dead about half an hour afterwards. Within less than three weeks he would have completed his forty-third year. The candour, modesty, and simplicity of his manners, his unwearied earnestness and his mild and steady zeal, combined with his talents and attainments, had inspired veneration and respect not only amongst the European but the native population of India. It was said by those who were capable of judging, that few persons, civil or military, had undergone so much labour, traversed as much country, seen and regulated so much in so short a time. On the announcement of his death the most eminent men at each of the three Presidencies and in Ceylon united in showing their regret at the loss which they had sustained. At Calcutta it was agreed to erect in the cathedral a monument to his memory, which was afterwards executed by Chantrey. A monument, also by Chantrey, was erected in St. George's Church, Madras, in testimony of the public regret. At Bombay it was resolved to establish, in Bishop's College, Calcutta, one or more scholarships under the title of 'Bishop Heber's Bombay Scholarship.' Mural tablets were erected in the churches of Trichinopoli and at Colombo in Ceylon. His friends in England placed a monument in St. Paul's Cathedral; and in Hodnet church there is a tablet to his memory, the inscription on which was written by Southey.

(*Life of Reginald Heber*, by his Widow, 2 vols. 4to., London, 1830. This work contains Selections from his Correspondence, Unpublished Poems, and Private Papers; the Journal of his Tour in Russia, &c., and a History of the Cossaks. *Last Days of Bishop Heber*, by the Archbishop of Madras.)

HECTOR (Ἕκτωρ), the greatest of the Trojan heroes who figure in our accounts of the Trojan war. He was the son of Priam and Hecuba, and married to Andromache. The poet of the 'Iliad' describes him not only as a bold and gallant warrior whom Achilles himself dreaded to approach, but as a hero ennobled by all the more tender and humane virtues, so that it almost seems as if the poet had developed his character with more care than that of any other hero, not even excepting Achilles. Hector is the favourite of his parents, and himself a happy husband and father. The reader need only be reminded of the beautiful passages in the 'Iliad' (vi. 369, &c.), where Hector, before going to battle, takes leave of his wife and child, and where (xxii.), amid the lamentations of his parents, he prepares himself for the contest with Achilles. Wherever the battle is fiercest, Hector is foremost, and, protected by the gods Ares (Mars) and Apollo, he fights victoriously against the bravest of the Greeks, such as Ajax, Nestor, Diomedes, and Teucrus. He was foremost among those who stormed the Greek camp, and advanced as far as the place where their ships were stationed. Patroclus then came forward and drove the Trojans back to their city, but was slain by Hector. This calamity roused Achilles from his inactivity, and, thirsting to avenge the death of his friend, he sought Hector, who, though implored by his parents to save himself, resolved to engage with his enemy. Achilles thrice chased him round the walls of Troy, and finally pierced him with his spear. Hector's body was tied to the conqueror's chariot and dragged to the camp of the Greeks; at the funeral solemnities of Patroclus, it was dragged thrice around his tomb, and then thrown away to be devoured by the dogs; but at length Achilles gave up the body to Priam, who appeared as a suppliant before him and begged for it. The remains of Hector were buried at Troy, where funeral sacrifices were offered to Hector as a hero; at a later time, however, his remains are said to have been conveyed to Thebes, in pursuance of an oracle. (Pausanias, iii. 18. 9; ix. 18. 4.)

HEDJAZ. [ARABIA, P. C. and P. C. S.]

HEDY'SARUM (from ἡδύσαρον, the Greek name of the *Coronilla securidaca*), a genus of plants belonging to the natural order Leguminosæ. It has a 5-cleft calyx, with the segments linear-subulate and nearly equal; the corolla with a large vexillum, and obliquely truncate; keel much longer than the wings; the stamens diadelphous; the legume of numerous flat orbicular or lenticular regular 1-seeded joints, which are connected together in the middle, and therefore the sutures are convex on both sides. The species are herbs or under-shrubs, with unequally pinnate leaves, axillary, with simple peduncles, and bearing racemose spikes of large purple, white, or cream-coloured flowers. The old genus Hedysarum has been subdivided into many smaller genera. The Saintfoin [SAINTFOIN, P. C.], *H. onobrychis* of older writers, now forms the genus *Onobrychis*, which differs from *Hedysarum* in the legumes consisting of many joints, not of one joint, as in that genus.

H. coronarium, French honeysuckle, has diffuse stems, the leaves with 3-5 pairs of elliptic or roundish leaflets, which are pubescent beneath and on the margins; the spikes or racemes of flowers are ovate crowded; the wings of the flower twice the length of the calyx; the legumes glabrous, with 25 orbicular prickly joints. It is a native of Spain and Italy. It has deep red or white flowers. In Calabria this plant grows wild in great abundance, and horses and mules are fed with it. It grows well in our gardens, but probably would not make a good field crop.

H. fruticosum has an erect shrubby stem, the leaves with 5-7 pairs of alternate elliptic obtuse leaflets, which are clothed with pubescence on both surfaces; the flowers few, disposed in spikes; the wings hardly longer than the calyx; the vexillum the length of the keel; the joints of the legume wrinkled; the nerves slightly echinate. It is a native of Siberia in sandy places. It has a pale purple flower, and is a very handsome plant. Horses eat it with avidity, and it may be made useful in fixing sand, in which it grows readily.

H. Mackenzii has recumbent stems; the leaflets oblong, clothed on both surfaces with canescent pili; the stipules sheathing; the joints of the legume transversely wrinkled and pilose. It is a native of arctic America and about the Saskatchewan, on the Eagle and Red-deer hills. The flowers are large and of a red colour. This was described as a liquorice plant by Sir A. Mackenzie, and named after him. The whole plant has a sweet taste.

H. lineare is used in Cochin China as a stomachic, and *H. alpinum* is used in Siberia for the same purpose. The *H. sennoides* of Willdenow, now *Ormocarpum sennoides*, has a root which is used in India as a tonic and stimulant. The *H. alhagi* of Linnæus is the *Alhagi maurorum* of recent writers. It is a spiny shrub, and from its branches exudes a sweet substance like manna. *H. tuberosum* of Roxburgh, *Pueraria tuberosa* of De Candolle, grows in the Circar mountains. The roots are used by the natives as poultices for swellings of the joints.

All the species of the genus Hedysarum may be cultivated. They thrive in a light rich soil; the perennial sorts may be increased by dividing the roots; and the seeds of the annual species should be sown in an open border.

(Lindley, *Flora Medica*; Don, *Gardener's Dictionary*; Burnett, *Outlines of Botany*.)

HEEM, JAN DAVITZE DE, one of the most distinguished of the Dutch fruit and flower painters, was born at Utrecht about 1600, and died at Antwerp in 1674.

His son, Kornelis, or Cornelius, was likewise an excellent painter in the same department.

(Houbraken, *Groote Schouburg*, &c.)

HEEMSKERK, MARTEN, a celebrated Dutch painter, who was born at Heemskerk, near Haarlem, in 1498: he was the son of a peasant farmer, Jacob Willemsze Van Veen, but he is known only by the name of his birth-place. Marten was employed by his father in common farm labour, which was particularly distasteful to him. He had given evidence of a talent for the art of design, and his mother was favourable to his plan of becoming a painter. As he was returning home one evening with a pail full of milk upon his head, lost in a reverie about his future prospects, he came unconsciously in contact with a tree; the milk was lost, and to Marten's dismay he saw his father hastening up to him with a stick in his hand. His mind was instantly made up; he fled to Delft, obtained admission into the house of a painter of the name of Jan Lucas, and he too became a painter. He studied afterwards with Jan Schoorel, at Haarlem, and his earliest works of distinction were painted in the style of that master. After painting for some years at Haarlem with great success, he set out, in 1532, for Rome, but before he left he presented the Painters' Company at Haarlem with a picture of St. Luke painting the Virgin Mary, a picture which is much praised by Van Mander, and it was long preserved with great care at Haarlem. In Rome, Marten, known as Martin Tedesco, distinguished himself as an imitator of Michel Angelo; the jealousy of the Italians, however, forced him to return to his own country, after a stay of three years in Italy. When he arrived at Dordrecht, he had a narrow escape of his life, for he put up, by recommendation from Rome, at an inn, which turned out to be a den of murderers, in which many travellers had perished: the story is told by Van Mander.

Heemskerk's early admirers were not at all pleased with the new style which he imported from Italy; he however found many new admirers, and he executed numerous works in this new style. In his earlier paintings he belonged to the school of the Van Eycks: his style was simple, earnest, and in character natural; in his later paintings he imitated in a manner the antique and the cinquecento style of Italy, but he caricatured the antique, and caught only the defects of the modern. There are scarcely any works by Heemskerk now at Haarlem; some were carried to Spain during the Spanish war, and many were destroyed by the iconoclasts in the riots of 1566. There is a Last Judgment by him at Hampton Court; and there are several of his earlier works in the Pinakothek, at Münich, which, however, show that he was not one of the best of the Van Eyck school. He died very rich, and, though twice married, childless, at Haarlem, in 1574. The engravings after his works, by various masters, amount to many hundreds.

(Van Mander, *Het Leven der Schilders, &c.*; Schopenhauer, *Johann Van Eyck und seine Nachfolger*.)

HEERE, LUCAS DE, a distinguished painter and poet, was born at Ghent in 1534. His father, Jan de Heere, was a good sculptor, and his mother excelled in miniature painting. Lucas was placed with Frans Floris, after he had made sufficient progress with his father to benefit by the instruction of Floris.

De Heere painted in France; and he was in England in the reign of Queen Elizabeth, whom he painted several times. There is a flattering allegory of her by him at Hampton Court: it represents Elizabeth as queen, attended by two maids of honour, coming into the presence of Juno, Minerva, and Venus; the first is put to flight, the second is astonished, and the last blushes; this is partly ascertained by the follow ing Latin verses, probably by De Heere himself, written on the frame:—

Juno potens sceptris, et mentis acumine Pallas,
Et roseo Veneris fulget in ore decor;
Adfuit Elizabeth; Juno perculsa refugit;
Obstupuit Pallas, erubuitque Venus.

In 1570 Lucas was employed to paint a gallery for Edward earl of Lincoln, lord high admiral, in which he was to represent the costumes of different nations. For England, says Van Mander, he painted a naked man surrounded by all sorts of woollen and silk stuffs, with a pair of scissors and a piece of chalk; and when the admiral asked him to explain it, Lucas said that he could not paint the Englishman in any particular costume, as he changed it daily; he therefore painted him naked, gave him stuff and shears, and left him to make his own clothes. This however, as Walpole has pointed out, was not an original device; it is prefixed by Andrew Borde, or Andrea Perforatus as he called himself, to his 'Introduction to Knowledge,' with the following lines:—

I am an Englishman, and naked I stand here,
Musing in my mind what raiment I shall wear.

The principal of Lucas's poetical works was the Garden of Poetry, 'Boomgaard der Poësijë;' he commenced also in verse the 'Lives of the Painters,' but this is lost. He died at Ghent in 1584: he used for a monogram an H and E joined, and he used also sometimes the following moral anagram of his own name, 'Schade leer u' (injuries teach you). De Heere was the master of Van Mander.

(Van Mander, *Het Leven der Schilders*, &c.; Walpole, *Anecdotes of Painting*, &c.)

HEEREN, ARNOLD HERMANN LUDWIG, was born at Arbergen, a village near Bremen, on the 25th of October, 1760. His father, who was pastor at Arbergen, and a man of extensive knowledge, gave him his first instruction in religion, Latin, and mathematics. His further education, until his sixteenth year, was intrusted to private tutors; but in 1776 his father was appointed preacher at the cathedral of Bremen, and young Heeren entered the domschule or gymnasium of Bremen to prepare himself for the university. He states that the exercises in Latin disputations at school and the intercourse with the wealthy merchants of Bremen exercised a great influence upon the development of his mind and upon the manner in which he afterwards viewed and described the phenomena of history and of human life. In the autumn of 1779 he went to the university of Göttingen with the intention of devoting himself to the study of theology, but the influence of Heyne, one of whose lectures he attended, wrought a complete change, and Heeren was soon engaged exclusively in philological pursuits. However he soon felt that philology, in the narrower sense of the term, was not his vocation, for the things about which he read in the antients interested him more than the languages themselves. Heyne did all he could to win Heeren for philology, and for a short time he succeeded. In 1784 Heeren took his degree of doctor in philosophy, and on that occasion wrote a dissertation 'De Chori Graecorum tragici natura et indole, ratione argumenti habita.' In the year following he published a new edition of the rhetorician Menander, and formed the plan of a new edition of the 'Eclogae' of Stobaeus. The preparations that he had to make for this work convinced him more and more that verbal criticism was not congenial to his mind. He had commenced giving lectures at Göttingen as privatdocent, but the opposition between his actual pursuits and what he felt to be his vocation became more and more painfully felt; his spirits began to fail, and his health also began to sink. It was fortunate for him that he possessed ample means, for otherwise he would perhaps have fallen a victim to his melancholy, the result of an ill-chosen career of life. He resolved to visit Italy, and principally Rome. One of the main objects of this journey was to collate the various MSS. of Stobaeus, but this did not prevent his paying attention to a variety of other subjects, which had more interest for him. His stay in many of the principal towns of Germany, France, and Italy was of great advantage to him; the future historian became acquainted with the world at large; he saw with his own eyes some of the countries to whose history a great part of his future life was to be devoted, and formed friendships with men of the highest eminence, such as Zoëga, Filangieri, and Cardinal Borgia, in the intercourse with whom his mind became expanded and enriched with new ideas. On his return to Göttingen in 1787, he was appointed professor extraordinary in the philosophical faculty, and henceforth his life flowed undisturbed by any changes of fortune; being possessed of wealth, he was enabled to continue his philological and historical studies without anxious cares; he enjoyed the favour and friendship of the highest in rank and literature, and in 1796 he married a daughter of Heyne, who remained his devoted and sympathizing companion throughout his life. All his energies were divided between his professional studies and duties, and the production of those works which will ever secure him a place among the best historians. His lectures had from the first an historical tendency, and if it had not been for the edition of Stobaeus, which he had undertaken, he would have confined himself exclusively to lecture on history. At length in 1799 he was appointed ordinary professor of history, as the successor of Gatterer. His reputation as a scholar and historian was already established, for the first two volumes of his Stobaeus had appeared in 1792 and 1794 (the third and last was published in 1801); in 1793 and 1796 he had published the first two volumes of his 'Ideen über die Politik, den Verkehr und den Handel der vornehmsten Völker der alten Welt' (the third and fourth volumes appeared in 1812 and 1815), which is his principal work, and the one on the completion of which he looked as the main object of his life; a fifth edition in 5 vols. appeared in 1824, &c. In 1799 he published the first edition of his manual of antient history ('Handbuch der Geschichte der Staaten des Alterthums'). A fifth appeared in 1826. It must be remembered that in addition to these works, which followed one another in rapid succession, and of which each has its own merits, he had for some years been editing, conjointly with his friend Tychsen, a journal on antient literature and art ('Bibliothek der alten Literatur und Kunst'), and had written a great variety of essays for other periodicals, and for the 'Transactions of the Royal Society of Göttingen.' His activity was astonishing, and, in addition to all this, he began about the year 1800 to study the history of the middle ages and of modern times, and also lectured upon these subjects with as much applause as he had before obtained by his lectures on antient history. It is further worth mentioning that Heeren's activity as an author was always in the closest connection with that of a lecturer, and before he wrote a work on any subject he had at least once or twice lectured on it in the university. Hence he always appears a master of his subject, and was enabled to give to his productions that finish and perfection which makes them popular in the best sense of the term, and which is certainly a rare characteristic of German writers. A great work relating to the history of modern times, and which is thought by some to be the best of his productions, bears the title 'Handbuch der Geschichte des Europaeischen Staatensystems und seiner Kolonien,' Göttingen, 1809; a fourth edition appeared in 1822. A work on the influence of the Crusades ('Sur l'Influence des Croisades,' Paris, 1808) was crowned by the Academy of Inscriptions. A collection of his minor historical works, in 3 vols. ('Kleine historische Schriften'), appeared from 1803 to 1808, and another embracing all his historical works, in 15 vols., from 1821 to 1826. Most of his works have been translated into English and Dutch, and some of them are still regarded as standard works of their kind. On the death of Eichhorn, in 1827, he undertook the editorship of the 'Göttingische Gelehrten Anzeigen,' which, together with his professional duties, took up so much of his time that he was unable to complete his great work on the politics and commerce of the states of antiquity, although considerable preparations had already been made for it.

Heeren's merits were universally acknowledged. The academies of St. Petersburg, Berlin, Munich, Stockholm, Dublin, and Copenhagen showed him their respect by electing him a member. He was also a member of the Asiatic societies of London and Calcutta. In 1827 or 1828 Heeren, in conjunction with Ukert, formed the plan of editing a series of works, containing the histories of the states of Europe. The best historians of Germany were induced to write histories for the series. The whole is not yet completed, but among these works there are some of the highest eminence, such as Lappenberg's 'History of England,' and Geijer's 'History of Sweden.' Heeren died at Göttingen, on the 6th of March, 1842.

The great merits of Heeren's works, especially of those relating to antiquity, are these: they are usually the result of a diligent study of the antient writers themselves, and represent the nations in their political and commercial relations in a very lively manner. His works are written in a clear style, so as to be intelligible to any person of moderate education, and the influence which they have exercised is, for this very reason, very considerable. His works are not indeed without their defects, and many of them no longer satisfy the demands of our age; but it must not be forgotten that Heeren was the first historian, at least in Germany, who breathed life into the history of antiquity, saw in it something more than a mere succession of battles and defeats, and made his readers familiar with the more peaceful pursuits of the antients and their principles of government. In his private life he is said to have been a man of the most gentle and benevolent disposition.

(For further particulars respecting his life, see Heeren's Letter to a friend in the first volume of his historical works, and Karl Hoeck, *A. H. L. Heeren, eine Gedächtnissrede*, Göttingen, 1843, 4to. A complete list of his works may be found in Pütter, Saalfeld, and Oesterley's *Geschichte der Universität Göttingen*, vol. ii. p. 194; vol. iii. p. 344; and vol. iv. p. 442.)

HEGE'SIAS (Ἡγησίας), a Greek rhetorician and historian, was a native of Magnesia, and lived about the time of the historian Timæus, that is, about B.C. 250. Respecting his life no particulars are known, but as an author he appears to have been of some importance in antiquity, though more for his bad than for his good qualities. Strabo (xiv. p. 648) calls him the founder of that florid and inflated style of oratory which was afterwards designated by the name of the Asiatic; and this testimony is borne out by Cicero (*Brut.* 83; *Orat.* 67, 69) and others. Hegesias himself pretended to imitate the Attic orators, especially Lysias. He seems to have been destitute of all the qualities required of an orator, and to have taken a great delight in childish conceits and a pretty way of expressing them. This we must conclude both from the opinions of antient critics as well as from the few specimens of his oratory which have come down to us, and are preserved in Dionysius (*De Compos. Verb.*, 4, 18) and Photius (*Biblioth. Cod.*, 250). As an historian he appears not to have been much better than as an orator. The subject which he chose was the history of Alexander the Great, but that he had no notion of the dignity of history is evident from the specimens given by Dionysius, Photius, and Plutarch (*Alex.* 3); and A. Gellius (ix. 4) does not appear to be much mistaken in classing him among those who, unconcerned about historical truth, filled their books with marvellous occurrences and incredible stories. (Compare Strabo, ix. p. 396; Longinus, *De Sublim.*, 3; Theon, *Progymnasm.*, 2; St. Croix, *Examen critique des Historiens d'Alexandre*, p. 47, &c.)

From this Hegesias we must distinguish HEGESIAS *the Cyrenaic philosopher*, who lived somewhat earlier, in the reign of Ptolemæus Philadelphus, and was a disciple of Paraebates. His doctrines, however, differed in several points from those of other Cyrenaics, and so much so that his followers were regarded as a distinct school, and are called as such Hegesiaci (Ἡγησιακοί). In the main points they agreed with Aristippus, the founder of the Cyrenaic school, who maintained that pleasure was the great object of man's life; but Hegesias and his school went further; they denied that kindness, friendship, and benevolence had any independent existence, but that they arise and disappear with our feeling of the want of them. Happiness, they said, is a thing impossible to attain, for our body is subject to many sufferings, and the soul suffers with it. Life and death are equally desirable; nothing is by nature either agreeable or disagreeable, but becomes so through the circumstances in which a man lives. A wise person therefore looks upon life with indifference, and regards nothing and nobody so much as himself, reducing everything to his own convenience. This miserable view of human life was somewhat softened down and improved by Anniceris, the disciple of Hegesias. Hegesias wrote a work entitled Ἀποκαρτερῶν, in which he introduced a person resolved to starve himself, and explaining to his friends why death was more desirable than life. He seems to have taught philosophy at Alexandria, but as in consequence of his doctrines many persons destroyed themselves, King Ptolemy Philadelphus is said to have forbidden him to teach any more. (Diogenes Laert., ii. 86, 93-96; Cicero, *Tuscul.*, i. 34.)

HEINRICH, CARL FRIEDRICH, a distinguished German scholar, was born on the 8th of February, 1774, at Moschleben in the duchy of Saxe-Gotha, where his father was pastor. He received his first education at the Klosterschule of Dondorf, and afterwards at the Gymnasium of Gotha, where he enjoyed the instruction of Döring, Manso, Jacobs, and other eminent scholars. Heinrich had read the principal Greek writers, even before he entered the Gymnasium, and his intimate acquaintance with them caused him to be looked upon as a wonderful boy. In 1791 he went to Göttingen, where he became the favourite pupil of Heyne, who made him the tutor of his son. In 1795 Heinrich was appointed teacher at the Gymnasium of Breslau, and in 1801 he obtained the title of professor. Böttiger, the eminent archaeologist, persuaded him to take an interest in the theatre at Breslau, and Heinrich not only exerted himself to raise its character, but wrote several dramas himself, and in the end became one of the managers of the theatre. In 1804 Heyne procured him the professorship of eloquence and of Greek in the university of Kiel. Philological studies had been greatly neglected there, and Heinrich at first lectured to empty benches, but he soon attracted a great concourse of students. In 1819 he was invited to a professorship in the newly-established university of Bonn. He accepted the offer, and henceforth continued to lecture there until his death on the 20th of February, 1838.

Heinrich was a very excellent Latin scholar, though his lectures on Latin authors were very unequal. The best were those on the Satires of Horace, Juvenal, and Persius, for he himself had great satirical talent; his explanations always excited a most lively interest, being seasoned with his own wit and sarcastic allusions. The philological seminary of Bonn was much indebted to his exertions; but his personal character was anything but amiable: he was whimsical, inconstant, and not unfrequently malicious. He published few works, but all of them have great merit; the following is a list of them:—1. 'Epimenides aus Creta, eine kritisch-historische Zusammenstellung aus Bruchstücken; nebst Zwei kleinern antiquarischen Versuchen,' Leipzig, 1801, 8vo., an excellent critical essay on the life of Epimenides and the works attributed to him. 2. 'Lycurgi Oratio in Leocratem,' Bonn, 1821, 8vo. 3. An edition of Cicero's treatise 'De Re Publica,' Bonn, 1828, 8vo., with an extensive critical commentary. He further wrote critical essays in several periodical works, and was one of the editors of Köppen's German Commentary on Homer, in 6 vols., Hanover, 1794-1823. In the year after Heinrich's death his edition of Juvenal, for which all preparations were made before, was published by his son, Bonn, 1839, 2 vols. 8vo., which is the best edition of Juvenal that we have. (See Long, in the *Classical Museum*, vol. i. p. 369, &c.) An edition of Persius, for which Heinrich had likewise left the MS. ready, was published by Otto Jahn.

(*Neuer Nekrolog der Deutschen;* Lübker und Schröder, *Lexicon der Schleswig-Holsteinisch Eutinischen Schriftsteller;* Naeke, in the Programme of the Lectures in the University of Bonn for 1838.)

HELIA'NTHEMUM, a genus of plants named from ἥλιος, 'the sun,' and ἄνθος, 'a flower,' because the flowers open with the rising of the sun, and fall with the setting of the sun in the evening. This genus belongs to the natural order Cistineæ or Cistaceæ, and the species were at one time included under the genus Cistus, but they differ materially in their characters. There are about 150 species enumerated, which are distributed in various parts of the world; they are chiefly found in the south of Europe, the north of Africa, and a few species in America. The calyx consists of 5 sepals, the 2 exterior ones smaller or wanting, 5 deciduous petals, numerous stamens, and 3-valved capsules. The flowers are yellow, red, or white, and are very elegant; none of the species possess any available property in the arts or medicine, but they are extensively cultivated on account of their very beautiful and ornamental appearance.

H. guttatum is an erect herbaceous plant with oblong lanceolate or linear leaves, the racemes without bracts, and the stigma subsessile. The flowers are yellow, with a deep red spot at the base of each petal. It is a native of France, Italy, Spain, Portugal, and Turkey, and is found in Anglesey and Jersey in Great Britain, but is a very rare plant.

H. canum, the Hoary Sun-rose, is distinguished by its shrubby appearance, without stipules, and having terminal bracteated racemes. The flowers are yellow and small. It is a native of the south of France and Germany, and is rarely found in Great Britain.

H. vulgare, the common Rock-rose, is a procumbent shrub, with stipules, bracteated racemes, the style larger than the ovarium, and bent at the base. The flowers are yellow, and bloom from May to September. It is a native of Europe, and is found in Britain in dry hilly pastures.

There is a very beautiful variety with double pale yellow flowers, which is much cultivated by florists. The stamens, if touched in the sunshine, spread slowly, and lie down upon the petals.

Almost all the species of Helianthemum are elegant plants, of hardy growth, and easily cultivated. They grow best in a light sandy soil, and should be protected during the winter in a frame.

(Don, *Gardener's Dictionary;* Babington, *Manual of British Botany;* Loudon, *Encyclopædia of Trees and Shrubs.*)

HELIOTRO'PIUM (from ἥλιος, the sun, and τροπή, a turning), a genus of plants belonging to the natural order Ehretiaceæ. It has a salver-shaped corolla, with the throat usually naked, but in some species bearded; the segments of the limb furnished with a single fold or a tooth between each; the stigma sub-conical; the carpels 4, 1-celled, combined, closed at the base, without any manifest receptacle. The species are annual or shrubby plants, with alternate leaves, and circinate spikes of small blue or white flowers.

H. Peruvianum, Peruvian Heliotrope or Turnsole, has a shrubby stem, petiolate oblong-lanceolate wrinkled leaves, terminal branched spikes; the tube of the corolla hardly the length of the calyx. The mouth of the corolla is intersected with five plicatures of a purple-lilac colour with a greenish throat. It is a shrub, growing one or two feet high, and is much cultivated on account of the scent of its flowers, which resembles very much the smell of the vanilla. It is a native of Peru.

H. Europæum, the European Turnsole or Heliotrope, has an herbaceous erect stem, with ovate flat-lined finely tomentose leaves, the lateral spikes solitary, the terminal ones conjugate, the calyx spreading in the fruit-bearing state. It is a native of the south of Europe and the regions of the Caucasus. The flowers are sweet-scented.

H. villosum has an herbaceous erect very villous stem, with ovate, flat, villous leaves, the spikes lateral, terminal, solitary, and conjugate; the corollas large; the calyx spreading in the fruit-bearing state. It is a native of Greece and of the islands of the Archipelago. It has large white corollas with a yellow throat. This appears to be the ἡλιοτρόπιον μέγα of Dioscorides (iv. 190) and the *H. supinum*, the ἡλιοτρόπιον μικρόν.

Upwards of eighty species of this genus have been enumerated. They are natives of the warmer parts of Europe, Asia, Africa, and America, and are found in New Holland. They do not possess any active properties.

Many other species besides those here described have sweet-scented flowers, and are cultivated on that account. Some of them are consumed in large quantities by perfumers for the sake of their volatile oil. They are astringent and also mucilaginous, and poultices made of the leaves have been applied to cancerous and scrofulous sores. It is supposed that the plant used for the cure of warts, and called 'Verrucaria,' belonged to this genus. In their cultivation the shrubby and perennial kinds will be found to thrive in any kind of rich light soil, and cuttings will root readily in sand under a hand-glass. The European annual species may be propagated from seed sown in an open border, whilst the tropical annual species must be sown upon a hot-bed before being planted out.

(Don, *Gardener's Dictionary;* Burnett, *Outlines of Botany;* Fraas, *Synopsis Plant. Floræ Classicæ.*)

HELL, MAXIMILIAN, a distinguished astronomer and member of the order of Jesuits, was born May 15, 1720, at Schemnitz in Hungary, and manifested, at an early age, a decided taste for the study of natural philosophy and astronomy. At twenty-five years of age he was employed as an assistant in an observatory belonging to the Jesuits at Vienna, and he was at the same time keeper of the museum of experimental philosophy which had just then been formed in that city. In 1746 he was made rector of an academy at Leutschau in Hungary; but this post he held only one year, when he returned to Vienna. Here he completed his theological studies, and received a small number of pupils, whom he instructed in mathematics. He took orders in 1751, and after three years he obtained the rank of doctor, with an appointment to the professorship of mathematics at Clausenburg in Transylvania. Having continued in this situation four years, he again returned to Vienna, where he was established in an observatory which had been built in conformity to his own directions; and he held the appointment during the remainder of his life. Besides the duty of making celestial observations, he was charged with that of giving lessons in mechanics; as, in England, about eighty years earlier, the first astronomer royal was required to teach the use of nautical instruments to two boys from Christ's Hospital: the German astronomer, however, gave the lessons only during one year, his time afterwards being fully occupied in performing services more important to science.

Through the mediation of Count Bachoff, who was sent from Copenhagen for the purpose of making the proposal, he accepted an invitation from the court of Denmark to undertake a journey to Wardhuys in Lapland, in order to observe there the transit of Venus over the sun's disc. Accordingly he set out from Vienna in 1768; and, after staying a short time at Copenhagen, he proceeded to the place of his destination: he was absent about two years and a half on that mission, when, having fully succeeded in its object, he returned to Vienna. Besides observing the transit, Hell took advantage of his residence in Lapland to study the geography, the natural history, and the climate of the country; the history, language, and religion of the people, with the state of the arts among them: he made also numerous observations on terrestrial magnetism, on the phenomena of the tides and winds, and on the variations of the barometrical column; and he measured the heights of the principal mountains. After his return he prepared a work containing a full account of his researches, which was to have been published in three volumes, 4to., but it never appeared.

Hell was very fortunate in the sky being favourable, on the day (June 3, 1769) that the transit took place, so that he was enabled to observe the interior contact at the commencement, and both the interior and exterior contacts at the termination of the phenomenon; and it is a proof of the accuracy of his observations that the value of the sun's parallax, which he deduced by comparing them with the corresponding observations at certain other places, agreed, within one-fifth of a second, with the value afterwards determined from comparisons with all the best observations which were made.

On accepting the engagement, Hell was enjoined by the Danish ministry to abstain from publishing any account of his observations till his return to Copenhagen, and till he had made all the requisite computations. The delay which, in consequence of this injunction, took place in making Hell's observations public, gave offence to Lalande, who had, by letters addressed to the different governments of Europe, greatly promoted the measure of observing the phenomenon at different places on the earth's surface; the two astronomers were however soon reconciled, and they continued to correspond with each other as before. Hell drew up a memoir relating to the transit, which was read before the Academy of Sciences of Copenhagen, November 24, 1769.

The principal work published by this astronomer was a series of Ephemerides in thirty-five volumes, 8vo., the collection being entitled 'Ephemerides Anni 1757—1791 ad Meridianum Vindobonensem Calculis definitæ.' With the exception of two volumes, these contain appendixes on astronomical subjects by himself or other scientific men, chiefly by Pilgram and Triesnecker; the former of whom edited the work during the absence of Hell in Lapland. The rest of his publications on astronomical subjects are as follow:—'Tabulæ Solares Nicol. Ludov. de la Caille cum Supplemento Reliquarum Tabularum,' 1763; 'Tabulæ Lunares Toh. Mayer cum Supplemento, etc.,' 1763; 'De Satellite Veneris,' 1765; 'De Transitu Veneris ante Discum Solis die 3 Jun., 1769, Wardoehusii observato,' 1770; 'De Parallaxi Solis ex Observationibus Transitûs Veneris, anni 1769,' 1773; and 'Methodus Astronomica sine Usu Quadrantis, etc.,' 1775. He also edited a collection, which had been made by Hallerstein, of the astronomical observations made by the Jesuits at Pekin from 1717 to 1752; this was published at Vienna, in 2 vols. 4to., in 1768.

Besides these works he published 'Elementa Algebræ J. Crivellii,' 8vo., 1745; 'Adjumentum Memoriæ Manuale Chronologico-Genealogico Historicum,' 16mo. 1750; 'Elementa Arithmeticæ Numericæ et Literalis,' 8vo. 1763; also a tract on the true magnitudes of the sun and moon when seen by the naked eye, 1775; and one on a New Theory of the Aurora Borealis, 1776.

All his works were published at Vienna; and he died in that city, April 14, 1792, being seventy-two years of age. A brother of Hell was a distinguished mechanician at Schemnitz, and the inventor of a sort of siphon for draining mines: this is described in the 'Mémoires de l'Académie des Sciences de Paris' for the year 1760.

(*Biographie Universelle;* Delambre, *Hist. de l'Astronomie au Dixhuitième Siècle.*)

HELM WINDS. [WIND, P. C.]

HELMINTHOCORTON. [SEA-WEEDS, P. C.]

HE'LODUS. [FISHES, FOSSIL, P. C. S.]

HELOSCIA'DIUM, a genus of plants belonging to the natural order Umbelliferæ and to the tribe Ammineæ. It has a calyx of 5 teeth or obsolete; the petals ovate, entire, with a straight or encurved apiculus; the fruit ovate or oblong; the carpels with 5 filiform prominent equal ridges; the interstices with single vittæ, the carpophore entire. There are three British species of this genus.

H. nodiflorum, with the leaflets obtusely serrate; *H. repens*, with the leaflets roundish, ovate, unequally and acutely inciso-serrate; and *H. inundatum*, with the leaflets of the lower leaves divided into capillary segments. The first is a native of brooks and ditches, and is frequently mistaken for the water-cress. [SIUM, P. C.] The second is a rare plant in Great Britain. The last species is found in ponds.

(Babington, *Manual of British Botany*.)

HELSTON, a market town and parliamentary and municipal borough, in the hundred of Kerrier or Kirrier, in the county of Cornwall, 296 miles west-south-west of the General Post Office, London: viz., 197 to Exeter by railway, and from thence 99 miles by coach road through Oakhampton, Launceston, Bodmin, and Truro. Helston was made a borough by King John (A. D. 1201). According to Lysons, the townsmen paid him forty marks of silver and a palfrey that their town might be made a free borough. King Edward I. made it one of the coinage towns; and it sent members to Parliament from his reign. There was a castle here in which Edmund, Earl of Cornwall, cousin of Edward I. resided at one time, but it was afterwards so neglected that it was in ruins in the time of Edward IV.; and the town itself was in the reign of Henry VIII. one of tho decayed towns for the repair of which an act of parliament was passed.

The town stands on the left or eastern bank of a small stream, the Lo or Low or Loo which forms about a mile below the town a wide expanse of water called Lo-pool. The river Hel or Heyl, distinguished from another stream of the same name in the county, as the Heyl in Kirrier, and sometimes called the Helford, flows about two miles east of the town, or rather less. The streets are irregularly laid out; but are paved and lighted with gas, and the town presents a neat and clean appearance. The market-house and town-hall are near the centre of the town, and the antient coinage-hall stands at the end of a street to which it gives name. There are no remains of the castle. The Church dedicated to St. Michael is a modern building of 'white moorstone' (granite), erected by the Earl of Godolphin in A. D. 1763. There are a baptist meeting-house and a Wesleyan chapel. Tho population of the old borough and chapelry which has an area of 130 acres was in 1841, 3584; the number of houses was 763, viz., 682 inhabited, 66 uninhabited, and 15 building. The number of houses in 1831 was only 616, viz. 581 inhabited, 23 uninhabited, and 12 building; the population was 3293, so that the increase of population in the ten years 1831-41 was 291; and the increase in the number of inhabited houses, 101. The town is the centre of an important agricultural and mining district: it has two markets, on Wednesday and Saturday; and there are several fairs or great markets in the year. A great number of shoes are made in the town, and are sold at the markets and fairs; or are sent to Redruth. The borough, which previous to the Reform Act returned two members, now returns only one; the old borough was, for parliamentary purposes, enlarged by the addition of the adjoining parish of Sithney and of a considerable part of the parish of Wendron. The population of Sithney parish in 1841 was 3362, of Wendron 5576, which, united with the population of the old borough, makes a total of 12,522; but what deduction is to be made for that part of Wendron parish which is not in the parliamentary borough, we have no means of ascertaining. The number of electors on the register in 1835-6 was 356, in 1839-40 it was 406, showing an increase in four years of 50 voters. The town is a polling station for the western division of the county of Cornwall. By the Municipal Corporations Reform Act, the borough has 4 aldermen and 12 councillors, but was not to have a commission of the peace except on petition and grant. The old municipal boundaries have not been altered. The living is a perpetual curacy united with the vicarage of Wendron, of which parish the chapelry of Helston is a dependency; the clear yearly value of the united benefice is 876*l*., with a glebe-house: it is in the rural deanery of Kerrier, in the archdeaconry of Cornwall and the diocese of Exeter. There were in the chapelry of Helston in 1833 two national schools with 100 boys and 70 girls partly supported by subscription; and five other day or boarding schools with 123 boys, 66 girls and 40 children of sex not stated, giving a total number of 399 children, or about one in eight of the population (according to the then recent census of 1831) under daily instruction. There were at the same time two Sunday-schools, with 260 children, viz., 127 boys and 133 girls connected with the two dissenting congregations.

(Lysons, *Magna Britannia (Cornwall)*; *Municipal Corporations Commissioners' Reports*, *Population Returns* and other *Parliamentary Papers*.)

HELVELLA. [HYMENOMYCETES, P. C. S.]

HEMANS, FELICIA DOROTHEA, was born September 25, 1794, at Liverpool, where her father, whose name was Browne, was engaged in mercantile pursuits. He was a native of Ireland; her mother was an Englishwoman, but was descended from a Venetian family, through her father, who was commercial agent at Liverpool for the Venetian government. Felicia Dorothea Browne was the fourth child of a family of three sons and three daughters. About the year 1800 Mr. Browne, in consequence of the failure of a mercantile concern in which he was engaged, removed his family from Liverpool to an old mansion, spacious and solitary, called Grwych, not far from Abergele, in Denbighshire, North Wales. Mr. Browne died not long afterwards. Felicia Browne began to write poetry before she was nine years of age, and her mother, a woman of education and taste, was her first confidant and encourager.

Miss Browne's first volume of poems was published in 1808, and contains some verses written by her as early as 1803 or 1804. A harsh review of this little volume affected her so much that she was confined to her bed for several days. Her second volume, 'The Domestic Affections,' was published in 1812.

In 1812 Miss Browne became the wife of Captain Hemans, of the fourth regiment. His constitution had suffered so severely in the retreat upon Corunna, and subsequently by fever caught in the disastrous Walcheren expedition, that he felt it necessary, a few years after their marriage, to exchange his native climate for that of Italy. This at least is the motive assigned for his leaving his wife; but their union, it is said, was not happy, and this separation, which took place just before the birth of her fifth son, closed it for ever. Mrs. Hemans, with her five sons, went to reside with her mother, then living at Bronwylfa, near St. Asaph, in North Wales.

Mrs. Hemans now resumed her literary and poetical pursuits with increased ardour. She studied the Latin, Italian, Spanish, Portuguese, and German languages. She made some translations from Horace, Herrera, and Camoens, and contributed a series of papers on Foreign Literature to the 'Edinburgh Magazine.' 'The Restoration of the Works of Art to Italy' was published in 1815; 'Tales and Historic Scenes,' in 1819; and, about the same time, 'The Sceptic,' a didactic poem, in heroic rhyme; and 'Modern Greece,' in ten-line stanzas. Her poem of 'Dartmoor' obtained the prize from the Royal Society of Literature in 1821.

When about twenty-five years of age, Mrs. Hemans became acquainted with the Rev. Reginald Heber, afterwards Bishop of Calcutta, who passed a part of every year at Bodryddan, near St. Asaph, and their acquaintance soon ripened into friendship. At his suggestion she wrote her first dramatic work, the tragedy of 'The Vespers of Palermo,' which was represented at Covent Garden Theatre, London, in 1823. It was unsuccessful there, but was afterwards better received at Edinburgh, when Walter Scott wrote an epilogue for it. 'The Siege of Valencia, the Last Constantine, and other Poems' was published in 1823.

In 1825 Mrs. Hemans removed, with her mother, her sister, and her own sons, to Rhyllon, near St. Asaph. Her sister had returned, in 1821, from Germany, where one of her brothers was attached to the Vienna embassy, bringing with her a fresh supply of German books, and Mrs. Hemans's delight in German literature may be dated from that time. Her 'Lays of many Lands,' most of which appeared in the 'New Monthly Magazine,' then edited by Thomas Campbell, were suggested by Herder's 'Stimmen der Völker in Liedern,' and, preceded by 'The Forest Sanctuary,' formed her next volume, published in 1827, which was followed, in 1828, by the 'Records of Woman.' Most of these poems were written at Rhyllon, and many of those in the last volume are tinged by the melancholy occasioned by the recent death of her mother, for whom her affection was always exceedingly strong.

In the autumn of 1828, on the marriage of her sister, and the removal of her brother, who was in the army, to Ireland, Mrs. Hemans established herself at the village of Wavertree, near Liverpool, in the expectation of obtaining good schools for her children and pleasant society for herself. She had little success in either of these objects. The schools were not such as she wished for; her house was inconveniently small; she was besieged by visitors, pressed to attend fashionable parties, and complains with some bitterness of 'this weary celebrity.'

In the early part of the summer of 1829 Mrs. Hemans paid a visit to Scotland. After staying a few days in Edinburgh, she proceeded to Chiefswood, in Roxburghshire, the residence of the author of 'Cyril Thornton,' and was there introduced to Sir Walter Scott, with whom she afterwards spent several days at Abbotsford. She returned to Edinburgh in August, and thence proceeded home to Wavertree.

In 1830 she published another volume of poetry, 'The Songs of the Affections,' and in the summer of the same year paid a visit to the lakes of Cumberland and Westmoreland. She remained a fortnight with Wordsworth at Rydal Mount, and then took up her residence at Dove-Nest Cottage, near Ambleside. After remaining some weeks, she was induced to make a second visit to Scotland, on which occasion she spent the greater part of the time at Milburn Tower, the seat of Sir Robert Liston. During this visit she formed a friendship in consequence of which she was induced to visit Dublin before she returned to Wavertree, and ultimately decided on leaving England, and fixing her abode at Dublin.

In the spring of 1831 Mrs. Hemans left England for Dublin, where she took lodgings. Her health, from the time of her leaving England, became rapidly worse, to which the advancing age of the sons remaining under her care was an additional cause of anxiety. 'My position,' she writes, 'obliged as I am "to breast a stormy world alone," precludes me from a calm still meditative life, which I would desire.' In November, 1831, after a visit to her brother in Kilkenny, she writes thus to a friend in England:—'On my return to Dublin I became a sufferer from the longest and severest attack of heart-palpitation I have ever experienced. It was accompanied by almost daily fainting fits, and a languor quite indescribable.' And not long afterwards, in another letter, she says:—'The constant necessity of providing sums of money to meet the exigencies of the boys' education has obliged me to waste my mind in what I consider mere desultory effusions,

"Pouring myself away,
As a wild bird amid the foliage turns
That which within him thrills and beats and burns
Into a fleeting lay."'

The latter months of 1833 were busily spent by Mrs. Hemans in arranging and preparing for publication the three collections of her poems which were published in the spring and summer of 1844: 'Hymns for Childhood;' 'National Lyrics and Songs for Music;' and 'Scenes and Hymns of Life.'

In August, 1834, Mrs. Hemans took the scarlet fever, and when imperfectly recovered, caught a cold; ague was superinduced, and never left her till it was subdued by her last fatal malady, dropsy, which before the end of 1834 had assumed an unequivocally dangerous aspect. The summer residence of the Archbishop of Dublin was placed at her disposal; change of scene and the kind attentions of the archbishop and his wife afforded some relief, but no permanent benefit; and in order to be near to her physicians, she was taken back to Dublin.

On the 26th of April, 1835, Mrs. Hemans dictated her last poetical effort, the 'Sabbath Sonnet.' She continued to sink gradually till May 12, 1835, when, after a long and quiet sleep, she died without a sigh or movement. She was buried in St. Anne's Church, Dawson Street, Dublin, which is close to the house in which she died. A tablet was erected by her brothers in the cathedral of St. Asaph, 'in memory of Felicia Hemans, whose character is best pourtrayed in her writings.' A volume of 'Poetical Remains' was published after her death.

Mrs. Hemans could hardly be called a beautiful woman, but her personal appearance was very pleasing. In early youth she was greatly admired for the brilliance of her complexion and her glossy golden hair; her complexion retained its clearness in her maturer years; her hair darkened into auburn, of a silk-like softness, and very long and abundant. In her aspect and movements there was something more than usually delicate and feminine. She was unassuming, and went seldom and reluctantly into general society. Her family, a few friends, her music, her books, and her poetical pursuits, were her chief sources of enjoyment. She played on the harp and piano-forte, and about the time when she went to reside at Wavertree, discovered in herself a faculty which gave her much gratification—that of composing melodies; she would sometimes make a musical air, and then write words for it, and sometimes set to music a song or lyrical piece already written. Among her friends she was distinguished by much vivacity and a very delicate wit. She was kind and affectionate; and was free from the slightest taint of jealousy towards the other female writers of her day, with most of whom she was on terms of friendship, either personal or by correspondence—with Joanna Baillie, Miss Mitford, Miss Landon, Miss Jewsbury, Mary Howitt, and others.

Mrs. Hemans's love of the art to which she had devoted herself was intense, and her appreciation of it was serious and high, as a means to purify and elevate the mind. In her later years her religious impressions became stronger, and her poetry became more tinctured with religious thoughts and feelings. Her knowledge was extensive, but it was not philosophical or scientific knowledge. Poetry was the object of all her studies, and she sought for its materials in history, voyages and travels, and the fine arts; but her especial delight was to contemplate the scenes of nature in all their aspects of beauty, and to muse upon the associations and sympathies connected with them. Her thoughts are unborrowed, are never vague or indistinct, and always seem to flow naturally from the scene or circumstance present to her mind. She is most successful when the subject is native, something which she has seen, or something which by its associations calls up the sympathies which are familiar to her. In foreign subjects she is less effective. Her poetry is thus peculiarly and strikingly the representation of her own character, of the thoughts and feelings of the woman; it is essentially lyrical and descriptive, filled with imagery, sometimes overflowing with it. She has no dramatic power; she cannot enter into the thoughts and feelings of others; she can only exhibit her own. Her tragedy was deservedly condemned. The actions and sentiments of the characters are above nature or out of it, and the diction is not dramatic, but poetical, and monotonously uniform from prince to peasant. Her versification has three distinct styles. Her 'Domestic Affections,' and other early poems, are obviously modelled on 'The Pleasures of Hope,' of Campbell; her 'Tales and Historic Scenes,' and other poems of the middle period, are in the manner of Byron, less flowing than her early style, but more vigorous. Her last style is her own, and whether in blank verse, in couplet rhymes, in stanzas, in sonnets, or in the varied measures of lyric poetry, exhibits in its free and continuous flow a perfection of rhythmical melody which in sweetness and fullness of sound has never been surpassed. In uninterrupted reading, however, it has an effect of cloying uniformity. Her great defect is the similarity of tone and treatment which pervades all her works. Many of her lyrical pieces are exceedingly beautiful.

(Chorley, *Memoirs of Mrs. Hemans;* Mrs. Hemans's *Poems.*)

HEMERO'BIUS, a genus of insects of the order *Neuroptera* and section *Planipennes.* The genus, as established by Linnæus, has been dismembered by subsequent entomologists, and is now equivalent to a family distinguished by the filiform antennae and by the number (four) of the palpi of the insects included in it. They have soft slender bodies, much exceeded in length by the large reticulated wings, which, when the animal is at rest, are deflexed. Their eyes are globular and vividly metallic. The larvæ are ferocious in habit, and prey upon plant lice, seizing them with their powerful jaws and sucking their prey to death. When full grown, they spin and envelop themselves in a silken cocoon. The eggs of Hemerobii are deposited on plants, and are pedunculated, so as to resemble fungi, for which they have sometimes been mistaken. These insects range from Europe to Australia, and there are many species natives of the British isles.

HEMICI'DARIS, a genus of fossil Echinodermata, from the oolite.

HEMIPNE'USTES, a genus of fossil Echinodermata, from the chalk marl.

HEMI'TRYPA, a genus of fossil Polypiaria, in the limestone of Devonshire, allied to Fenestella. (Phillips.)

HEMLING, HANS. [MEMLING, HANS, P. C. S.]

HENDERSON, THOMAS, was the son of a respectable tradesman at Dundee, where he was born December 28, 1798. After an education such as his native town could afford, he was apprenticed to a writer (or attorney) for six years. At the end of this term be was sent to Edinburgh, at the age of twenty-one, to complete his legal instruction. He was then successively secretary to the celebrated judge John Clerk of Eldin, the Earl of Lauderdale, and the Lord Advocate Jeffrey, and in these employments he continued till 1831.

During his residence at Dundee he acquired a taste for practical astronomy, as well as for the history and literature of that science. At Edinburgh he frequented the observatory, then a very small establishment, but sufficiently well equipped to give valuable opportunities to a learner. Weak bealth and a tendency to disorder in the eyes are very poor aids to an astronomer, but they did not hinder Mr. Henderson from bringing himself into notice, though his scientific pursuits could only be the relaxations of a life of business. In 1824 he began to communicate with Dr. Thomas Young, then superintendent of the Nautical Almanac, whom be assisted both by methods and calculations. The consequence was, that at Young's death it was found that he had placed in the hands of Professor Rigaud a memorandum desiring that the Admiralty might be immediately informed, as soon as his death sbould take place, that be knew of no one more competent than Mr. Henderson to be appointed his successor. The government, however, confided the trust to Mr. Pond, the astronomer royal, who immediately offered Mr. Henderson, on terms of remuneration, employment for a great part of his time. This offer was not accepted: but on the death of Mr. Fallows the Admiralty proposed to Mr. Henderson to succeed him in the charge of the observatory at the Cape of Good Hope. This offer was accepted; and from April, 1832, the date of his arrival at the Cape, be must be considered as a professional astronomer.

After vigorous application to bis duties for little more than a year, he found his health and spirits give way. His isolated position and separation from his family, accompanied by the knowledge that he was subject to a disorder of the heart, which might at any time, and which finally did, prove fatal, made him wish to return to Scotland. He came back accordingly in 1833, with a rich store of observations, the reduction of which he imposed upon himself as a voluntary duty. In 1834, by an agreement between the government and the Astronomical Institution of Edinburgh, the latter gave up their observatory to the University, the former agreeing to appoint and provide for an astronomer, who was also to hold the professorship of practical astronomy in the University. On the recommendation of the Astronomical Society of London, to whom Lord Melbourne applied for advice, Mr. Henderson was appointed the first astronomer royal for Scotland. Here, in the midst of his friends, and in the position which, of all that could have been imagined, he would have chosen for himself, he pursued his observations and researches till his death, which took place suddenly, November 23, 1844.

A very full account of Mr. Henderson's astronomical writings will be found in the annual report of the Astronomical Society for 1845, with a list of his writings, which consist of upwards of seventy communications, of different degrees of magnitude and importance, to different scientific publications, independently of the volumes of observations which issued from the Edinburgh Observatory. We might particularise what he did on occultations, on the solar and lunar parallaxes, &c.; but it will better suit our limits and the nature of the subjects, to refer the reader to the memoir just cited, and to confine ourselves to a mention of the manner in which his name is connected with the discovery of the parallax of the fixed stars. [PARALLAX, P. C.] Mr. Henderson, when at the Cape, repeated the attempt in which Brinkley had failed, namely, the detection of the effect of parallax upon the meridian observations. The stars chosen were α^1 and α^2 Centauri; and the results derived from the former star show discordances, both in right ascension and declination, very much resembling those which parallax would cause. Mr. Main, in his elaborate Investigation of the modern claims upon this subject (*Mem. Astron. Soc.* vol. xii.), says that in the event of a parallax at all comparable to that assigned by Mr. Henderson being ultimately found to belong to the star, he will deserve the merit of the first discovery. Mr. Maclear, Mr. Henderson's successor, made a new series of observations on the same stars, with a different instrument, from which Mr. Henderson produced results very nearly agreeing with bis own.

The private character and social qualities of Mr. Henderson are among the pleasant recollections of those who knew him. In his astronomical career be resembled his friend Mr. Baily in bringing to his subject the most methodical habits of business. He was well acquainted with astronomical literature, and with other branches of science; and at different times supplied the places of the professors of mathematics and of natural philosophy in the University of Edinburgh. He formed a great attachment to the methods of the German astronomers, and his models were MM. Bessel and Struve. His determination to be well acquainted with all that was doing abroad made him collect an astronomical library which, for a man of his very limited means, was of extraordinary extent and goodness; and those who knew him remember the ready manner in which he could produce the results of his reading. Of bis writings we may say, briefly, that, in addition to their valuable masses of observations, they abound in all that distinguishes the astronomer, properly so called, from the noter of phenomena.

HENRI'CO CATERI'NO DA'VILA, born at Pieve di Sacco near Padua, was the son of Antonio Davila, who was great constable of Cyprus when that island was taken by the Turks from the Venetians in 1571. Antonio emigrated to Spain, where he had relations, and afterwards to France, where he won the favour of Catherine de Medicis, and of her son King Henri III. Lastly he went to reside in the Venetian States, where a son was born to him in 1576, to whom he gave the names of Henrico Caterino, in homage to bis royal French patrons. When Henrico was seven years old his father took him to France for his education. At the age of eighteen he entered the army of Henri IV., in which he served four years, and was severely wounded at the siege of Honfleur. In 1599 be was recalled to Pieve di Sacco by his father, who soon after, in a fit of temporary insanity, put an end to his life by throwing himself out of a window. Not long afterwards Henrico entered the military service of Venice, and was employed successively in Candia, Friuli, Dalmatia, and other stations. In 1631 he was sent to take the command of the garrison of Crema, with orders from the senate to the postmasters on the road to supply him with every conveyance required for the service. On arriving at the stage of S. Michelo, near Verona, the postmaster refused to furnish the necessary accommodations. High words ensued, and the postmaster fired a pistol, and shot Davila dead in sight of bis wife and children. One of Davila's sons attacked the murderer, and killed him on the spot; others were wounded in the affray, and the chaplain of Davila was also slain.

Davila is known to the world through his History of the Civil Wars in France, 'Storia delle Guerre Civili di Francia,' from the death of Henri II. to the peace of Vervins in 1598, a period of forty years most eventful in the history of that country. He treads, therefore, upon the same ground as De Thou in his 'Historia sui Temporis.' Some critics have noticed that Davila evinces a partiality for the French court, and especially for Catherine de Medicis, who had been his father's benefactress. The facts, however, stated by Davila are acknowledged to be true, and he was well acquainted with them through his own and his father's connexion with France. He was familiar with the politics of his age, and with the leading contemporary characters. He was also well acquainted with the topography of the places in which most of the events which he narrates occurred. His style is graphic and animated, especially when he describes a popular insurrection, a combat, or the storming of a town. His account of the massacre of St. Bartholomew may be quoted as a specimen. Apostolo Zeno, comparing Davila with Guicciardini, observes, that whilst the prolixity of Guicciardini in dwelling minutely upon minor matters becomes wearisome to the reader, the course of Davila's narrative runs on uninterrupted, adverting briefly to circumstances of subordinate importance, and dwelling chiefly upon those which have materially affected the interests either of religion or the state. By common consent Davila is numbered among the best historical writers of Italy. His work has gone through many editions, and has been translated into several languages. Apostolo Zeno published a splendid edition of it in 2 vols. fol. Venice, 1733, to which he has prefixed a life of the author.

(Tiraboschi, *Storia della Letteratura Italiana;* Corniani, *I Secoli della Letteratura Italiana.*)

HENRYSON, ROBERT, a Scottish poet of much merit, lived in the latter part of the fifteenth century. Of his life hardly anything is known. He is supposed to have been the

Robert Henryson whose signature as notary-public is attached to a charter granted in 1478 by the abbot of Dunfermline, in Fifeshire; and he is elsewhere said to have been a schoolmaster in that town. It has been inferred that he must have been an ecclesiastic; and it has been conjectured that he may have been a Benedictine monk. In a poem of Dunbar, printed in 1508, he is spoken of as dead: and in one of his poems he had described himself as a 'man of age.' His tale of 'Orpheus Kyng, and how he yeid to hewyn and to hel to seik his quene,' was printed at Edinburgh, in 1508: and in 1593 there was printed his 'Testament of Faire Creseide,' which had been suggested by the 'Troilus and Creseide' of Chaucer, and is found in the common editions of that poet's works. His beautiful pastoral of 'Robin and Makyne' is known to most readers from Percy's 'Reliques.' Other specimens of Henryson's poems are in Sibbald's 'Chronicle of Scottish Poetry,' in Dr. Irving's 'Lives of the Scottish Poets,' and in Ellis's 'Specimens.' The fullest collections of them, however, are in Lord Hailes's 'Ancient Scottish Poems,' 1770, and in a volume containing his thirteen poems, called 'Fables,' edited by Dr. Irving in 1832, for the Bannatyne club. For that club, in 1824, Mr. George Chalmers had edited the 'Testament of Creseide,' and 'Robin and Makyne.' Henryson writes with much greater purity and correctness than most Scotsmen of his time: his versification is good, and his poetical fancy rich and lively.

HEPATI'TIS. [Liver, Diseases of, P. C.]

HERACLE'UM, a genus of plants belonging to the natural order Umbelliferæ and the tribe Peucedaneæ. The calyx consists of 5 minute teeth, the petals abcordate with an inflexed point, the outer ones radiant. There are 34 species noticed, but only one of these is found in Great Britain, and few are applied to any useful purpose.

H. Sphondylium, Cow Parsnip, has ternate pinnate leaves, the leaflets lobed or pinnatifid, cut, and serrated. The stem is about four feet high, the lower leaves very large, and the flowers white or reddish. It is a native of Europe, and probably of Siberia, and is found plentifully in the meadows and hedges of Great Britain. The whole plant affords wholesome and nourishing food for cattle, and is collected in Sussex for fattening hogs; hence it is sometimes called hog-weed. Cows and rabbits are also fond of it, and horses will sometimes eat it, but it does not appear to be so agreeable to them. The Kamtchatdales and Russians are in the habit of using the shoots and leaf-stalks as food, after the rind, which is bitter, has been taken off. They collect large bundles of tho plants, and during the process of drying the stalks become covered with a saccharine efflorescence which is esteemed a great delicacy. The Russians distil an ardent spirit from the stalks thus prepared by first fermenting them in water with bilberries. The seeds of the plant are diuretic and stomachic, and exhale a powerful odour.

H. pubescens has ternate leaves, somewhat pubescent beneath; the leaflets toothed and pinnatifid; the umbels of many rays; involucre from 1 to 2 leaves; the fruit elliptic, having the disk rather villous. It is a native of Taurida in shady places, and of the Caucasus in alpine places. The young shoots are filled with a sweet aromatic juice which is eaten by the natives of the Caucasus in a crude state.

H. Pyrenaicum has large leaves, tomentose beneath; the leaflets lanceolate, toothed, or ternate; the involucre of few leaves; the young fruit covered with long hairs; the matured ones glabrous and nearly orbicular. It is a nativo of the Eastern and Central Pyrenees, and of Italy. D. Don thinks that this plant is identical with the *H. gummiferum* of Willdenow, which was supposed to yield the gum ammoniacum of commerce. Don has however identified the plant which yields this gum, and has placed it in a new genus. [Dorema, P. C. S.]

All the species of Heracleum grow well in any soil, and are easily propagated by seeds or by dividing the root.

(Don, *Gardener's Dictionary*; Burnett, *Outlines of Botany*; Babington, *Manual of British Botany*.)

HERA'CLIUS, Roman emperor from A.D. 610 to 641. Since the publication of the volume of the 'Penny Cyclopædia' containing the life of this great emperor, the importance of Asia Minor and the adjacent countries as regards Europe has been much increased, and accordingly it appears useful to give a more circumstantial description of his campaigns against the Persians, which are of equal interest for the historian, the geographer, and the soldier.

The destitute condition of the empire at the accession of Heraclius compelled him to be an almost inactive spectator of the ruinous invasions of tho Avars in Europe and the Persians in Asia. By submitting to an annual tribute of one thousand talents (pounds?) of gold, as many talents of silver, one thousand silk robes, and one thousand slave girls, he induced the Persian king Chosroes or Khosrew to discontinue his invasions of Asia Minor and to be satisfied with the conquests he had made from the Greek empire, which comprehended Egypt and the whole of the Asiatic provinces east and south of a line drawn from the northern frontiers of Syria to the eastern extremity of the province of Pontus. Heraclius made a less humiliating peace with the Avars. Having got rid of his enemies, he employed vigorous means to fill his treasury, not sparing the property of the churches; and he was thus enabled to raise an army strong enough to stop all further designs of the Persian king. The plan of attacking that powerful foe was bold and well designed, and it was executed with so much boldness and prudence, and such a startling combination of offence and defence, as to equal the strategical operations of the greatest generals.

A powerful Persian army was stationed in the valley of the Upper Euphrates ready to descend through the passes of the Anti-Taurus into the high plains of Cappadocia, and to push on towards Constantinople as they had done in A.D. 616. The army of Heraclius, consisting chiefly of raw levies, was quartered in the environs of Constantinople, and afterwards in those of Chalcedon on the Asiatic shore of the Bosporus, and a whole year was required to prepare his men for a campaign. But Heraclius was master of tho sea, and his numerous fleet enabled him to choose his base of operation. Early in the spring of 622 he embarked his troops, and from the Bosporus sailed to the eastern corner of Cilicia, which lies round tho bay of Iskénderún (Alexandria), and is protected on the north and east by the Taurus and on the south by Mount Amanus. There on the plain of Issus he continued accustoming his troops to actual warfare by making them manœuvre in the same way as modern troops do, and he occupied tho Cilician and Syrian gates and other passes that lead through the surrounding ranges. A Persian army approaching in full confidence of making the Romans prisoners of war, or of forcing them to re-embark, was turned, routed, and driven into the mountains of Armenia. Having thus cleared his way and secured his rear, Heraclius marched through tho Cilician gates northward in the direction of Mount Argæus (Arjísh) and the Upper Halys (Kizil Irmák), where, as it seems, a portion of his troops remained during the winter as a body of observation. The emperor with the main body advanced upon Trebizond, and quartered his troops in the province of Pontus. Trebizond now became the centre of his operations. He left it, however, soon after his arrival, sailed to Constantinople, and in the following spring of 623 returned with a fleet and a chosen body of 5000 men. It is important to ascertain his motives for conveying his army by sea to the south-eastern extremity of Asia Minor, and thence fighting his way through inaccessible mountains right across Asia Minor to the Euxine, if he intended to make Trebizond the basis of his operations; for it seems that he could have gone there directly from Constantinople without incurring the risk of losing half his army, or perhaps the whole of it, in the defiles of tho Taurus and Anti-Taurus. Our sources say nothing of his motives, and generally we know few details of his first campaign. However, if we take the state of the empire into due consideration, and draw conclusions from his subsequent campaigns as to his first, we cannot hesitate to believe that Heraclius intended to attack Persia from two points, each of them equally well situated for an attack and affording equal security in case of a forced or voluntary retreat. And it becomes no less probable that he chose the bay of Iskénderún for his place of disembarkation, and thence marched towards the Euxine, because he wanted to relieve, through his presence at tho head of an army, the minds of those of his subjects who were most exposed to the inroads of the Persians, and to occupy as many mountain-passes as possible in order to prevent the Persians from breaking through the defiles between Cappadocia and the Upper Euphrates. In this, however, he did not succeed. The plan of his campaign further shows a fact corroborated by many subsequent wars, namely, that the inland tract between Trebizond and Issus is unfit for operations on a large scale, and that the only points from which Armenia, Mesopotamia, and Syria may be successfully invaded by an army coming from Asia Minor are the eastern angles of Pontus and Cilicia, whence it is evident that a power which is master of the sea, especially the Mediterranean, and lands sufficient forces at either of those points, will effect or prevent the conquest of all Asia Minor and the adjoining eastern countries with less force and in a shorter time than any power which is only a land force, however strong it may be. In preferring Trebizond to Cilicia as his principal basis of operation, and attacking Persia from the north, Heraclius further intended to compel his rival to withdraw his advanced troops from Syria and the other western provinces for the defence of his hereditary dominions, and thus to relieve his subjects and increase his means.

From Trebizond Heraclius carried the war, in the spring of 623, into the heart of Persia. The nations in the Caucasus were his allies, and he had entered into negotiations with the khazars beyond the Caucasus. These were the causes of his first advancing north-east into the Caucasian provinces, and only after having shown himself there and increased his army through the contingents of his allies, he marched south upon Charsa (Kars) and thence in a direction parallel with the Araxes as far as the great bend of that river, where, after a south-eastern and eastern course, it turns north-east. Thence he marched right upon Gazaca or Gandzaca, which is the still common Armenian name of Tabriz, and this city fell into his hands with all its wealth, Chosroes, who was in the neighbourhood with 40,000 men, not daring to offer battle for the relief of his northern capital. According to an absurd tradition Crœsus, King of Lydia, had saved his treasures in Gandzaca, where they were kept till they became a prey of Heraclius. From Gandzaca Heraclius marched south, turned the Persian army and fell upon their rear, took and destroyed Theabarma, now Urúmíyeh, near the western shore of the large lake of Urúmíyeh, which is said to be the birth-place of Zoroaster, and many other cities which have not yet been identified, and at last wheeled round and took up his winter-quarters in the flat country between the Lower Araxes and the Caspian, which is now known as the plain of Mogan. We may suppose that he chose that tract, which is renowned for its vast pasturages, for the support of his numerous cavalry, and for the purpose of having an easy communication with the khazars, who used to pass through Daghestán and the Iron Gate, near Derbent, whenever they invaded Persia.

In the following year, 624, Heraclius penetrated into the heart of Media, took Casbin, and probably also Aspahan (Isfahán), defeated Chosroes in a pitched battle, and, after having carried the Roman arms farther into Persia than any of his predecessors, returned to his former winter quarters at the foot of the Caucasus.

Our knowledge of the campaign of 624 is very imperfect; the accounts in the sources are vague and scanty, and the whole is so obscure that D'Anville gave up the idea of investigating it critically.

During this time Chosroes had withdrawn his troops from Egypt and Syria, and thought himself strong enough to act on the offensive. In the spring of 625 he ordered his lieutenant Sarbar, or Sarbaraza, to menace Asia Minor, while he endeavoured to keep the Roman emperor at check in the Caucasus. Sarbar was in Northern Mesopotamia; however, he did not take his way through the inland tract, which he could have done either in the direction from Diyárbekr, Málátiyeh, Síwás, and Amasia, through the province of Sophene and the north-eastern part of Cappadocia, or in the direction of Marásh and Kaisáríyeh through the centre of Cappadocia; but he marched south-west and fell upon the eastern angle of Cilicia. His intention was apparently to take the easiest way for penetrating into Asia Minor, to cut off the communication between the Romans in the fortresses of the Anti-Taurus and the Taurus with the Mediterranean, and to destroy the magazines of the Romans in Cilicia. Informed of this diversion, Heraclius moved on; but while he appeared to threaten the main body of the Persians under Chosroes, he suddenly passed by, left the defence of Armenia to his Caucasian allies, and followed Sarbar through Mesopotamia, either by his track or on a parallel road. They met in Cilicia on the banks of the Sarus, now Sihún, at a moment when Sarbar was in a very critical position, for although we do not know whether he entered Cilicia through the Syrian gates, or through the valley of the Pyramus or Jihún, it is evident that either one or both of those passes were already stormed by Heraclius before the Persians had even entered the defiles of the Cilician passes, which were defended by Roman troops. Theophanes says, that Heraclius approached from Germanicia (Marásh) passed by Adána, and arrived in Cilicia before Sarbar; and as, when the battle began, the Romans were on the right and the Persians on the left bank of the Sarus, we may suppose that Sarbar came through the Syrian passes and found himself in presence of the main army of the Romans, just when he was going to attack the Cilician passes. In the ensuing battle Heraclius astonished both his own and his enemy's troops by his heroic deeds. At the head of a few veterans he stormed the stone bridge over the Sarus (below Adána), which the Persians had occupied and fortified, and slew with his own hand a gigantic Persian whom nobody dared to fight. After a bloody conflict the Persians were routed; and Sarbar escaped, through the Syrian passes, with the scattered remnants of his army to Persia. Heraclius did not pursue him, but marched through the Cilician passes upon Sebaste (Síwás), and took up his winter-quarters in Pontus.

The next campaign of 626 equals the most splendid military operations in antient or modern time. In its grand outlines it may be compared to the operations of Hannibal and Scipio in B. C. 204, and to Napoleon's campaign in France in 1814: Hannibal was still in sight of Rome when Scipio boldly sailed to Africa; and the allies were fast advancing upon Paris, when Napoleon turned them and marched towards Germany: under similar circumstances Heraclius was more fortunate than either Hannibal or Napoleon, and it is only just to say, that his fortune was not accidental, but the effect of his superior genius. Early in 626 Chosroes opened the campaign with two armies against Heraclius, and a third under Sarbar, who was commissioned to attempt a second invasion of Asia Minor. Sarbar was successful, traversed the whole peninsula, and reached the walls of Chalcedon, opposite Constantinople; and, at the same time, a host of more than a hundred thousand Avars and other barbarians, the allies of Chosroes, invaded Thrace, laid siege to Constantinople, and twelve times assailed its walls. Chosroes hoped to induce Heraclius to hasten to the succour of his capital, but the emperor stood firm at the foot of the Caucasus, dispatching however, by sea, twelve thousand armed horsemen, who arrived safely at Constantinople. He knew that, however great the danger was for Constantinople, the Persians and Avars had no ships to effect a union, and that the inhabitants of the capital would fight to the last before they surrendered to an enemy whom it was more dangerous to encounter in the open field than in their assaults upon walls and towers. A Slavonian fleet having entered the Bosporus, destined to convey the Persians over to the European shore, the Greek galleys left the Golden Horn, and, in sight of the besiegers, destroyed the ships of the barbarians or took them and carried them off into the harbour of Constantinople. Shortly after this event the Avars withdrew and Constantinople was free, although Sarbar continued to amuse himself with the siege of Chalcedon.

While this took place in the west, Theodore, the brother of Heraclius, defeated the Persian general Said, in Armenia, and the emperor defended with success the Caucasian provinces against the desperate attack of Chosroes, who took the field against him with a select army of 50,000 men called the Golden Spears. A still greater advantage the emperor derived from effecting an alliance with Ziebel, the khan of the Khazars, who came through the Iron Gate with a numerous host, and joined the Romans at Tifilis (Tiflis). Another army of Khazars invaded Persia on the side of Turkistán. The united Romans and Khazars were 70,000 men, or perhaps more, since the Khazars alone were 50,000 strong, and Heraclius led them forthwith into the province of Atropatene, where he took up his winter quarters. He crowned the success of his arms by a stratagem which proved more advantageous than the winning of three pitched battles. After the junction of the Romans and the Khazars Chosroes sent a dispatch to Sarbar, with an order to give up all further designs against Constantinople, and to join him without delay in Persia. The messenger having fallen into the hands of the Romans, Heraclius altered the dispatch, enjoining him to hold out as long as possible, and the letter was forwarded through another courier. Sarbar continued the siege, but his protracted absence irritated the king so much that he dispatched a second messenger to the first lieutenant of Sarbar with an order to kill his general as a traitor. This dispatch having been delivered to Sarbar instead of his lieutenant, he added the names of four hundred of the principal officers as being all destined to be sacrificed to the anger of their master, whereupon he showed them the order, and declared the only way to save themselves was to break their allegiance to Chosroes and to make peace with the emperor on their own account. The officers gave their consent, they persuaded the army to follow their example, and Heraclius having granted them favourable conditions, they laid down their arms, and abandoned Chosroes at a moment when he stood most in need of them. There is something strange in this story, and it would seem as if Heraclius had not so much a hand in it as Siroes, the son of Chosroes, who rebelled against his father, and put him to death in 626.

In spite of this loss Chosroes had still a numerous army, the amount of which is however exaggerated when it is stated at 500,000 men, to oppose Heraclius in the campaign of 627. But his efforts were in vain. With irresistible power the Roman emperor moved on upon Assyria, and although his progress was slow, he was successful in every siege and engagement. He came from the province of Atropatene, passed the Zabas (Great Záb) in its upper part, and marched towards Niniveh (opposite Mósul), where he encountered a Persian army commanded by Rhazater, who had followed the emperor for some time, but gained some marches over him, and had taken a position near the ruins of Niniveh with the intention of preventing the Romans from occupying the valley of the Tigris and marching upon Ctesiphon. After an obstinate resistance from daybreak till night Rhazater was routed and killed, and Heraclius, who had again signalized himself as a general and a warrior, pursued the fugitive enemy, and occupied the bridges over the Great and the Little Záb, which the Persians had no time to secure. The battle at Niniveh was fought on the 12th of December, 627. On his way to Dastagerd or Artemita, Heraclius took, plundered, and destroyed the royal palaces of Rusa, Beglali, and others, and immense treasures fell into his hands. Soon afterwards he took Dastagerd, the favourite residence of Chosroes, and its treasures, of which Theophanes gives a fabulous description; and many thousands of captive Romans, chiefly inhabitants of Edessa and Alexandria, as also three hundred standards and other trophies taken from the Romans in former campaigns, were recovered by the victors. Chosroes fled from Dastagerd to Ctesiphon (El-Modain), and thence into the interior of Persia. Heraclius was already in sight of Ctesiphon, when he suddenly retreated north-east upon Siazura (Sherzúr) and Gandzaca, crossing the Assyrian mountains in the midst of winter without loss. The motives of his retreat were either the fear of being unable to take the well fortified city of Ctesiphon in the winter, the want of provisions in Assyria, which had been ravaged, being already very sensibly felt, or perhaps the rebellion of Siroes against his father Chosroes, whom he treacherously seized and put to death with eighteen of his sons, the brothers of Siroes. (February 28th, 628.) In the month of March following peace was concluded between Siroes and Heraclius. Siroes ceded Syria, Egypt, Mesopotamia, and Armenia, and gave back the Holy Cross taken by his father at the conquest of Jerusalem; and Heraclius gave up many thousand Persian captives, and allowed the Persian troops who still occupied the principal towns of Egypt, Syria, and Mesopotamia to return to their native country: they were treated with great humanity on their march through the Roman provinces. In the same year Heraclius had his triumphal entrance in Constantinople. Theophanes, so vague and obscure in his accounts of the first campaigns of Heraclius, gives a detailed and accurate description of the campaign of 627. It is not in the plan of this article to relate the particulars of the latter part of the reign of Heraclius, during which he lost all his conquests, which fell into the hands of the Arabs. A colossal statue of Heraclius existed at Barletta in Puglia so late as the end of the fifteenth century.

(Theophanes, p. 250, &c.; Nicephorus, p. 4, &c.; Cedrenus, p. 407, &c.; Zonaras, vol. ii. p. 82, &c.; Glycas, p. 270, &c., in the Paris editions; Georgius Pisida, *De Expeditione Heraclii; Bellum Avaricum; Heraclius:* the author of these short historical poems, which however are very valuable, accompanied Heraclius on his campaigns against the Persians; Gibbon, *Decline and Fall;* Lebeau, *Histoire du Bas Empire;* D'Anville, *Recherches Géographiques concernant l'Expédition de l'Empereur Héraclius en Perse,* in the xxxii. vol. of *Mémoires de l'Académie des Inscriptions et Belles Lettres.* The map of Asia Minor and part of Persia, in Kinneir's 'Journey through Asia Minor, Armenia, and Kurdistán,' indicates the routes taken by Heraclius in his campaigns, but they are not correct. We want a complete critical commentary on the expeditions of Heraclius, which would offer less difficulties now than it did to D'Anville, since our knowledge of the country is more exact than it was a hundred years ago.)

HERBART, JOHANN FRIEDRICH, a distinguished German philosopher, was born in 1776, at Oldenburg, where his father at the time held an office connected with the administration of justice. Receiving his religious instruction from a man well acquainted with the philosophical systems of Leibnitz and Kant, Herbart, at the age of about twelve, was led to speculate upon such subjects as God, freedom, and immortality. In his eighteenth year he went to the University of Jena, where he studied under Fichte, and formed an intimate acquaintance with him, and he entertained the highest opinion of his master until Schelling's work, 'Vom Ich,' fell into his hands, which was admired by Fichte, while Herbart opposed its tendency with the greatest zeal. This caused a breach between Fichte and Herbart, who gladly accepted a place of private tutor which was offered to him at Bern in Switzerland. He had already conceived the idea of a system of psychology based upon mathematics, and the more clearly Fichte explained his views upon psychology in his 'Sittenlehre' (Leipzig and Jena, 1798), the more Herbart became convinced that the speculations of Fichte must be abandoned if any permanent basis was to be gained for his science. About the same time he devoted himself with great zeal to the study of the history of antient philosophy, which led him to form an intimate acquaintance with the systems of Plato and the Eleatics. However he continued his own researches which he had commenced under Fichte, and from 1802 to 1805 he delivered philosophical lectures in the University of Göttingen, where he developed his peculiar method of thinking, which was subsequently much extended, but remained essentially the same as it had been from the beginning. His tendency was pre-eminently practical, and it was partly owing to this circumstance, and partly to his personal acquaintance with Pestalozzi, that his first works treated on education. In 1809 he was appointed professor of philosophy at Königsberg, and was at the same time entrusted with the superintendence of the higher educational establishments in the eastern parts of Prussia, in the organization of which he did great service. In 1833 he was invited to the chair of philosophy in the University of Göttingen, where his lectures attracted great attention on account of the clearness and precision with which he explained his views. He remained at Göttingen until his death, on the 14th of August, 1841.

Herbart is the founder of a particular system of philosophy, which is interesting on account of his peculiar method rather than his originality of thought, for in reality his system is of a syncretic kind, and Fichte's influence upon it cannot be mistaken. Although Herbart occasionally professes to be a follower of Kant, still he is of opinion that Kant's 'Criticism of Pure Reason' is almost without any objective value, and that its method must be entirely abandoned if metaphysics are to be founded on a secure and permanent basis. Herbart's realistic tendency further reminds us of the monades of Leibnitz. Philosophy, according to Herbart, has not, like ordinary sciences, any particular set of subjects which are its province, but it consists in the manner and method in which any subject whatsoever is treated. The subjects themselves are supposed to be known, and are called by him 'notions' (Begriffe), so that philosophy is the methodical treatment and working out of those 'notions.' The different methods of treatment constitute the main departments of philosophy. The first of them is logic, which considers the nature and clearness of notions and their combinations. But the contemplation of the world and of ourselves brings before us notions which cause a discord in our thoughts. This circumstance renders it necessary for us to modify or change those notions according to the particular nature of each. By the process of modification or change something new is added, which Herbart calls the supplement or complement (Ergänzung). Now the second main department of philosophy is metaphysics, which Herbart defines to be the science of the supplementary notions. The method of discovering the supplementary notions which are necessary in order to render given facts which contain contradictory notions, intelligible, is, according to him, the method of relations, and it is by this method alone that the other notions of the world and of ourselves can be properly defined. Hence arises what he calls practical metaphysics, which is subdivided into psychology, the philosophy of nature, and natural theology. A third class of notions, lastly, add something to our conceptions, which produces either pleasure or displeasure, and the science of these notions is aesthetics, which, when applied to given things, forms a series of theories of art, which may be termed practical sciences. They are founded upon certain modal notions, such as the ideas of perfection, benevolence, malevolence, justice, compensation, equity, and the like. In his metaphysics Herbart points out three problems containing contradictions, viz. things with several attributes, change, and our own subjectivity (das Ich). In order to solve these contradictions, and to make the external and internal world agree and harmonize so as to become conceivable, he assumes that the quality of everything existing (des Seienden) is absolutely simple. Things therefore which exist have no attributes referring to space and time, but they stand in relation to a something, which is the essence of things. Wherever this essence consists of a plurality of attributes, there must also be a plurality of things or beings, and these many simple things or beings are the principles of all things in nature, and the latter, consequently, are nothing but aggregates of simple things. They exist by themselves in space so far as it is conceived by our intellect, but not in physical space, which contains only bodies. We do not know the real simple essence of things, but we may acquire a certain amount of knowledge concerning internal and external relations. When they accidentally meet in space they disturb one another, but at the same time strive to preserve themselves; and in this manner they manifest themselves as powers, although they neither are powers nor have powers. By means of these principles Herbart endeavours to reform the whole system of psychology which he found established by his predecessors; for, according to him, the soul too is a simple being, and as such it is and remains unknown to us; and it is neither a subject for speculation nor for experimental psychology. It never and nowhere has any plurality of attributes, nor has it any power or faculty of receiving or producing anything; and the various faculties usually mentioned by psychologists, such as imagination, reason, &c., which sometimes are at war and sometimes in concord with each other, are, according to Herbart, mere fictions of philosophers. In like manner he denies that it possesses certain forms of thought or laws regulating our desires and actions. The soul as a simple being, and in its accidental association with others, is like the latter subject to disturbance and exerts itself for its own preservation. The latter point is the principal question in Herbart's psychology, and he endeavours to deduce and calculate the whole life of the soul, with the aid of mathematics, from those mutual disturbances, checks, and from its reactions against them. Hence he is obliged to deny man's moral or transcendental freedom, although he allows him a certain free character. He maintains the immortality of the soul, because the simple principles of all things are eternal; but he denies the possibility of acquiring any knowledge whatever of the deity.

These theories, which betray a tendency to subtleties and over-refinement, are explained more fully in his works, of which the principal are contained in the following list:—1, 'Pestalozzi's Ideo eines A. B. C. der Anschauung, untersucht und wissenschaftlich entwickelt,' Göttingen, 1802, 8vo. 2, 'Allgemeine Paedagogik,' Göttingen, 1806, 8vo. 3, 'Allgemeine Practische Philosophie,' Göttingen, 1808, 8vo. 4, 'Hauptpunkte der Metaphysik,' Göttingen, 1808, 8vo. 5, 'Einleitung in die Philosophie,' 1813, an improved edition appeared in 1816. 6, 'Kleines Lehrbuch der Psychologie,' Göttingen, 1815, 8vo. This work called forth great opposition, to which he replied in 7, 'Ueber meinen Streit mit der Modephilosophie dieser Zeit,' Königsberg, 1814. His great psychological work, however, is 8, 'Psychologie als Wissenschaft, neu gegründet auf Erfahrung, Metaphysik, und Mathematik,' Königsberg, 2 vols. 8vo., 1824-25. 9, 'Allgemeine Metaphysik, nebst den Anfängen der Philosophischen Naturlehre,' Königsberg, 1828-29, 2 vols. 8vo. 10, 'Kurze Encyclopaedie der Philosophie, aus practischen Gesichtspunkten entworfen,' Königsberg, 1831, 8vo. His smaller essays appeared in three volumes, Leipzig, 1842-43, 8vo.; the first volume contains a good Life of Herbart.

(*Neuer Nekrolog der Deutschen*; Brockhaus, *Conversations-Lexikon*.)

HEREDITAMENT. [CHATTELS, P. C.; DESCENT, P. C.; ESTATE, P. C.]

HERESY. This word is the English form of the Greek Haeresis (αἵρεσις). It signifies literally 'a choice,' and hence it came to denote an opinion on any subject; and it was used to express a sect in philosophy. The word occurs in the New Testament, sometimes simply to denote a religious body, and sometimes as a term of reproach applied to the religious opinions of persons which differed from the opinion of him who used the term. When ecclesiastical councils determined what was the orthodox or Catholic faith, then Christians who would not acknowledge the decisions of such councils were called Heretics, and their guilt was expressed by the term Heresy: those who reject Christianity altogether are infidels and unbelievers.

The fifth title of the first book of the Code of Justinian contains penalties against Heretics, Manichæans, and Samaritans, which, in some cases, extended to death. Heretical books were ordered to be burnt. Before the Reformation in England heresy was the holding of opinions contrary to the Catholic faith and the determination of Holy Church: at least this is the definition of heresy in the statute 2 Hen. IV. c. 15. The court in which a man could be convicted of heresy, according to the common law, was that of the archbishop in a provincial synod. After conviction the criminal was delivered up to the king to do what he pleased with him. If the criminal had abjured his heresy and then relapsed, the king in council, upon a second conviction, might issue the writ De Haeretico comburendo, upon which the criminal was burnt alive. One Sawtre, it is said, was the first man burnt alive for heresy in England, and the writ De Haeretico comburendo was formed in his case. But the statute 2 Hen. IV. c. 15, empowered the diocesan alone, without a synod, to commit a man for heretical opinions, and to imprison him as long as he chose, or fine him; or if he refused to abjure, or after abjuration relapsed, the sheriff, mayor, or other officer, who should be present, if required, with the ordinary or his commissary, when the sentence was pronounced, was to take the convict and burn him openly, without waiting for the king's writ.

It is unnecessary to mention the statutes of Henry VIII. relating to heresy. The Reformation was not fully established till the reign of Elizabeth, and the statute 1 Elizabeth, c. 1, declares that the persons to whom the queen or her successors shall give authority to judge of heresies shall not declare any matters to be heresies except 'such as heretofore hath been adjudged heresy by the authority of the canonical Scriptures, or by the first four general councils, or any of them, or by any other general council wherein the same was declared heresy by the express and plain words of the canonical Scriptures, or such as shall hereafter be adjudged heresy by parliament with consent of the clergy in convocation.' But there is no statute that determines what heresy is. After this statute of Elizabeth the proceedings in cases of heresy remained as they were at common law; for this statute repealed all former statutes about heresy, which was accordingly punished, after the Reformation was fully established, by ecclesiastical censures, and by burning alive a criminal who had been convicted, in the manner above described, in a provincial synod. The writ for burning the heretic could not be demanded as a matter of right, but was left to the discretion of the crown; and both Elizabeth and James the First, in their discretion, thought proper to grant the writ. Elizabeth, it is said, burnt alive two Anabaptists, and James burnt alive two Arians.

The statute of 29 Charles II. c. 9, abolished the writ De Haeretico comburendo. Heresy is now left entirely to the ecclesiastical courts; and the punishment of death in consequence of any ecclesiastical censure was by that act abolished in England. As Elizabeth and James practically showed their approbation of burning heretics alive, so Lord Coke (3 *Instit.* c. 5) approves of the punishment.

At present the ecclesiastical courts punish for heresy, when they do punish, *pro salute animae*, as it is termed—that is, solely out of regard to the soul of the offender. But it is difficult to say at present what can be called heresy; and perhaps it is difficult to say what is exactly the punishment for it. It is remarked in the Report of the Criminal Law Commissioners on Penalties and Disabilities in regard to Religious Opinions, 1845 (p. 22), that 'the jurisdiction, as it may affect the laity, and clergy not of the established church, or indeed as administered *pro salute animae*, appears to militate with the principles contained in modern acts of toleration, that are inconsistent with the infliction of punishments for mere opinions with respect to particular articles of faith or modes of worship.' Indeed there seems no risk in asserting that much of the jurisdiction of the ecclesiastical courts in respect to heresy, whether it shows itself in speaking, writing, or preaching, has been destroyed by the various Toleration Acts. The Criminal Law Commissioners see no reason for retaining the jurisdiction of the ecclesiastical courts in matters of heresy, 'except, so far as it may be directed, to prevent ministers of the Established Church from preaching in opposition to the Articles and doctrine of the establishment of which they receive their emoluments.' So far as this, there is certainly no objection. There ought to be some speedy mode of depriving a man of these emoluments, which he accepts upon certain terms. He who will receive alms [Frankalmoigne, P. C. S.], and yet preach against the doctrines which he is paid for teaching, deserves the reprobation of all mankind; and those who dislike ecclesiastical authority most could not be better pleased than to see such an offender handed over to his brethren to be dealt with in any way that the rule of the church provides, to which the offender has solemnly submitted himself.

In the year 1845 proceedings were commenced in the Arches' Court of Canterbury against the Rev. Mr. Oakley for writing, publishing, and maintaining doctrines contrary to the Articles of Religion.

The history of Heresy in England is instructive. The change from burning alive to the free expression of opinion on religious matters is one of the steps in the social progress of England. For some other matters connected with the subject, see Blasphemy, P. C.

HERMES, GEORG, the founder of a philosophical school of Roman Catholic theology, was born on the 22nd of April, 1775, at Dreyerwalde, near Münster in Westphalia, where he received his first education from the priest of the place. He subsequently became a pupil of the gymnasium at Rheina, and there gave the first proofs, especially in his mathematical lessons, of his strong mental powers. After the year 1792, when he entered the theological faculty at Münster, he devoted himself with great zeal to the study of the philosophy of Kant, and thus arrived at the conviction that no one can establish a perfect system of theology unless he has previously fathomed the first principles on which all human knowledge is based. In 1798 he was appointed teacher at the gymnasium of Münster, and all his exertions henceforth were directed towards restoring, on a firm basis, that which had been demolished by Kant's 'Criticism of pure Reason.' But as a teacher at the gymnasium, he had no opportunity of making known the results of his philosophical studies. This opportunity however was offered to him in 1807, when he was appointed professor of theology at Münster. His great talent as a lecturer, and his kind and benevolent manners, attracted great numbers of students. On one occasion, when he had to give his opinion on some ecclesiastical question, he greatly offended Droste-Vischering, afterwards Archbishop of Cologne, and the ill feeling thus created had probably some influence in the subsequent proceedings against the doctrines and followers of Hermes. In 1819 Hermes was appointed professor of theology in the newly established University of Bonn. His lectures again attracted students not only from all parts of Catholic Germany, but the King of the Netherlands sent a large number of young men to Bonn for the special purpose of studying under Hermes. In the enjoyment of the highest esteem both of his colleagues and pupils, he died at Bonn on the 26th of May, 1831.

The only work that Hermes published bears the title 'Einleitung in die Christ-Katholische Theologie,' Münster, 1819, 8vo.; a second edition appeared in 1831. So long as the Archbishop Spiegel zum Desenberg was alive, Hermes and his views were not attacked by the see of Rome; but soon after the elevation of Droste-Vischering to the archbishopric of Cologne, reports were made to Rome about the infidel tendency of Hermes's work, which still continued to be the chief theological manual at Bonn and other German universities, where the chairs were filled by the disciples of Hermes. There is no doubt that the denunciation against Hermes was in the first instance made by some German who was hostile to him, but it was taken up very eagerly at Rome by Perronne, who made his report to the pope. The objectionable point in Hermes's work was his principle, that reason or philosophy must in the first place prove the reality of a divine revelation, and in the second, the truth of the Roman Catholic system. These points being ascertained, Hermes demanded absolute submission to revelation. He does not attempt philosophically to prove the truth of every particular dogma, but only to show that the Church has a right to establish her dogmas, and to demand submission to them. Hermes thus did not attack a single dogma of the Church, and his orthodoxy can scarcely be disputed; but if we consider that the whole method of Hermes claimed for every theologian the right of exercising his private judgment, and at the same time remember that the Roman hierarchy had reason to dread every philosophical inquiry into its system, since, although Hermes remained orthodox, it was by no means certain that future theologians might not be led astray by their application of philosophy to theology, it will not be surprising to find that, on the 26th of September, 1835, the pope issued a brief against the work of Hermes. The severity with which Archbishop Droste-Vischering carried the brief into execution produced a rupture between the courts of Berlin and Rome. The disciples of Hermes made all possible efforts to defend their master, and two of them, Professors Braun and Elvenich, went to Rome to point out to his holiness that Perronne had misrepresented the views of Hermes. But their exertions were of no avail. The pope, as late as the year 1844, severely censured the Prince-bishop of Breslau for not being zealous enough in preventing the circulation of the doctrines of Hermes. In the same year the professors Braun and Achterfeld of Bonn, who refused to recant their Hermesian opinions, were forbidden to lecture in the university by order of the archiepiscopal coadjutor, Von Geissel, at Cologne. The number of pamphlets that have been written for and against Hermes is prodigious, and has probably contributed not a little towards the religious movement now going on among the Roman Catholics of Germany. The best exposition of the whole controversy may be found in Elvenich's 'Der Hermesianismus und sein Römischer Gegner Perronne,' Breslau, 1844, 8vo.

(Brockhaus, *Conversations-Lexikon*, ninth edition.)

HERMIT, more properly *Eremite*, from the Greek ἐρημίτης, signifying an inhabitant of a desert, is the name given to such religious persons as retired from society without becoming members of any monastic community. The distinction between hermits and monks, and the origin of both, are explained in P. C. under the term Monachism (xv. 312). See also Anchoret (i. 507) and Ascetic (ii. 437).

HERMO'GENES, a heretic of the early church, against whom Tertullian has written a treatise, was most probably a native of Africa, and flourished, according to Basnage and Le Clerc, A.D. 168. The chief information we possess respecting him is contained in Tertullian and Theodoret. It appears from the former of these writers that Hermogenes, though professedly a Christian, had throughout his life evinced a strong tendency to the doctrines of the Heathen philosophers, and especially to those of the Stoics. He is accused of having taught that God made the world out of matter that was coeternal with him. The chief design of Tertullian's treatise is to confute that notion: his principal argument against him is, that if matter be eternal, there must necessarily be two Gods, which however Hermogenes did not allow, but expressly asserted the existence of one supreme governor of the universe. The following, in a few words, appears to have been the system of this heretic: he did not introduce any con or any creator different from the one God, the Father; but he asserted the eternity of matter, and that God created the universe out of it. This matter had a confused and turbulent motion, and to it he ascribed all the evils which exist in the creation. It was out of this confused matter that God brought order and perfection. He however believed in a future judgment, and, probably, most of the other great doctrines of religion, as he is not charged by either Tertullian or Theodoret with any other heresy than that to which we have alluded. We have no account of any of his writings, though it may be inferred from the arguments of his opponents that he was an author. We are ignorant of the year of his death. For a fuller detail of his opinions see Lardner, *Hist. of Heretics*, ch. xviii.; Tillemont, *Hist. Eccl.*; and Cave.

HERNANDIA'CEÆ, a natural order of incomplete Exogenous plants. It has monœcious or hermaphrodite flowers, with an involucellum in the pistiliferous and hermaphrodite flowers: a petaloid calyx, tubular, 4-8-parted, deciduous; definite stamens inserted into the calyx in two rows, of which the outer is often sterile, with the anthers bursting longitudinally; the ovary superior, 6-celled, with a pendulous ovule and peltate stigma; a drupaceous fruit with one seed, which is pendulous; the embryo is inverted, without albumen; the cotyledons somewhat lobed, shrivelled, and oily. The species are trees with alternate entire leaves, and flowers arranged in axillary or terminal spikes or corymbs.

This order has been constituted by Blume. It contains only two genera, Hernandia and Inocarpus. These were sometimes referred to Myristiceæ, from which they differ in the absence of albumen from their seeds. Their longitudinal anthers distinguish them from the Lauraceæ, in which order they have also been placed. Their affinity is undoubtedly with Thymeleaceæ, from which they differ only in their drubaceous fruit, lobed cotyledons, and the involucel to some of the flowers.

Hernandia, the typical genus of this order, was named after Hernandez, a naturalist sent out to Mexico by Philip II. of Spain; and it is said to have been given to these plants, which have large leaves and little flowers, in allusion to the great opportunities afforded to this naturalist and the little use he made of them. The characters of this genus are the same as the order.

H. sonora is a tall erect tree, with cordate peltate leaves, yellowish panicled flowers, a large inflated succulent calyx, with a small roundish entire mouth. It is a native of the various parts of the East and West Indies, and has obtained its name *sonora* from the noise made by the wind in whistling through its persistent involucels. The bark, the seed, and the young leaves of this tree are slightly cathartic. Rumphius says that the fibrous roots chewed and applied to wounds produced by the Macassar poison, act as an effectual cure. The juice of the leaves is employed as a depilatory. It destroys the hair wherever it is applied, and this without producing pain. The wood of this species is very light, and Anblet says that the wood of H. Guianensis takes fire readily from a flint and steel, and may be used as tinder. Several species of Hernandia are mildly purgative.

(Lindley, *Natural System*; Lindley, *Flora Medica*; Burnett, *Outlines of Botany*.)

HE'SPERIS (from 'Hesperus,' the evening), a genus of plants belonging to the natural order Cruciferæ, and the tribe Sisymbreæ. The flowers emit a sweet fragrance during the night, and hence the genus derives its name. The pods are quadrangular, or sub-compressed, the valves keeled and somewhat swerved, the seeds in a single row. There are only three species enumerated, and none of these are made use of by man but as ornamental and sweet-scented plants.

H. Matronalis, Dame's Violet, is the only British species; it has an erect branched stem, ovate lanceolate leaves, and large handsome lilac fragrant flowers. The ladies of Germany have pots of this plant placed in their apartments; hence it has been called Dame's Violet. Parkinson calls it Queen's Gilliflower; and Gerard, Damask Violet.

All the species thrive best in a light rich soil, and require the same treatment as most other tardy garden-plants.

(Don, *Gardener's Dictionary*; Babington, *Manual*.)

HETERO'CERUS, a genus of pentamerous coleopterous insects established by Bosc. Latreille places it in his second section of his family *Clavicornes*, and forms of it a tribe under the name of *Acanthopoda*, on account of the flattened broad limbs armed with spines. These beetles have small oval depressed bodies, and eleven jointed antennæ, the last six articulations forming a cylindrical club. They live in sand or mud, by streams or among marshes, burrowing in the ground by means of their spinous tibiæ. When disturbed or alarmed they come out of their holes. The larvæ live in the same situations with the perfect insects. Several species are found in Britain.

HETERO'MERA, the second section of coleopterous insects in the arrangement of Latreille, including such as have five articulations in the first four tarsi, and four in the two posterior. They are all vegetable feeders. Latreille divided the *Heteromera* into four groups: 1st, the *Melasoma*, dusky or black insects, for the most part apterous and having hard elytra, which are often anchylosed. Their jaws are furnished with a hook, their claws are simple, and their eyes are oblong and depressed, a character which indicates nocturnal habits. They live in sand, or under stones, and often in cellars and vaults. They are very tenacious of life, living many months after being transfixed by a pin and placed in the cabinet. Doubtless this is owing to the quantity of fat in their bodies, which much exceeds that found in allied insects, and enables them to subsist for a long period without food. They are found in all parts of the world. The genera *Pimelia*, *Blaps*, and *Tenebrio* are types of as many tribes among the *Melasoma*. The *Blaps mortisaga* and the meal-worm, *Tenebrio molitor*, are familiar British examples.

2nd. The *Taxicornes*, insects without hooked jaws, with more or less square bodies, hard elytra, wings, short antennæ, and feet adapted for running, furnished with simple claws. They live under the bark of trees, or in the fungi parasitical on their trunks. A few live on the ground under stones. The genera *Diaperis* and *Coryphus* are types of tribes in this division.

3rd. The *Stenelytra*, which differ from the preceding in the structure of the antennæ, those organs being perfoliate or clavate in the Taxicornes, but simple among the insects of the present section. In other respects they are similar. The genera *Hylops*, *Cistela*, *Dircaea*, *Oedemera*, and *Myctera*, are types of tribes. They mostly inhabit wood. The *Oedemeræ* are found on flowers: they fly well.

4th. The *Trachelides*, beetles having triangular or heart-shaped heads, remarkable for being pedunculated. The neck is not retractile. Their bodies are soft, and furnished with wings, protected by flexible elytra. The jaws are not furnished with hooks, and the claws are bifid. *Lagria*, *Pyrochroa*, *Mordella*, *Anthecus*, *Horia*, and *Meloe*, are types of tribes in this division. In the tribe of *Cantharidea*, of which *Meloe* is the type, are found the blistering beetles, which were probably the insects known to the ancients under the name of *Buprestis*, and regarded as poison to cattle and even to man.

HEUCHE'RA, a genus of plants named in honour of John Henry de Heucher, professor of botany at Wittemberg, and author of the Hortus Wittenbergensis. This genus belongs to the natural order Saxifragaceæ, and consists of about sixteen species. It has a permanent 5-cleft calyx with an imbricated æstivation; undivided somewhat unequal petals; 5 stamens; 2 styles, very long, distinct, the length of the stamens, eventually diverging; the capsule crowned by the withered flower, at the lower part united to the calyx, 1-celled, dehiscing between the styles. The species are herbs with leafless stems, radical leaves, and racemose or panicled flowers.

H. Americana, Alum root, has rough scapes and leaves, and the whole plant pubescent; the leaves on long petioles, somewhat 5-7-lobed, toothed; the inflorescence elongated, panicled; the lobes of the calyx short, obtuse; the petals lanceolate the length of the calyx; the stamens much exserted. This plant is a native of North America, where it has obtained, on account of its astringent properties, the name of *Alum Root*. It contains tannin, and it is to this principle that its astringent character is to be ascribed. The other species contain tannin, but are not used for any purpose in the arts or medicine.

(Don, *Gardener's Dictionary*; Lindley, *Flora Medica*.)

HEXAPLA, the plural of ἑξαπλοῦς, which means 'six fold,' was an edition of the Scriptures of the Old Testament prepared by Origen, which exhibited, in addition to the original Hebrew text, six Greek versions in as many parallel columns; namely, the Septuagint, that of Aquila, that of Symmachus, that of Theodotion, one found at Jericho, and one found at Nicopolis in Epirus. It also comprehended a seventh version of the Psalms. The Hebrew text was besides given both in Hebrew and in Greek characters: so that properly speaking there were eight columns in all, whence the work is sometimes called Origen's Octapla. And he also prepared a less extensive work, containing only the versions of the Seventy, of Aquila, of Symmachus, and of Theodotion, which he entitled Tetrapla. Only some fragments of Origen's Hexapla remain, which have been collected and published by Montfaucon under the title of 'Origenis Hexaplorum quae supersunt,' 2 vols. fol., Paris, 1713. There is also a later edition, which however is held in far less estimation, by C. F. Bahrdt, 2 vols. 8vo., Leipzig and Lübeck, 1769-70. Before Montfaucon published his edition, which is now of great rarity, many fragments of the Hexapla had been collected by Petrus Morinus Parisinus, and inserted by Flaminius Nobilius in his Greek Bible printed at Rome in 1587; and all that had then been recovered were given by Joannes Drusius in his 'Veterum Interpretum Graecorum Fragmenta,' Arnheim, 1622.

(See P. C. AQUILA, ii. 206; BIBLE, iv. 372; SEPTUAGINT, xxi. 257; SYMMACHUS, xxiii. 445; THEODOTION, xxi. 326.)

HEYWOOD, JOHN, one of our earliest dramatic writers, lived in the first half of the sixteenth century. He was probably a native of London, was educated at Oxford, and possessed lands at North Mims, in Berks, where he is supposed to have made the acquaintance of his neighbour Sir Thomas More. This lover of wit introduced him at the court of Henry VIII., where his musical skill as a player on the virginals, and his liveliness, both in society and in his writings, gained him high favour. To Queen Mary he was further recommended by his zealous attachment to the Romish Church. In the reign of Edward VI. he was accused of plotting against the government, and is said to have with difficulty escaped the halter. He retired to the continent, and died about 1565, at Mechlin, in Brabant. Heywood's dramatic pieces stand between the miracle-plays and moral-plays on the one hand, and the elaborated dramas on the other. 'They may properly and strictly,' says Mr. Collier, in his 'History of Dramatic Poetry,' 'be called Interludes—a species of writing of which he has a claim to be considered the inventor.' The earliest of them, 'A mery Play between the Pardoner and the Frere, the Curate and Neybour Pratte,' was not printed till 1533, but must have been written before 1521. In Dodsley's Old Plays will be found his 'Play called the Foure P. P., a new and a very mery Enterlude of a Palmer, a Pardoner, a Potycary, a Pedlar,' which is a fair specimen of his undramatic arrangements and of the grotesque coarseness of his humour. Among the other productions bearing his name was a posthumous volume of 'Woorkes,' 1576, 4to., which contains proverbs in verse, and six hundred epigrams, by which in his own time he was probably best known. In respect of them, and to distinguish him from a later play-writer [Heywood, Thomas, P. C.], he is not unfrequently called 'The Epigrammatist.'

HIERA'CIUM, a genus of plants belonging to the natural order Compositæ. The heads are many-flowered, the involucre imbricated with many oblong scales. Fruit terete, angular, and furrowed, with a very short crenulated margin. There are nineteen British species of this genus, but none of them are valuable on account of the properties they possess.

H. Pilosella has a leafless single-headed stem; elliptic-lanceolate or lanceolate leaves, hairy above, glabrous beneath. The flowers are of a pale lemon colour with a red stripe on the back. It is found on dry banks and elevated places.

H. alpinum has lanceolate leaves narrowed into a footstalk, entire or toothed; the involucre is covered with long silky hairs, and the florets externally hairy and of a bright yellow colour. It is found on rocks in Great Britain.

(Babington, *Manual of British Botany*.)

HIERO'CHLOE, a genus of grasses belonging to the Phalacideæ. It has two glumes nearly equal, membranous, 3-nerved, about as long as the flowers; three flowers, the lower with three stamens, the upper palea with two keels, the upper flowers with both stamens and pistils, the stamens two, the upper palea with 1 keel. One species of this genus, the *H. borealis*, has been found in Great Britain: it has an erect panicle, glabrous pedicels, and flowers without awns. The stem is about a foot high. It has only been found in Scotland.

(Babington, *Manual of British Botany*.)

HIGH COMMISSION COURT, a tribunal established by Queen Elizabeth under the authority of a clause in the Supremacy Act (1 Eliz. c. 1), which exercised arbitrary power in matters of faith and in ecclesiastical concerns as the Star Chamber did in civil affairs. The commissioners were forty-four in number, of whom twelve were ecclesiastics, and three commissioners constituted a quorum. Their jurisdiction extended over the whole of the kingdom, and was not confined to the clergy, but included all classes. They were directed to visit, reform, redress, order, correct, and amend all errors, heresies, schisms, abuses, offences, contempts, and enormities whatsoever which by any ecclesiastical authority whatever might be lawfully ordered or corrected. The commissioners, or any three of them, judged at their own discretion of any speech or writing which tended to heresy or schism. All appeals from the inferior ecclesiastical courts were carried before the Court of High Commission. The court was empowered to punish incests, adulteries, fornications, and to inquire into matters relating to matrimonial offences. Other ecclesiastical courts had been subject since the Reformation to inhibitions from the supreme courts of law, but this court was exempt. It exercised its powers therefore without control, and was authorised to conduct its proceedings, not only by the ordinary legal processes, by juries and witnesses, but to use 'all other means and ways which they could devise.' This empowered them to resort to the rack, to torture, inquisition, and imprisonment, and to proceed, not upon information, but at their own discretion upon rumour and suspicion. The court could bring before it a suspected person, and by administering to him an oath, compel him to answer any question, and thereby criminate himself or his friends. Refusal to take this oath was punishable by imprisonment. Fines were levied which often ruined the offender, and he might be imprisoned for any length of time at the discretion of the court. The great object for which the court was established was more especially to punish any departure from the Act of Uniformity in matters of religion or in the services and ceremonies of the Established Church. Elizabeth, in a letter to the Archbishop of Canterbury, said she was resolved 'that no man should be suffered to decline, either on the left hand or on the right hand, from the drawn line limited by authority and by her laws and injunctions.' The Commons remonstrated feebly against the tyranny of the Court of High Commission, and by way of answer she granted towards the close of her reign a new patent in which the powers of the court were in some respects extended.

In the reign of James I. the sentences of the Court of High Commission were most generally confined to deprivation; but when the Commons remonstrated on account of its proceedings he refused to interfere. In 1610, by virtue of the royal prerogative, he established a Court of High Commission in Scotland, the authority of which was readily acknowledged by the bishops and some of the clergy.

In 1641, the Court of High Commission and the Star Chamber were both abolished, and a clause was introduced into the act which prohibited the revival of the former court or any other of a like nature. James II., however, issued a new commission, and appointed seven commissioners to exercise full and unlimited authority over the Church of England, and with the full powers of the former courts. Sancroft, archbishop of Canterbury, refused to be a member. Four of the commissioners were bishops, and the three laymen were the Earl of Rochester, Chancellor Jeffries, and Lord Chief Justice Herbert. The Revolution swept away this arbitrary institution.

HIGH CONSTABLE. [Constable, P. C., p. 466.]

HIGH STEWARD. [Steward, Lord High, P. C.]

HIGH TREASON. [Treason, P. C.; Law, Criminal, P. C. S.]

HIGHMORE, JOSEPH, a portrait and historical painter of some reputation in his day, was born in London in 1692. He was the nephew of Highmore, Serjeant-painter to William III., and was originally bred to the law, but having a decided disposition for painting, he gave up the law and became the pupil of Sir Godfrey Kneller, in whose style he painted. The City was the first field of his labours, whence he removed to Lincoln's Inn Fields, where he painted a set of portraits of the Knights of the order of the Bath, which has been engraved by John Pine. Highmore was a man of much general information; he had a good knowledge of anatomy and was thoroughly acquainted with perspective. He used to attend Cheselden's lectures, and he made the drawings for his treatise on anatomy: we owe to him also one of the best practical books on perspective:—'The Practice of Perspective, on the principles of Dr. Brook Taylor; in a series of Examples, from the most simple and easy to the most complicated and difficult cases,' London, 1763. He published also a critical examination of the ceiling painted by Rubens, in the Banqueting-House at Whitehall; it represents the apotheosis of James I. Highmore painted many portraits of royalty, nobility, and gentry, one of the best of which is that of Young, the poet, at all Souls' College, Oxford. His historical pieces are of only average merit: one of the best, Hagar and Ishmael, was presented by him to the Foundling Hospital, where it still remains; there is also in the same institution a portrait of Mr. Emerson by him. He painted several pictures from the works of Richardson the novelist, but his chief works are taken from the Scriptures. He died at Canterbury in 1780, in the house of his daughter, who was married to one of the prebendaries of that city, and he was buried in the cathedral.

(*Gentleman's Magazine*, April, 1780.)

HIGHTEA, a genus of fossil plants from the Isle of Sheppey. (Bowerbank.)

HILLIARD, NICHOLAS, limner, jeweller, and goldsmith to Queen Elizabeth and to James I., was born at Exeter in 1547; his father, Richard Hilliard, was high sheriff of Exeter and Devonshire in 1560.

Hilliard, a jeweller by education, acquired painting by studying the works of Holbein, and he obtained great celebrity as a miniature painter. Dr. Donne, in a poem on a storm in which the Earl of Essex was surprised, returning from the island voyage, says—

> a hand or eye
> By Hilliard drawn, is worth a history
> By a worse painter made.

There are many miniatures, especially of ladies, by Hilliard extant. He painted Mary Queen of Scots, Elizabeth several times, James I., and Prince Henry. He had for twelve years the exclusive privilege of painting and engraving the portraits of James I. and the royal family. Charles I. possessed several of his works, among them a view of the Spanish Armada, 'and a curious jewel containing the portraits of Henry VII., Henry VIII., Edward VI., and Queen Mary; on the top was an enamelled representation of the battle of Bosworth, and on the reverse the red and white roses.'

Hilliard was the master of Isaac Oliver: he died in 1619, and was buried in St. Martin's-in-the-Fields.

(Walpole, *Anecdotes of Painting*, &c.)

HILTON, WILLIAM, R.A., was born at Lincoln on the 3rd of June, 1786. His father, who was a portrait painter and a native of Newark, died in 1822. Hilton was placed with J. R. Smith, the engraver, in London, in 1800; he obtained about the same time admission into the Royal Academy as a student, and in 1803 he exhibited at the Academy-exhibition a picture of banditti, in a good style, and of extraordinary merit for so young a man. In 1804 he exhibited Hector re-inspired by Apollo; and in 1806 Cephalus and Procris. These early works were followed by a series of noble compositions, in a superior stylo of execution and treatment, which greatly distinguished him from the majority of his brother labourers. However, neither his subjects nor his style were popular, and he had the mortification to witness the success of very inferior artists, while his own works remained on his hands.

In 1814 he exhibited Miranda and Ferdinand bearing a Log; and he was elected an Associate of the Academy in the same year. He was elected a member in 1820, when he exhibited his picture of Ganymede, which he presented to the Academy as his diploma piece. In 1825 he exhibited his Christ crowned with Thorns. Two years afterwards he succeeded Fuseli as keeper of the Academy, a post which he held until his death on the 30th of December, 1839, in his fifty-fourth year.

Hilton died in possession of his best pictures—The Angel releasing St. Peter from Prison; Serena rescued by Sir Calepine; Comus; the Murder of the Innocents, exhibited in 1838, the last work exhibited by Hilton; Amphitrite; Una with the Lion entering Corceca's cave; and Rizpah watching the dead bodies of Saul's Sons (unfinished). Sir Calepine rescuing Serena, exhibited in 1831, was purchased by subscription from Hilton's executors, for 500 guineas, and was presented to the National Gallery, where it now hangs, and it is one of the most attractive English pictures in the collection, though far from being the best of Hilton's works. Una entering the cave of Corceca, exhibited in 1832, was purchased by R. Elison, Esq., and was engraved by W. H. Watt for the Art Union of London, and distributed among the subscribers of 1842. St. Peter delivered out of Prison by the Angel, of which the figures are of the size of life, also exhibited in 1831, was purchased by William Bishop of Plymouth. Mr. Robert Vernon, who possesses the best collection of recent English paintings extant, has two capital works by Hilton—Rebecca with Abraham's servant at the Well, exhibited in 1829; and Edith and the Monks searching for the body of Harold, exhibited in 1834. The following also are among Hilton's best works:—Nature blowing Bubbles, in the possession of Sir John Swinburne, Bart.; Jacob parting from Benjamin, in the possession of W. Wells, Esq.; the Graces teaching Cupid to play on the Lyre, the property of Sir George Phillips, Bart.; Cupid sailing on his Quiver, belonging to W. Smith, Esq.; Cupid and a Nymph, the property of J. H. Turner, Esq.; the Rape of Europa, painted for the late Earl of Egremont, of which there is a print by Charles Heath; and the Infant Warrior—

——'This Hotspur Mars in swathing clothes;
This infant warrior.'——Shakspere.

exhibited in 1836.

The greater part of the above-mentioned works were exhibited with the works of old masters at the British Institution in 1840.

Hilton must ever rank very high among the painters of his own country, up to his own age; but his glory will diminish as the sphere of comparison is extended. He was not a great painter; his energy was not extraordinary, nor was his invention exuberant, but his colouring is harmonious and rich, and his taste in composition and design was refined and manly. The figure of Sir Calepine, in the National Gallery, is not a very good specimen of his style; it is exaggerated, and is not upon its feet. This is a peculiarity which occurs more than once in Hilton's works; his figures appear sometimes to want their specific gravity. Those who knew him describe him as a man of much intelligence and great amiability. 'His manners were mild and graceful; his voice was at all times low, and his demeanour peculiarly quiet: like all men of genius he was modest, retiring, and unassuming.' He died a widower, and childless.

(*Art Union*, 1840; *Catalogues of the Exhibitions of the Royal Academy*.)

HINCMAR was born in France in 806. He was of a noble family, and nearly related to Bernard, Count of Toulouse. At a very early age he was placed under the care of Hilduin, abbot of St. Denis, in which monastery he soon acquired a high reputation for learning and strict observation of monastic discipline. His talents and high birth brought him under the notice of the Emperor Lewis the Meek, at whose court he became a frequent attendant. It was there that, conjointly with the emperor and Hilduin, he formed a plan, which was sanctioned by the council of Paris in 829, of reforming the rules of the monastery of St. Denis, into which many abuses had been gradually introduced. Hilduin, having fallen under the displeasure of his royal master, was banished from the court, and retired to Saxony, whither he was accompanied by Hincmar. On the death of Hilduin, his successor Lewis, an illegitimate grandson of Charlemagne, again introduced him to the court of the emperor, who presented him with the government of the abbeys of Notre Dame at Compiègne and St. Germer. On this occasion he evinced his respect for the observance of the canon law, which at that period was often set aside, in requesting the sanction of the bishop of the diocese, and that of his own abbot, previous to accepting that preferment. In the year 845 was assembled the first council of Beauvais, consisting of ten bishops of the provinces of Rheims and Sens. In that council the deposition of Ebbonius, archbishop of Rheims, was confirmed, and Hincmar was elected by the clergy and people to succeed him. During the session of the council of Beauvais, eight articles of convention between the emperor and Hincmar were drawn up, defining the extent of their separate jurisdictions in matters spiritual and temporal. During the same year a council was likewise held at Meaux, presided by Hincmar and the primates of Sens and Bourges, in which the powers of the metropolitan bishops were more clearly defined and extended.

About this period Godeschalcus, a native of Germany, and monk of Orbais in France, attracted popular notice by a new exposition of the doctrines of St. Augustine on predestination. His peculiar views on this abstruse subject were prominently brought forward during a pilgrimage which he made to Rome, and drew upon him the displeasure of the principal theologians of the day. A council was convened at Mayence by Raban Maurus, archbishop of that city, in which the opinions of Godeschalcus were combated and condemned, the arguments against him being chiefly deduced from the writings of St. Augustine himself. It was there resolved to transmit his case, and to leave the judgment to be pronounced upon him to Hincmar, in whose province was situated the monastery of Orbais. The peculiar opinions of this imprudent monk, magnified by the hostile interpretation of them which Raban sent to Hincmar, brought upon him a severe chastisement from one who had already begun to rule the church with an iron hand. Hincmar caused him to be accused before thirteen bishops at the council of Quiercy, where he was declared an incorrigible heretic, and deposed from the order of priesthood, into which, it appears, he had been irregularly admitted. This punishment, however, was not sufficient to appease the rancour of his judges; tho bold enunciation of his tenets was construed into contumacy, and, as such, punishable, according to the rule of St. Benedict, by corporal chastisement. He was condemned to a public flagellation, and to commit his writings to the flames, which sentence was executed with all the cruelty so characteristic of that barbarous period. He was afterwards confined in the monastery of Hautvilliers, where, twenty years afterwards, he ended his miserable existence.

In the year 852 Hincmar embellished and enlarged the church of St. Remy at Rheims, and caused a magnificent vault to be constructed, in which he deposited the relics of its patron saint. The following year he assisted at the council of Soissons, in which all the ministerial acts of his predecessor Ebbonius were declared to be void, the administration of baptism alone excepted. In 857 he composed his first great work on Predestination, the preface of which is the only part extant: in his zeal to combat in it the doctrines of Godeschalcus, he is accused of having fallen into the opposite error of Semi-Pelagianism. About this time also he wrote several letters to Charles the Bald, in which he complains of the frequent pillage of the churches and monasteries, and appears to intimate that the depredators were emboldened, if not by the countenance of the king, at least by the knowledge that the offence would go unpunished. These letters present a singularly interesting picture of the lawless manners of the age. A few years after he wrote a second treatise on the subject of Predestination, which has been preserved. The arguments in it are chiefly directed against the opinions of the learned John Scotus Erigena, whom he accuses of error respecting the doctrine of the Trinity in Unity, and the real presence in the eucharist. Among other curious accusations brought against Scotus, he charges him with believing that the soul of man is not lodged in the body, and that the punishment of hell solely consists in remorse of conscience caused by the remembrance of sins.

In the year 862 we find Hincmar engaged in controversy with the pope, Nicholas I., one of the most learned ecclesiastics of the age. The occasion of it was as follows:— Rothadius, bishop of Soissons, had incurred the displeasure of his metropolitan, Hincmar, on account of the deposition of a priest of his church, whom Hincmar wished to restore to office. Rothadius, refusing to re-admit this priest, was condemned in two councils held at Soissons, excommunicated, and afterwards deposed and imprisoned. On an appeal of Rothadius to Rome, the pope issued a peremptory order to Hincmar to restore this bishop to his see within thirty days, or to appear at Rome, either in person or by legate, to answer the charge which had been made against him. In the year following Hincmar commissioned Odo, bishop of Beauvais, to proceed to Rome, and to request a confirmation of the decrees of the council of Soissons. Nicholas, irritated at the opposition of Hincmar, rescinded the decisions of that council, and demanded the liberation of Rothadius, in order that he might plead in person at Rome the cause of his appeal. This demand was at first resisted by Hincmar, but, through the interference of the king, Rothadius was released, and deputies were finally sent by Hincmar to the pope to state the reasons of his conduct. This triumph of Nicholas was soon succeeded by one more important; Rothadius was restored to the episcopal dignity, and he returned to his diocese accompanied by a legate of the pope. The pretensions of Rome in this affair were founded on 'The Decretals of the Ancient Pontiffs,' a work probably composed by Isidore Mercator, but claiming much greater antiquity. Hincmar, though the most learned canonist of the age, does not appear to have doubted the authenticity of these Decretals.

The interference of the Pope in temporal matters was however more successfully resisted. On the death of Lothaire, king of Lorraine, Adrian II. was desirous of excluding Charles the Bald from the succession of his states, and to bestow them upon the Emperor Lewis. To this effect he addressed two letters, one to the nobles of Lorraine, and the other to the subjects of Charles, threatening excommunication should they disobey his injunctions to favour the cause of Lewis. Hincmar, in the name of his fellow subjects, replied to the pretensions of the Pope. In his letter he remarks that Adrian should bear in mind that 'he is not at the same time king and bishop, and that his predecessors had regulated the church, which was their concern, not the state, which is the heritage of kings.' The opposition was successful, and Charles, with the aid of Hincmar and other prelates, took possession of the throne of Lorraine, of which all the subsequent efforts of the disappointed pontiff were unable to deprive him.

In the year 871 Hincmar presided at the Council of Douzi, composed of twenty bishops assembled by the order of Charles the Bald, for the purpose of inquiring into the conduct of Hincmar, bishop of Laon, nephew of the archbishop of Rheims. He was accused of spoliation of church revenues, of usurpation of powers not properly belonging to a bishop [Interdict, P.C.], and of revolt against his sovereign. His uncle appears to have conducted the trial with severe impartiality, and, on conviction, sentenced him to be degraded from his ecclesiastical office.

About ten years after these events Hincmar exercised the same firmness in defending the rights of the church against the encroachments of regal authority that he had shown in opposing the claims of the Roman pontiff. Lewis III. wished to bestow the bishopric of Beauvais upon Odacer, a favourite courtier, who had been rejected as unworthy of the office by the Council of Vienne, and he endeavoured, both by supplication and menace, to obtain the acquiescence of Hincmar to his nomination. This prelate, however, boldly defended the liberty of canonical elections, and the independence of the church. In a letter addressed to Lewis, he fearlessly reminds him of the sanctity of the oath he had taken to respect the privilege which the church possesses to refuse induction to unworthy candidates, and warns him against arrogating to himself a power which had been denied to the most eminent of his predecessors. 'I trust,' he observes in it, 'ever to preserve inviolate my fidelity and devotedness to your service, indeed I have not a little contributed to your own election; return not therefore evil for good, by endeavouring to persuade me in my old age to depart from the holy rules of the church, which, thanks be rendered to God, have ever been my pride during six and thirty years of my episcopacy.' (Hinc. *Op.* tom. ii. p. 188.) He proceeds to advise him to assemble a council, in order that his nomination may be ratified by the clergy and people of Beauvais. In a second letter he uses still stronger language, and terminates it with these ominous words: 'It is your lot soon to depart from this earth, but the church with its pastors, under J. C. their chief, has, according to his promise, an eternal existence.'—'This threat,' says Fleury, 'appeared a prophecy, when the king, while yet in the strength of his youth, died the following year.' (Fleury, b. liii. c. 31.)

Hincmar did not however long survive his royal master; about this period the Normans extended their predatory incursions as far as his province, the principal towns of which they pillaged and destroyed. They were advancing towards Rheims, when notice of their approach was given to Hincmar, who was obliged to leave the city by night, having previously taken the precaution to secure the treasures of the church, and the relics of St. Remy. The aged prelate arrived at Epernay, worn down by fatigue and anxiety. Severe illness compelled him to remain in that town, where, on the 21st of December 882, he ended his eventful life. The name of Hincmar, though associated with the darkest period of ecclesiastical history, will ever be conspicuous as that of one of the most zealous defenders of the liberties of the church. His great object was to produce that unity among its members which could alone present an effectual barrier against the encroachments of regal and papal authority. The memorable words which he uttered when he heard that the Pope was about to visit France, and threatened the excommunication of its bishops, are a sufficient index of his fearless spirit. 'Si excommunicaturus venit, excommunicatus abibit,' 'if he comes to excomminicate, he will return excommunicated.'

The principal works not alluded to in this article, are 1st, 'A Treatise on the Duties of a King,' addressed to Charles the Bald. 2nd, 'On the Ordeal by Water,' which practice he attempts to authorize by quotations from Scripture, and which unfortunately proves that he was not superior to the superstitions of the age. 3rd, 'On the Rights of Metropolitan Bishops.' 4th, 'On the Translation of Bishops and on their Duties.' 5th, 'On the Council of Nice;' and 6th, 'On the Nature and Sanctity of Oaths;' besides several letters and 'Capitularia.' His works have been collected in two volumes folio by the learned Sirmond, Paris, 1645, and another volume was added to this collection by Cellot, in 1658.

The following are the principal authorities which have been consulted, and may be referred to for a fuller detail of his life. Fleury, Mosheim, and Waddington's *Eccles. Hist.*; Longueval, *Histoire de l'Eglise Gallicane*, tom. vi.; Mézerai, *Hist. de France*, tom. ii.; Michelet, *Hist. de France*, l. ii. c. 3; and Guizot's *Sixth Lecture on Modern Civilization.*

HINDOO ARCHITECTURE. [Hindustan, P. C., p. 235.]

HINGE, a kind of joint, usually made of iron or brass, upon which doors, gates, shutters, box-covers, &c., are made to turn in the act of opening and shutting. Hinges are constructed in a great variety of forms; but in most of the commoner kinds the action is that of a hollow cylinder working round a fixed central pin. Without pretending to describe contrivances so familiar to every one, we may briefly notice a few of the more important deviations from the ordinary form, referring to Hebert's 'Engineer's and Mechanic's Encyclopædia' for fuller details. In Collinge's patent hinges, which are peculiarly adapted for hanging large heavy doors and gates, the principal rubbing action is between a hollow cap and an accurately turned sphere, formed, as it were, upon the end of the pin; a cavity being provided for the reception of a supply of oil to lubricate the rubbing surfaces. Mr. Redmund, another celebrated manufacturer, who has displayed his ingenuity especially in designing hinges for unusual and apparently impracticable situations, in rendering them ornamental where, if of the ordinary form, they would be a disfigurement, and for contriving invisible hinges for situations in which it is desirable to conceal the hinges altogether, is the inventor of the *rising hinges* so frequently used for hanging room-doors in houses of superior character.

In ordinary door-hinges the hollow cylinder which works round the axis or central pin is divided transversely into two, three, or more portions: one or more of such portions being attached to and forming part of that leaf or half of the hinge which is screwed to the door, while the other portion or portions form part of that half of the hinge which is screwed to the door-post. In the rising hinges a similar arrangement is followed; but instead of the hollow cylinders being divided transversely *at right angles*, they are divided by spiral or rather helical lines. The result of this contrivance is, that when the door is opened it is lifted up a little from the floor by the sliding upon one another of the inclined helical surfaces; so that although the door may shut very close to the floor, it rises, when opened, to a sufficient height above the floor to allow its lower edge to clear the carpet. Another advantage of this kind of hinge is, that the weight of the door acting upon the inclined rubbing surfaces of the hinges, causes it gently to close itself so soon as the hand is removed from it; but as this might in some cases prove inconvenient, it is usual to cut a portion of the helical curves away, so as to form two horizontal planes which come opposite to each other when the door is opened to about an angle of 90°, or so as to form a right angle with its position when shut. By this arrangement the door retains its disposition to close whenever it is not opened more than 50° or 60°, which is as much movement as is usual upon a person entering or leaving the room, but will stand open if opened to or beyond 90°, although even then a very slight push is sufficient to cause it to close steadily and quietly. In some cases a small spring is attached to hinges of this description, to aid the closing of the door when it has been opened but a little way. Hinges supplied with much more powerful springs are often used for the doors of public offices, where it is desired to render the closing of the door both certain and quick. For such doors, hinges which will open in either direction and cause the door to spring back to its original position are often used. In connection with such spring hinges, we may notice Hebert's contrivance of a hinge for external shutters, in which a spring catch or detent is employed to hold the shutter open, the pressure of the finger being needful to release the catch before the shutter can be closed.

One of the most curious contrivances of the hinge kind is that which Hebert describes as Whitechurch's patent hinge, the details of which are too complicated to be explained without several illustrations. We can only state that it is an apparatus by which doors or windows may be opened at pleasure either on the right or left hand, or by which, in other words, either edge of the door may be made, at pleasure, the opening edge. A handle is fixed near to each side of the door or window, by turning which the required positions of the apparatus are varied at pleasure: the action of this handle being to disconnect or release the door from the style or post near to which it is placed, and at the same moment to complete its hinge-like connection with the opposite style. Notwithstanding the singularity of this action, the door is stated to be even more securely hung and better supported, and capable of turning upon its hinges with greater facility than one hung in the common way; and it cannot be unhung more readily, both requiring the aid of a turnscrew. Such a mode of hanging doors is recommended for cabins in ships and steam-vessels, and for other situations in which space is very limited and great convenience is required.

Another contrivance worthy of notice, which is also described and represented by Hebert, is Nettlefold's hinge for the doors of book-cases, by which two adjacent doors opening in contrary directions may be hung without an intervening style: the two doors being connected together by a hinge resembling that by which ordinary doors are hung, and the axis of this hinge being connected with the edge of a thin partition in the book-case by metal brackets above and below the hinge, the space occupied by which is notched or cut out of the edges of the doors. Doors hung in this way fold completely back, and the hinges do not offer the slightest impediment to the removal of the volumes which happen to stand next to the partition, and which, were the doors hung in the usual way, could only be removed by first taking out those which stand adjacent to them.

HIPPO (Ἵππων), a Greek philosopher, who is called by some a native of Samos and a follower of Pythagoras, and by others a native of Rhegium, in southern Italy. With regard to his age, some writers have made him a contemporary of Thales, or have placed him even before the age of Thales; but he evidently belongs to a much later time, and was perhaps a contemporary of the comic poet Cratinus (about B. C. 450), who ridiculed him in one of his last comedies; further, Hippo mentions the four elements of the physical philosophy of Empedocles in such a manner that we must infer that he was acquainted with the theory of Empedocles. Aristotle (*Metaphys.* i. 3) does not appear to attach any great value to the philosophical system of Hippo, which in fact was that of Thales, with sundry additions and modifications. He thus went back to the materialism of the early Ionic school; and as Thales had taken water, so Hippo took moisture to be the principle of all things. (Aristot. *De Anima*, i. 2; Plutarch, *De Placit. Philos.* 5.) He explained his views in a work which seems to have been called φυσικὰ δόγματα, which, however, owing to its insignificance, appears to have fallen into oblivion at a very early period, and scarcely any fragments of it have come down to us. Clemens of Alexandria (*Cohortat. ad Gent.* vol. i. p. 48, ed. Potter) has preserved an epigram of Hippo, which is also printed in the editions of the Greek Anthology. (Iamblichus, *De Vita Pythag.* 36; Sextus Empir. *Pyrrhon. Hyp.* iii. 30, *adv. Mathem.* ix. 361; Scholiast. *ad Aristoph. Nub.* 97; compare Brandis, *Geschichte der Griech. Römischen Philosophie*, vol. i. p. 121, &c.; Bakhuizen van den Brink, *Variae Lectiones ex Historia Philosophiae Antiquae*, pp. 36-59.)

HIPPOBRO'MA (from ἵππος, a horse, and βρῶμα, food), a genus of plants belonging to the natural order Lobeliaceæ. It has the limb of the calyx 5-parted with linear segments; the tube of the corolla long, straight, entire, with the limb 5-parted nearly equal; the stamen-tube projecting, completely monadelphous and syngenesious; the stigma sloped, the capsule 2-celled, 2-valved, many-seeded.

H. longiflora is the only species. It is an herbaceous plant, with short axillary pedicels, mucronate or coarsely toothed leaves, with long slender white flowers. It is a native of Jamaica, St. Domingo, Cuba, and Martinique, in damp places and by the side of streams. This is one of the most poisonous of plants. If the juice only accidentslly touches the lips or eyes it produces a burning inflammation. Horses are violently purged after eating it.

(Don, *Gardener's Dictionary*; Lindley, *Flora Medica.*)

HIPPOCRE'PIS (from ἵππος a horse, and κρηπὶς a shoe, on account of the curved shape of its pods), a genus of plants belonging to the natural order Leguminosæ, the tribe Hedysareæ. It has diadelphous stamens, a piliform acute style; the legume curved, with numerous 1-seeded joints; the seeds cylindrical or compressed, oblong, curved, fixed to the middle part of the joint, and therefore the umbilicus is in the middle of the curve. The species are herbs, or under-shrubs, with unequally pinnate leaves and yellow flowers, which are sometimes solitary and axillary, sometimes sessile, but usually disposed in umbels on the tops of the axillary peduncles.

H. Balearica, Minorca Horse-shoe Vetch, is a shrubby erect plant, with the peduncles longer than the leaves, bearing an umbel of flowers at the apex, the legumes glabrous, a little arched. It is a native of the island of Minorca. It is a pretty plant, worthy of cultivation, but requires the greenhouse in winter. It grows well in a soil composed of loam and peat; and cuttings strike readily under a hand-glass.

H. comosa, common Horse-shoe Vetch, has the pods umbellate, their joints rough, curved, neither dilated nor bordered, glabrous; the peduncles longer than the leaves. It is a native of Europe, and is found on dry chalky banks in Great Britain. It is also found in the north of Africa.

There are seven or eight more species of Horse-shoe Vetch. They are all worth cultivation on account of their beauty. The perennial species are adapted for rockwork and banks, and may be propagated by dividing the roots. The annual species should be grown from seeds, which may be sown early in spring.

(Don, *Gardener's Dictionary*; Babington, *Manual of British Botany.*)

HIPPO'PHAË, a genus of plants belonging to the natural order Elæagneæ. It has diœcious flowers with ovate scaly bracts. The staminiferous flowers have a perianth of two leaves adhering by their points; the stamens have four very short filaments; the pistilliferous flowers have the perigone tubular and cloven at the summit; the style is short, the stigma elongated; the nut 1-seeded, clothed with the large coloured berry-like perigone.

The only species of this genus is the ***H. rhamnoides***, which is a small shrub found on the east and south-east coasts of Great Britain, and other parts of Europe. The acid berries yielded by this plant are often eaten as a salad both in this country and in France. This plant also yields a colouring matter, which is used for dyeing yellow. Although in this country the berries are innocuous, they seem to exert a deleterious influence, or are supposed to do so, in some of the countries of the south of Europe. They are said to be a favourite food with the Tartars, and the fishermen of the Gulf of Bothnia eat them with their fish.

(Babington, *Manual of Brit. Bot.*; Burnett, *Outlines of Botany.*)

HIPPU'RIS (from ἵππος, a horse, and οὐρα, tail, from the resemblance of the stem to a horse's tail), a genus of plants belonging to the natural order Halorageæ. It has the calyx-limb very minute, obsoletely 2-lobed; no petals; one stamen; a filiform style lying in a channel of the anther; the stigma simple, acute; the fruit nucumentaceous, 1-celled. Three species of this genus have been described. Of these, *H. vulgaris*, the common mare's-tail, is found abundantly throughout Europe and North America. It has linear leaves, 6-12 in a whorl, and callous at the point. It is found in ditches and lakes. In deep water the submersed leaves are flaccid and pellucid, and not callous at the points. This plant is very common in Great Britain in stagnant waters and slow streams.

(Babington, *Manual of British Botany.*)

HIRCIC ACID. This substance was obtained by Chevreul from the fat of the goat.

To prepare it, the aqueous product of the distillation of the liquid acid separated from the soap of goat's fat, is saturated with barytes. After having evaporated the solution, the dry salt is decomposed by dilute sulphuric acid; the hircic acid then floats on the surface of the liquid in the form of an oil.

This acid remains fluid at 32°: it is lighter than water, smells of the goat, is insoluble in water, and forms soluble salts with potash and barytes. It has not been analyzed.

HIRING OF SERVANTS. [SERVANT, P. C.]

HIRT, ALOYSIUS, was born at Bela near Donaueschingen in Baden, June 27, 1759. In early life he visited Italy and studied the remains of classic art there, and on his return settled at Berlin, having been appointed preceptor to Prince Henry of Prussia. In 1796 he became professor of architecture and the fine arts at the academy of Berlin, and was subsequently made professor of archæology at the University of Berlin. Among his numerous publications are several special disquisitions on particular structures, such as the Temple of Solomon, the Temple of Diana at Ephesus, and the Pyramids of Egypt; but those by which he will be most generally and longest known are his 'Baukunst nach den Grundsätzen der Alten,' 1809, and his 'Geschichte der Baukunst bey den Alten.' 1821-7, 3 vols. 4to., with a folio atlas of plates. This last not only gives a history of antient architecture, that of Egypt included, down to the time of Constantine, but also a full account of all the various classes of buildings. Latterly he was much occupied in arranging the collections in the Berlin Museum, which brought him into a literary dispute with his former pupil and protégé, Dr. Waagen, since well known here by his visit to England and remarks on English art. Hirt died at Berlin June 29, 1837, just two days after entering his seventy-eighth year.

HOADLEY, BENJAMIN, M.D., eldest son of Bishop Hoadley [HOADLEY, BENJAMIN, P. C.], was born February 10, 1705, in London. He was admitted of Corpus Christi College, Cambridge, April 8, 1722, and received his degree of M.D. in 1729. In June, 1742, he was appointed physician to his Majesty's household, and in January, 1746, was appointed physician to the household of Frederic, Prince of Wales, and he held both offices at the same time. He was the author of 'Three Letters on the Organs of Respiration,' read at the Royal College of Physicians, London, 1737, being the Gulstonian Lectures for that year; 'Oratio Anniversaria in Theatro Col. Medicor. ex Harveii instituta, habita die 18mo Oct. 1742;' 'Observations on a Series of Electrical Experimenta,' 1756, 4to. Dr Hoadley is now known chiefly as the author of 'The Suspicious Husband,' 1747, a bustling comedy, full of incidents of intrigue, in which Garrick was distinguished for his performance of the character of Ranger, as Elliston was also in more recent times. Dr. Hoadley died August 10, 1757, in his house at Chelsea. His brother, the Rev. JOHN HOADLEY, LL.D., born October 8, 1711, died March 16, 1776, was the bishop's youngest son. He was the author of several poems in Dodsley's Collection, and of five dramatic pieces, which are now forgotten. He published an edition of Bishop Hoadley's Works, London, 1773, 3 vols. folio

HOANG-HAI, or WHANG-HAI, *The Yellow Sea*, is a large mediterranean sea, which runs into the eastern coast of Asia, being enclosed on the west and north by China Proper, and on the east by the Peninsula of Corea; on the south it is open and united to the Pacific Ocean. It lies in the parallels of the Mediterranean, which divides Europe from Africa, between 34° and 41° N. lat., and extends from 117° 40′ to 127° E. long.

The northern portion extends in length from west to east somewhat more than eight hundred miles from the shores of the Gulf of Petcheli, near the mouth of the river Peiho, to the coast of Corea, at the back of James Hall's Island; and it comprehends two basins, being divided nearly in the middle by a widely projecting peninsula, which juts out on the northern coast, and may be called the Peninsula of Leao-tong, as it forms a part of the province of that name. The strait which lies between the most southern point of this peninsula and the northern shores of the Province of Shan-tong is about fifty miles wide, and it contains numerous small rocky islands, so that it would appear that at some remote period the Peninsula of Leao-tong was united to that of Shan-tong. Between these islands are passages which lead to the most western basin, which consists of two gulfs, that of Petcheli and that of Leao-tong.

The Gulf of Petcheli washes the north-western shores of Shan-tong and the eastern of Petcheli. These shores are low, and can only be seen from the deck of a vessel at the distance of about nine miles. The uniformity of the soundings along these shores is unusual. At the distance of ten miles from the beach they vary only between four and a half and six fathoms, and at twelve miles between six and eight fathoms. Large vessels cannot approach the shores, and must remain at anchor from four to six miles off. This part of the Hoang-hai is only navigated by flat-bottomed vessels, which find shelter in the embouchures of some small rivers. Where the gulf approaches the above-mentioned strait between Leao-tong and Shan-tong, the shores rise higher, and are well defined. Here a range of mountains stretches from south-west to north-east at the distance of ten or twelve miles from the sea, and between them and the shore is a lower belt of elevated ground in a state of high cultivation, covered with many towns and villages, and interspersed with scattered trees and several extensive woods. Along this coast the soundings are somewhat deeper than on the other, but not so deep as might be expected from the bold outline of the land; and there appear to be some harbours for larger vessels.

The northern portion of the western basin, or the Gulf of Leao-tong, is imperfectly known, for no European vessel has sailed up to its most remote recess. The shores are rocky and high, and they increase in elevation and steepness as they proceed farther north. But in spite of the rocky nature of the adjacent countries the soundings are rather regular and of moderate depth. Some good harbours for large vessels are known to exist, and it is supposed that several others may be found when this portion of the Hoang-hai is better known. The upper part of the mountains which enclose this gulf are barren and nearly destitute of trees, but between them and the shores there are many fertile and well-cultivated tracts.

The water in the western basin of the Hoang-hai is of a dirty yellow or green, which colour seems to be derived from that of the mud, which constitutes its bottom. There are a few small islands in this part of the sea, but the group of three islands, called the Moatao Islands, which lie partly in the strait between the western and eastern basin, are of moderate extent and well cultivated and populous.

The eastern basin of the northern portion is very little known. Only the most southern part of it, that which washes the north-eastern shores of the Peninsula of Shan-tong, has been navigated by Europeans, and in these parts the navigation is safe, and there are only a few rocky islands. The soundings are regular and moderate, and there are some tolerable harbours for small vessels. The northern unknown part is represented on the Chinese maps as containing several extensive groups of islands, especially along the shores of the Peninsula of Leao-tong.

The most southern part of the Yellow Sea, or that which lies south of a line drawn from the most north-eastern cape of the Peninsula of Shan-tong to the coast of Corea at the back of James Hall's Islands, is at its southern extremity between the mouth of the river Hoang-ho and the south-west cape of Corea nearly seven hundred miles wide, but grows narrower as it proceeds north, being near its northern boundary hardly more than two hundred miles across The shores of this part of the Hoang-hai are high and rocky, with the exception of a tract of about sixty miles contiguous to the mouth of the Hoang-ho on the north, where the country consists of alluvium. Farther north on the Peninsula of Shan-tong several ranges of high ground advance to the coast, and in this part some harbours of considerable extent are said to exist, but they have not yet been visited by Europeans. The navigation along this country is not dangerous, though farther south between the mouths of the Hoang-ho and Yang-tse-kiang the sea is full of shoals and sandbanks. On the opposite side, along the coasts of Corea, the sea to the distance of fifty or sixty miles from the continent is literally dotted with islands and rocks, which are generally small. Though the number of islands renders the navigation dangerous, and requires great caution on the part of seamen, they contain numerous excellent harbours. The straits which separate the islands are generally from one mile to two or three or even four miles across, and are all close harbours, capable of containing in security all the navies of the world. They form, in fact, an almost endless chain of harbours communicating with each other. They appear to be all inhabited, and therefore must possess fresh water.

Though the Yellow Sea is not visited by European vessels, navigation is very active, as it washes those parts of China Proper which are most populous and best cultivated, and where the manufacturing industry is carried to the highest point. Accordingly the number of junks which are met with along this coast, or are seen in the harbours, is very great, and sometimes excites the surprise of European navigators; but along the coast of Corea these vessels are rarely met with.

(Staunton, *Account of an Embassy to the Emperor of China;* Mac Leod, *Narrative of the Alceste's Voyage to the Yellow Sea;* and Basil Hall, *Account of a Voyage of Discovery to the West Coast of Corea*, &c.)

HOANG-HO. [Yellow River, P. C.]

HOARE, WILLIAM, R.A., an historical and portrait painter, born at Bath about the year 1706. He studied at Rome nine years, where he was the fellow pupil of Pompeo Batoni, under Francesco Fernandi, called D'Imperiali. Upon his return to England he established himself at his native place, where he acquired a great reputation as a portrait painter in oils and crayons; he painted also some historical pieces. There is an altar-piece by Hoare, of Christ bearing the Cross, in the church of St. Michael at Bath; and another of the Lame Man healed at the Pool of Bethesda, in the Octagon Chapel, for which he received 100*l.* and a pew in the chapel. He was one of the original members of the Royal Academy, and sent several works to its early exhibitions. He died at Bath in 1792.

HOARE, PRINCE, who succeeded Boswell as foreign secretary to the Royal Academy, was the eldest son of William Hoare: he was professionally a painter, and is known as the author of about twenty dramatic pieces, among which are—'No Song no Supper;' 'Lock and Key;' 'My Grandmother,' and other lively farces; and he published in 1806, 'An Inquiry into the requisite cultivation and present state of the Arts of Design in England,' 8vo. p. 270.

Prince Hoare presented the so-called 'Slaughter of the Innocents,' by Raphael, to the Foundling Hospital, which institution has lent it to the National Gallery; it is however only a part of a composition, and has been so completely painted and varnished over, that if originally by Raphael, now at least nothing whatever of Raphael remains but the composition, which is brutal and without expression. Prince Hoare died at Brighton in 1834, aged eighty.

(Edwards, *Anecdotes of Painting*, &c.; *Literary Gazette.*)

HOARE, SIR RICHARD COLT, Baronet, the historian of Wiltshire, and an eminent biographer and antiquary, was born the 9th of December, 1758, and died the 19th of May, 1838. His father, the first baronet, was married to Anne, second daughter of Henry Hoare, Esq., and of Susanna, daughter and heiress of Stephen Colt, Esq. In a very pleasing autobiography which Sir R. Colt Hoare drew up in his old age, he says:—'In my youth I was initiated in the business of our family bank (Messrs. Hoare's bank, Fleet-street, London), till my grandfather removed me from it, and gave up to me during his life-time all his landed property. An early habit of application to business induced me to have recourse to the pen and pencil: for, without some amusement, life ultimately must produce tedium and *ennui*; and, thanks to Providence, I used in my advanced age to feel the benefits of the early habits of application.' In 1783 he married the eldest daughter of Lord Lyttleton, who died in 1785, leaving one child, Henry. In 1787 he succeeded to the baronetcy. After the death of his wife he made an extensive tour on the continent, which occupied him nearly two years; and in 1788 he again left England on a continental tour, and did not return until August, 1791. He devoted ample time to the examination of interesting objects, and filled his portfolio with valuable drawings. For the gratification of his family and friends he printed an account of his travels in four volumes. They were subsequently condensed, and published in 1818 in two volumes, 8vo., under the title of 'A Classical Tour through Italy and Sicily; tending to illustrate some districts which have not been described by Mr. Eustace in his Classical Tour.' When the greater part of the Continent had become closed in consequence of the war, Sir Richard travelled through his own country, and he began with Wales; 'but, as travelling without a pursuit becomes tedious, I resolved,' he says, 'to take Giraldus as my guide.' In 1806 he published a translation of Giraldus, with views, annotations, and a life of Giraldus, in two splendid quarto volumes. He furnished the drawings for the description of Monmouthshire by Archdeacon Coxe. In 1807 he visited Ireland, and published a short account of his excursion. But it is as the historian of Wiltshire, his native county, that Sir R. Colt Hoare's fame as a topographer and antiquarian is best established. The first volume of South Wiltshire is confined to British antiquities, and includes Stonehenge. The second volume commences with North Wiltshire, and Part I. is devoted to the British Period, and contains the account of Avebury. Part II. comprises the Roman Period. These two elaborate volumes were followed in 1821 by the History of Modern Wiltshire. In the description of several of the hundreds he had a coadjutor for each; but the difficulty of obtaining aid of this kind at length compelled him to confine his attention to South Wiltshire. A catalogue of works printed for private circulation by Sir R. Colt Hoare is given in the 'Gentleman's Magazine' for July, 1838, which also contains a list of his communications to the Royal Society of Antiquaries.

HODGES, WILLIAM, R.A., was born in London about the year 1744; his father was a blacksmith, and kept a shop in St. James's Market. He attended Shipley's drawing school when very young, and became afterwards the pupil of Wilson the landscape painter. He painted decorations for theatres, landscapes, and architectural views; among the latter, a view of the interior of the Pantheon, Oxford Street, which was burnt down on January 14, 1792.

In 1772 Hodges accompanied Captain Cook as draftsman on his second voyage to the South Seas; and his drawings were published in Cook's narrative. After the completion of this work he went to India, where, under the patronage of Warren Hastings, he realized a considerable fortune, and returned to London in 1784. About 1790 he made a tour on the Continent of Europe, visiting Russia; and he exhibited a view of St. Petersburg at the Royal Academy in 1793. In 1795, finding that his Indian fortune was diminishing instead of increasing, he established a bank at Dartmouth in Devonshire, which however broke two years afterwards in consequence of the devastations of the French in Newfoundland. The shock brought on the death of Hodges, on the 6th of March; and his wife, his third, died a few months afterwards. He was elected a member of the Royal Academy in 1787.

Hodges was not a painter of great ability; in style he imitated Wilson, but with little success; his best works are—a view of Windsor from the great park, and three or four views painted in India. He painted also two or three historical pieces for Boydell's Shakspere. His last works were two ordinary landscapes illustrating the effects of peace and war, which he exhibited with twenty-three others, one of which was a large view of Falconet's equestrian statue of Peter the Great at St. Petersburg, in Old Bond Street; one was a seaport in prosperity, the other was the same view devastated by fire and sword. He closed the exhibition in disgust at the little attention which it attracted; sold his pictures by auction, gave up painting, and, as already mentioned, turned banker. These two pictures, which have been engraved, are now in Sir John Soane's museum. Several of the works of Hodges have been engraved; he himself executed a set of Indian views in aquatinta which he dedicated to the East India Company. He published also an account of his Travels in India, with plates.

(Edwards, *Anecdotes of Painting*, &c.)

HOENE, referred to in P. C., from Brahe, p. 327, is a misprint for Hveen, the name of the island on which Brahe's observatory was built. [Uranienburg, P. C.]

HOERBERG, PEHR, a distinguished Swedish painter, was born in a village of Småland, in 1746; his father was a private soldier and extremely poor. Hoerberg's youth was spent in begging, watching sheep, and other peasant's labour; and like Giotto's, his first efforts were made with sticks or chalk in the woods when performing his pastoral duties. When only fourteen years of age he entered the service of a painter of Wexiö, but he remained with him for a very short period. However, by the time be was two and twenty years of age, he contrived to learn so much from one painter and another in his own district, that he was enabled to maintain himself by his paintings, and he even ventured to take a wife. In 1784, in his thirty-eighth year, he became a student in the Royal Academy of Arts at Stockholm, in which he obtained two prizes, and made rapid progress. In 1790 he established himself at Olstorp in East Götaland, where he obtained a great reputation, and in 1797 be was elected a member of the Swedish academy, and was appointed historical painter to the king. He died in 1816.

There are eighty-seven altar-pieces by Hoerberg in Sweden, five of which are copies; his paintings altogether amount to about 700, mostly religious pieces; his drawings are likewise numerous, and he executed many engravings.

His execution is unfinished, but his compositions are vigorous and perspicuous: and his figures are more distinguished for character than for beauty.

His autobiography was published at Upsala in 1817; it has been translated into German and Danish; the original MS. is in the library of tbe Gymnasium of Linköping.

(*Kunstblatt*, 1822; Nagler, *Allgemeines Künstler Lexicon.*)

HOLA'STER, a genus of fossil Echinodermata, from the chalk and greensand deposits.

HOLCUS, a genus of grasses belonging to the tribe Sesloriceæ. It has 2-flowered glumes, the lower perfectly awnless, the upper usually staminiferous, with a dorsal awn; the paleæ hardening on the fruit. There are two British species of this genus. *H. lanatus* has the upper glume obtuse, apiculate; the awn smooth, except for a short distance from the tip. It grows in meadows and pastures. *H. mollis* has the upper glume acute, and the awn rough throughout its whole extent. It grows in thickets or open places on a light soil. The *H. cernuus* of Willdenow, and the *H. sorghum* of Linnæus are now referred to tbe genus Sorghum. [SORGHUM, P. C.] Fraas refers the μέλινη of Theophrastus (*Hist. Plant.* viii., 1, 3, 7, 10) to these grasses, and not to the *Setaria Italica*, as had been done by previous authors.

(Babington, *Manual of British Botany*; Fraas, *Synopsis Plant. Floræ Classicæ.*)

HOLL, ELIAS, a distinguished German architect, was born at Augsburg in 1573. His father, Johann Holl, was likewise an architect, and was much employed by the celebrated graf Fugger of Augsburg. Elias was taken when young to Venice, by a rich merchant of the name of Garb; and he there studied the Italian architecture, which style he adopted in his future works at Augsburg, though much simplified in parts and in decorations. Augsburg owes to Holl a great portion of its public buildings, but his masterpiece is the Rathhaus, or town-hall, built 1615-20, which, though not among the largest, is still one of the handsomest in Europe. The façade is 147 feet wide, its depth is 110 feet, and in the centre 152 feet high; there is a print of it by Solomon Kleiner. Holl built also several churches, and the castle or palace of Schönfeld, and the palace of Wilibadsberg at Eichstädt. He died in 1636, aged sixty-three.

(Von Stetten, *Erläuterungen der in Kupfer gestochenen Vorstellungen aus der Geschichte der Reichstadt Augsburg*, &c.; Lipowsky, *Baierishes Künstler Lexicon.*)

HOLLAND, SIR NATHANIEL, historical, landscape, and portrait painter, was the third son of Dance, the architect of the Mansion House, who died in 1768, and the younger brother of George Dance, R.A., the architect of Newgate.

Nathaniel Dance was the pupil of Hayman, and he studied also a few years at Rome. He was one of the original thirty-six members of the Royal Academy, founded in 1768, though he cannot have been at that time more than twenty-five years of age. He contributed many works to the academy exhibitions as Sir Nathaniel Holland, as well as Nathaniel Dance. He changed his name to Holland upon his acquisition of a baronetcy in 1800, having previously married Mrs. Dummer, who was connected with several noble families. This lady was possessed of entailed estates, chiefly in Hampshire, including Netley Abbey on the Southampton river, to the value of 18,000*l.* per annum. Upon his acquisition of his title, Sir Nathaniel Holland appears to have resigned his academical diploma, for from that time he exhibited as an honorary exhibiter. He represented for some time the borough of East Grinstead: he resided at Cranbury House, near Winchester, and he died suddenly in that city on October 15, 1811, aged about sixty-eight. Lady Holland survived until 1825, when she died, leaving personal property to the amount of half a million, the greater portion of which came to her nephew the late Earl of Cardigan, who was her sole executor and residuary legatee. A story was circulated about Sir Nathaniel Holland, that when he became possessed of his great fortune, he was ashamed of his profession, and that he spent thousands in the repurchase of his own works, for the purpose of destroying them to obliterate the recollection of his ever having been an artist. This story, however, independent of the warm contradiction it met with from some of his friends, is contradicted also by the facts of his continuing to paint and exhibit, and of his presenting pictures to his friends; it is also absurd to suppose that people of rank would part with the portraits of their relations for a pecuniary consideration to the painter, to enable him to destroy them. The report was no doubt magnified from the fact that he destroyed some of his own works in his own possession, because he thought that they were not calculated to add to his reputation. All his best works however still exist, but chiefly in private collections. The Marquis Camden and Sir W. W. Wynne contributed three to the exhibition of the works of deceased British artists at the British Institution in 1817—Orpheus, and Garrick as Richard III.; two of his very best works; and Charles, Earl Camden, Lord Chancellor. The following are also among his best works:—Timon of Athens, of which there is a fine print by J. Hall; Virginia, scraped in mezzotint by J. G. Haid; and the death of Mark Antony, engraved by T. Watson. Dance painted many portraits, including both royal personages and bishops, and latterly also some landscapes; the last work which he exhibited was 'A View in the New Forest.'

It has been also reported that Sir Nathaniel saved 200,000*l.* out of his wife's income and bequeathed it to his relatives: but this report is also untrue; he distributed only 30,000*l.* among his relations, the residue was bequeathed to his widow. These reports have been here noticed, more particularly because they have been carelessly repeated and with considerable asperity by the writer of the article on GEORGE DANCE in this work. [P. C. S.] They appeared in the 'Gentleman's Magazine' for 1811, and in part, in 1825, but have been contradicted in subsequent editions of Pilkington; and upon their insertion in 1824 in the 'Somerset House Gazette,' they were immediately afterwards contradicted in that same work, and an apology was made for their appearance. The statements of the 'Gentleman's Magazine' were apparently not seen by any of Sir Nathaniel's friends, or that work would have certainly contradicted them also.

(*Somerset House Gazette*, 1824; *Gentleman's Magazine*, 1811, 1825; *An Account of all the Pictures exhibited in the Rooms of the British Institution, from* 1813 *to* 1823.)

HOLLAND, HENRY, holds a high rank among the architects of his own time, and was greatly patronised by George IV. when Prince of Wales. But we have no information as to his personal history; and his finest work, the portico of Carlton House, has passed away. It was one of unusual grandeur, especially when we consider the period of its erection (about 1784), and was a fine specimen not merely of the Corinthian order, but of the Roman Corinthian style, in its full and uniform luxuriance, every part of it being highly finished up, and not only was the frieze of entablature enriched with sculpture throughout—with one exception, and that by Holland himself, the only instance of such classical decoration among the whole of our modern classical porticoes—but even the very bases of the columns were enriched with carving, a species of adornment by no means thrown away since, being so near the eye, it challenged direct and minute observation. Being only hexastyle—and there was not at that time any instance of an octastyle in the metropolis—it did not make that display in regard to columniation in front which some later examples do: yet it excelled all before or since in its bold projection from the building, which rendered it of *triprostyle* proportions in that respect, although unfortunately, as regarded architectural character, a column was omitted on each flank, in order to obtain an intercolumn sufficiently wide to admit carriages. The depth and consequently the effect of the portico was still further increased by its being also recessed within the building, by which it was rendered very nearly a square in plan, the depth being almost equal to the breadth. The Ionic colonnade screen in front of Carlton House was censured at the time, not for its real deficiencies, but as an architectural absurdity in itself. It was objected as a conclusive argument against it, that the columns supported nothing, whereas at any rate they were essential for the support of their entablature, and the entablature was requisite for connecting together the two gateways; therefore had there not been such open colonnade, there must have been a wall, shutting out a view of the portico from the street.

While Carlton House and its fine portico have disappeared without being recorded by any engravings intended as adequate architectural studies of them (those in the 'Illustrations of the Public Buildings of London' being both too few and upon much too small a scale to serve such purpose), another work of Holland's, for the same royal patron, and which has also disappeared, though in a different manner—namely, the Pavilion at Brighton, as it existed previously to its being transformed into its present shape by Nash—has, unluckily for the credit both of the architect and his princely employer, been preserved in Richardson's 'New Vitruvius Britannicus.' As a residence for the Duke of York, Holland altered Featherstonehaugh House, Whitehall (built by Paine), adding to it the elliptical entrance-hall, on what was originally the court-yard, and the screen façade towards Whitehall. This, which was afterwards called Melbourne House and is now Dover House, would have been in every respect a far worthier and more interesting subject for the 'Vitruvius' than the preceding one; nevertheless, not only is it omitted there, but has never been edited in any elevation of it, though in such separate form the composition and design would show themselves in some respect more advantageously than in the building itself, it being too low and upon too diminutive a scale for a piece of street architecture, and for its actual situation.

Holland erected old Drury-Lane Theatre, that is, the structure which was begun in 1791, and burnt down in February, 1809; and which was considerably larger than the present one, their respective dimensions being 320×155 and 240×135 feet; yet, except for its extent and loftiness of mass, the edifice made scarcely any pretensions to architecture externally. He was also the architect of another building in the metropolis, of considerable architectural distinction, the India House, Leadenhall Street, the credit of which has, rather strangely, been generally given to Richard Jupp, who was only the Company's surveyor, and the conductor of the works, the design, and consequently the architecture, belonging to Holland. And the design is in some respects unusually florid in character, the frieze of the portico (a recessed Ionic hexastyle loggia) being highly enriched, like that of Carlton House, the pediment filled in with sculpture, and its acroteria surmounted by colossal emblematical statues. All the rest of the façade however is by much too plain and undignified to accord with such degree of embellishment confined to the centre of it, and the rustication of the ground-floor, showing merely horizontal joints, will bear no comparison with that classical mode of such decoration which was exhibited by him in the façades of Carlton House and Dover House. The entablature of the portico is suppressed elsewhere, the cornice alone being continued along the rest of the front, for which there is some reason, since otherwise the cornices of the windows would have joined the architrave. Holland also made some alterations in the mansion built by Brown [Brown, P. C. S.] at Claremont, and added the colonnade screen wings to the Assembly Rooms at Glasgow.

He died at his house in Hans Place, Sloane Street, Chelsea, June 17, 1806, aged about sixty; he therefore did not live to witness the destruction of his Drury-Lane by fire and that of Carlton House, his finest work, by demolition.

HOLLAND, HENRY RICHARD VASSAL FOX, LORD, was the only son of Stephen, second Lord Holland. His mother was Mary, daughter of John Fitzpatrick, first Earl of Upper Ossory.

Sir Stephen Fox, Knight, distinguished for his magnificence and public spirit, as well as for his great wealth, having, in 1703, at the age of seventy-six, married a second wife, Christian, daughter of the Rev. Charles Hope of Naseby in Lincolnshire, had by her, besides a daughter, two sons, Stephen and Henry, and died in 1715 at the age of eighty-nine. Stephen became Earl of Ilchester; and Henry, who figures in our political history as the rival of the first Pitt, was, in 1763, raised to the peerage as Baron Holland, of Foxley, in the county of Wilts, his lady having the year before been made Baroness Holland, of Holland, in the county of Lincoln. Both baronies passed to their descendants. The eldest son of the first Lord Holland was Stephen, the second lord; his second son was the Right Hon. Charles James Fox, the celebrated orator and statesman.

The subject of the present notice was born at Winterslow House, in Wilts, 21st November, 1773. On the 9th of January, 1774, that mansion, a splendid building, was destroyed by fire, and the infant was with difficulty saved from the flames, his mother, who rescued him at the risk of her own life, having however, in so doing, taken probably the only direction by which she could have made her escape. On the 1st of July the boy lost his grandfather, the first Lord Holland; on the 24th of the same month, his grandmother Lady Holland; and on the 26th of December in the same year, his father, the second Lord Holland; on which he succeeded to the peerage, when he was little more than a twelvemonth old.

His mother died in 1778, and then the care of the child's education devolved on her brother, the Earl of Upper Ossory. After having been for some time at a school in the country, he was sent to Eton, where he spent eight or nine years, and where George Canning, Mr. Frere, the present Lord Carlisle, and other persons who subsequently rose to distinction, were among his contemporaries and associates. In October, 1790, he was entered as a nobleman at Christ's Church, Oxford; but all that is told of his academical career is that he took the honorary degree of master of arts, in right of his rank, in June, 1792.

It appears to have been before leaving the university that he made his first visit to the Continent, in the course of which he saw Copenhagen, Paris, and a part of Switzerland. He is stated to have been present when Louis XVI. accepted the constitution (as revised), after being brought back from Varennes, which was on the 13th of September, 1791. In March, 1793, he went abroad a second time, and, France being now closed, directed his course to Spain, over a great part of which country he travelled, studying the language and literature, and making himself acquainted with the character and manners of the people. From Spain he proceeded to Italy; and there, at Florence, in the beginning of the year 1795, first met Lady Webster, the wife of Sir Godfrey Webster, with whom he returned to England in June, 1796, and whom he married the next year, after she had been divorced from her first husband, who obtained 6000*l.* damages in an action against Lord Holland. (See the particulars in the *Annual Register* for 1797, pp. 10, 11.) After his marriage with Lady Webster, Lord Holland assumed, by sign manual, her family name of Vassal, which however has been laid aside by his children.

He now took his place in the House of Lords. His first speech was made on the 9th of January, 1798, on the motion for committing the bill for trebling the assessed taxes. He addressed the House both early in the debate, and again at the close, in what is described as having been a very animated and successful reply to Lord Grenville, who, while he complimented the young peer on the ability with which he had spoken, had noticed some of his remarks in a way that was considered to be personal. On the division, nevertheless, Lord Holland found himself one of a minority of six against seventy-three; so that he had early and emphatic experience of the position in which he was to pass the greater part of his political life. He began also on this occasion a system which he probably carried to a greater extent than any other peer ever did, by entering a long protest against the bill on the Journals of the House. This first of Lord Holland's long series of protests, many of them very able papers, and valuable for the constitutional information they contain, was signed only by himself and Lord Oxford (the present peer).

From this date Lord Holland took a frequent part in the debates for the next four years, being all this time one of the steadiest opponents of the administration, and seconding in the Upper House the principal efforts of his uncle Charles James Fox in the Commons. Among other measures which met with his opposition was the Union with Ireland, which he contended (8th May, 1800) would both impoverish that country and endanger the constitution of England. A few days before this (on the 30th of April) he had moved that the penal laws against the Roman Catholics should be taken into consideration by a committee of the whole House. This motion, the first of the kind that had been made in the Lords, was got rid of by the previous question without a vote.

Meanwhile, in 1800 before the war was suspended, he had paid a visit to Germany, and returned from Dresden by Cologne and Brussels, having obtained a French passport from Talleyrand, and liberty to make use of it from Lord Grenville, then foreign secretary. In the summer of 1802, after the conclusion of the peace of Amiens, he repaired, with Lady Holland, to Paris, and was there soon after joined by Mr. Fox, along with whom he was introduced to the first consul. From Paris, Lord and Lady Holland proceeded through France to Spain, and they remained in that country till after the breaking out of the war with England in January, 1805, returning home through Portugal by means of passports obtained through the Prince of the Peace.

He now resumed his attendance in the House of Lords; and his name, as before, appears frequently in the reported debates. He was not admitted to office during the ministry of Mr. Fox and Lord Grenville (January—September, 1806); but on the 28th of August he and Lord Auckland were appointed joint-commissioners and plenipotentiaries for arranging and settling the several matters in discussion between this country and the United States, with Mr. Munro and Mr. Pinckney, the United States commissioners; and on the 27th of the same month he was sworn of the privy council. An arrangement of the differences with America was effected after a long negociation (with the omission however of the impressment question); but Mr. Jefferson refused his ratification, and it came to nothing. On the 15th of October, after the death of Mr. Fox, Lord Holland was appointed lord privy seal; and he held that office for the six months longer that the Grenville ministry lasted.

In 1806, Lord Holland became an author by the publication of 'Some Account of the Life and Writings of Lope Felix de Vega Carpio,' in an octavo volume. This work, which was republished in 1817, when it was extended to two volumes by the addition of an account of Guillen de Castro and other matter, was creditable to his lordship's taste and familiarity with the more popular parts of Spanish literature, without being very learned or profound. It had the merit, or luck, of leading the way in the revival of that interest in the literature of Spain which has since prevailed to some extent in this country, though it spread more rapidly at first than it has done of late years—a difference to be attributed partly to the allurement of novelty and the promise held out by an unexplored field, but more perhaps to the political circumstances and events which for a time drew so much attention to every thing Spanish. Lord Holland followed up his Life of Lope de Vega the next year by another octavo volume entitled 'Three Comedies from the Spanish;' and in 1808 he edited and introduced by a preface of some length Mr. Fox's fragment entitled 'A History of the early part of the Reign of James the Second.'

On the breaking out of the Spanish insurrection in this last-mentioned year, he hastened once more to visit the peninsula; and he remained there till the latter part of the year 1809. The rest of his public life for many years was a continuation of the same course of opposition to the policy of the government with which he had set out on his entrance into parliament. He took a leading part in most of the great questions that came before the House of Lords, and particularly distinguished himself by his support of Sir Samuel Romilly's law amendments, by his advocacy of Catholic emancipation, and his opposition to the orders in council, the cession of Norway, and the detention of Bonaparte at St. Helena. However opinion may differ as to the positive wisdom of his politics, the praise at least of consistency cannot be refused to him. He was one of the steadiest Whigs of the school of Mr. Fox. But in those days the boundaries of party were much more clearly marked than they are now; and almost the only sort of inconsistency that was possible was going over openly from the one camp to the other, changing from Whig to Tory or from Tory to Whig. These two great parliamentary divisions were then quite distinct, and did not shade off into one another as they do now.

When the unsuccessful attempt was made through the Marquess Wellesley to effect a union of parties in January 1811, it was proposed that in the new ministry to be formed upon that principle Lord Holland should occupy the post of First Lord of the Admiralty. Like the majority of his party he supported without joining the ministry of Mr. Canning in 1827. In 1828, he made what has been described as his best speech in introducing the Bill for the repeal of the Test and Corporation Acts to the House of Lords. At last, on the accession of the Whigs to power in November 1830, he became once more a cabinet minister as Chancellor of the Duchy of Lancaster; and this office he held (with the exception of the ministerial interregnum of a fortnight in May 1832, and Sir Robert Peel's four months' tenure of power from December 1834 to April 1835) till his death at Holland House on the 22nd of October 1840. He was succeeded by his son, the present Lord Holland.

The only performances which Lord Holland sent to the press besides those already mentioned were 'A Letter to the Rev. Dr. Shuttleworth in favour of the Catholic Claims,' 8vo., Lon., 1827, and 'A Letter from a Neapolitan to an Englishman,' which is stated to have been privately printed in 1818, and to have been written to clear up some misconception by Murat of a conversation which his lordship had had with him. He is also the author of a translation of Ariosto's Seventh Satire, which Mr. Stuart Rose has printed in an Appendix to the Fifth Volume of his translation of the Orlando Furioso (1827), together with a version of the 25th Canto of that poem, which is stated by Mr. Rose to be the performance of an old schoolfellow, who may perhaps be Lord Holland. As a speaker Lord Holland was more animated than graceful; when he began, in particular, he was usually for some time extremely impeded and embarrassed; and he never rose from this hesitation into any thing like the free and impetuous torrent of argument or the impassioned declamation by which his relative Mr. Fox, after a similar unpromising outset, used to carry every thing before him. But his speaking had always the great charm of honesty and earnestness; and it commonly also indicated, with however little of what could be called brilliancy, a well-informed and full mind. Lord Holland was much beloved by as extensive and varied a circle of friends as perhaps any man ever possessed; and his house at Kensington, interesting from its earlier history, was during all his lifetime the resort of the most distinguished persons both in the world of politics and in that of literature.

(*Gentleman's Magazine* for December, 1840.)

HOLO'STEUM (from ὅλος, 'all,' and ὀστέον, 'a bone,' an antiphrasis applied to this plant because it is soft and unlike bone), a genus of plants belonging to the natural order Caryophylleæ, and the sub-order Alsineæ. It has 5 sepals; 5 petals, toothed at the end; 3, 4, or 5 stamens; 3 styles; a subcylindrical many-seeded capsule, opening at the end, with 6 teeth. The species of this genus are herbs with nothing to recommend them for use or cultivation. One species, *H. umbellatum*, is British. It has umbellate flowers, pubescent viscid peduncles, the pedicels reflexed after flowering, the leaves acute, elliptical, or elongate. It is not a common plant, but has been found on old walls and dry places at Norwich, Bury St. Edmunds, Eye, and Yarmouth.

(Babington, *Manual of British Botany*.)

HOLY ORDERS. [ORDINATION, P. C.]

HOLZER, JOHANN, a distinguished German fresco painter of the early part of the eighteenth century, was born at Burgeis, near Marienberg in Vintschgau, in the Tyrol, in 1709. His father was miller to the Benedictine Convent of Marienberg, and Holzer was first instructed by N. Auer at Meran in the Tyrol. He made here such extraordinary progress, that at the early age of eighteen his reputation spread far into Germany, and he was invited by the painter J. A. Merz, to Straubing in Bavaria, to assist him in some frescoes in the convent church of Oberalteich. From Straubing Holzer went to Augsburg, where he lived six years in the house of the painter J. G. Bergmiller, from whom he learnt much in the mechanical department of painting, both in fresco and in oil, for Bergmiller was the principal painter in Augsburg at that time, and was much employed. Holzer painted many excellent frescoes upon the exteriors of houses in Augsburg, but few, if any, now remain; there is however a collection of twenty-eight prints after them by J. E. Nilson, entitled Picturæ a Fresco in Ædibus Augustæ Vind., a J. Holzer, &c. Among these frescoes, a peasant dance, upon the façade of a beer shop, was a very popular work; and it is spoken of in the highest terms in the letters of J. L. Bianconi and Count Algarotti. The neighbouring peasant girls at that time wore extremely short petticoats; in the dance the movements and forms of their legs were accordingly fully displayed; and Bianconi speaks with enthusiasm of the beauty and life of the young peasant girls in this painting; the figures were above the size of life. Holzer's greatest works however are the frescoes of the convent church of Schwarzach near Würzburg; he obtained the commission to execute them by competition; and they were painted in 1737, when he was only twenty-nine years of age. They are the best works that were executed at that time in Germany; and Holzer is by some considered the founder of the new era of German fresco painting. They are however now in a most dilapidated condition; the church is in a ruinous state, and the convent is a paper mill. Dr. Waagen does not notice the Benedictine Convent of Schwarzach in his account of the works of art in Franken, though it contains many works besides the frescoes of Holzer; there are frescoes by Piazzetta and Tiepolo, but they are said to be inferior to those by Holzer. Holzer painted the cupola and ceiling of the church; the subjects represented are—the Glorification of St. Benedict; the Transfiguration of Christ; the Martyrdom of St. Sebastian; St. Felicita and her Seven Sons; the Foundation of the Convent; and the Papal Confirmation of the Foundation. The martyrdom of St. Sebastian is described as the most successful composition.

After the completion of these works, Holzer was invited by the prince bishop of Würzburg to paint his palace, for which he made the designs, but they were not quite satisfactory to the bishop. He was in the meanwhile invited by the Elector Clement of Cologne to paint the newly established capuchin convent at Clemenswerth, and he accordingly immediately prepared himself for this work. He however did not live to commence it; he died of a fever at Clemenswerth, a few days after his arrival, in July, 1740, at the age of thirty.

Holzer's works are described as successful in every department of art, in invention, form, character, light and shade, and colour. He engraved a few plates. Several accounts of him have been published in Germany; the first in 1765, at Augsburg, and the last in the Tyrol in 1834. In the latest accounts he is called Johann Evangelist Holzer; see Nagler, *Künstler Lexicon*.

(Zapf, 'Leben Johann Holzers,' printed in Meusel's *Miscellaneen Artistischen Inhalts*, 1781.)

HOMŒOPATHY, the art of curing founded on resemblances, expressed in the Latin expression 'similia similibus curantur.' It is derived from the two Greek words 'ὅμοιος,' 'similar,' and 'πάθος,' 'feeling' or sensation, and hence a condition of body, such as that of disease. According to this law, disease is cured by remedies which produce upon a healthy person effects *similar* to the symptoms of the complaint under which the patient suffers.

This system of medicine stands in direct contradistinction to that founded upon the principle of treating diseases by their opposites, 'contraria contrariis curantur,' which has served more or less as a guiding law since the time of Galen. To this last method the disciples of the new school have given the name of Allopathy, from the two Greek words 'ἄλλος,' 'other,' and 'πάθος,' 'condition.' This distinctive nomenclature will be adopted in this article as a matter of convenience, and to avoid circumlocution. The arguments adduced in support of the truth of the homœopathic law seem principally drawn from three sources, namely, from popular experience, from observations upon the effects of medicinal agents recorded in the works of eminent medical men of different schools and various epochs, and from experiments upon healthy individuals made by the founder of the system and his disciples upon themselves.

1st. Popular experience has proved that the safest manner of restoring the circulation of a frozen limb is to rub it with snow (similia similibus); warm applications, according to the evidences of the same experience, would cause the destruction of the part affected (contraria contrariis).

Again, severe burns are most quickly cured by the use of heated spirits of wine or oil of turpentine, which excite a very similar sensation, although in a greatly modified degree (similia similibus). Cold applications, although they give temporary relief, are, as is well known, generally followed by increased inflammation and severe after-suffering (contraria contrariis), as corroborated by the evidence of John Hunter, Kentish, Sydenham, and other medical names of high repute.

The homœopathists also insist that the acknowledged efficacy of Jenner's great discovery is a powerful argument of the truth of the homœopathic law, since by producing a similar disease an almost perfect immunity from attacks of the small-pox is obtained.

2ndly. They endeavour to show by a number of observations collected from the works of different medical allopathic authors, that many drugs recorded by them as curative in different forms of disease were observed by others, also allopathists, to produce effects closely resembling the symptoms of those very forms of disease, or in other words, that they acted upon the principle, similia similibus: an instance or two will be sufficient illustration. The English sweating sickness, which committed such ravages in the year 1485, and for some time baffled the physicians, yielded, according to Willis, to sudorifics; and it is upon record that after the adoption of this mode of treatment very few died of it. Opium in general causes extreme drowsiness, heavy and deep sleep; and it has, according to the testimony of many allopathic physicians, proved curative in diseases characterised by similar symptoms. Moreover, it is asserted by the homœopathists that all the remedies acknowledged as specifics by the medical profession, of whatever school, act upon this law; for instance, they maintain that Peruvian bark produces medicinal symptoms closely analogous to those of marsh fever, and that the well-known efficacy of mercury in syphilitic complaints, and of sulphur in various forms of cutaneous disease, is attributable to the same power (similia similibus), and as above stated, that the action of vaccine matter, as a prophylactic or preventive medicine against small-pox, depends upon the same law.

Assuming, therefore, that the position of the homœopathists is supported by the arguments which they adduce, and that the law upon which specifics act have been clearly ascertained, it would seem to be incumbent upon those who have dedicated themselves to the advancement of the healing art to endeavour, by personal experiment and careful observations upon the effects of medicines upon the human body in health, to add to the numbers of this class of remedies, and in this manner materially to improve the treatment of disease. This view of the subject appears strengthened by the opinion of Sydenham and other great names in medicine. Dr. Alison, professor of the University of Edinburgh, observes, 'The increasing efficacy and usefulness of our art must depend on the progress which may be expected in the discovery of specifics which may counteract the different diseased actions of which the body is susceptible as effectually as the cinchona counteracts intermittent fever, citric acid the scurvy, or vaccination the small-pox.'

3rdly. Dr. Samuel Hahnemann, the founder of this system of medicine, being struck, as noticed in his life [HAHNEMANN, P.C.S.], with the close analogy between the symptoms produced by Peruvian bark and those of the forms of disease for which it was considered a specific, and having obtained similar results from other medicines tried upon his own person, was led to the discovery of the homœopathic law; and he, believing that the mode of operation of all remedial agents was in perfect harmony with this principle, by repeated experiments upon himself and some medical friends, converted to his opinions, first determined their direct action and then employed them in disease. The practical results obtained by himself and the physicians of his school are appealed to by them as a further confirmation of the truth of their fundamental law.

The extremely minute quantities in which the remedies are administered seem to form a marked difference between the homœopathic and all other schools of medicine. The homœopathists however assert that this is merely a point of practice to be determined by the physician at the bedside of his patient, and that in the application of the homœopathic principle to the treatment of disease, it was soon found that remedial agents given in the doses usually employed acted too energetically upon a frame already predisposed to their influence by the affinity existing between their medicinal effects and the morbid signs of the disease; and hence a gradual diminution was made in the quantity of the medicine exhibited, in order to approximate to that amount which might exert its full curative power without aggravating the sufferings of the patient by an excess of medicinal action. The result has been, the general adoption among homœopathists of the minute doses at present in use, which perhaps more than any other cause, from its discrepancy with generally received opinions, has prevented any impartial investigation into the principles of the new system by the profession at large.

Homœopathy numbers in its ranks many medical men who had obtained high repute and professional eminence in the other systems before they embraced the principles of homœopathy, and seems to be more or less diffused in all parts of the world, if we may form any opinion from its literature, which comprises medical works in German, Italian, English, French, Swedish, Russian, Spanish, Latin, and Portuguese. The system has also adherents in North and South America and Asia. The great bulk however of the medical profession are more or less opposed to its adoption.

HOMICIDE. [MURDER, P. C.]

HONE, WILLIAM, was born in 1779 at Bath, where his father is stated to have been an occasional preacher among the dissenters. He is said to have been so rigid in his religious notions that he would not suffer his son to be taught to read out of any other book than the Bible. William was placed at the age of ten in an attorney's office in London; but after some time his father, finding that he had attached himself to some reforming society and begun to take part in what he seems to have thought very objectionable politics, removed him to another master at Chatham, with whom he remained between two and three years. He then returned to London, and was engaged for some time as clerk to an attorney of Gray's Inn; but at last he quitted the law, and, having married, set up in July 1800 as a bookseller, with a circulating library, in Lambeth Walk. From this locality he removed to what was then called St. Martin's Churchyard, in the neighbourhood of Charing Cross; and here he appears to have remained stationary for several years, although it is stated that he was once burnt out, and also underwent many vicissitudes in business. He had always been fond of literature, and in 1806 he brought out his first publication, an edition of Shaw's 'Gardener.' After this he devoted much of his time to an attempt which he made in conjunction with a friend to establish a savings bank in Blackfriars Road, which, however, failed. He then entered into partnership as a bookseller with this friend, Mr. John Bone; but the speculation ended in bankruptcy. When he got upon his feet again he established himself in a shop in May's Buildings, whence he removed to High Street, Bloomsbury; and here he appears to have remained till 1811, when on the retirement of Mr. John Walker he was selected by the booksellers to be what is called the Trade Auctioneer, and placed in a counting-house in Ivy Lane. Before this he had been employed to compile the Index to the new edition of Lord Berners's Translation of Froissart. But he had no genius for business, and, having now taken to the investigation of the abuses in lunatic asylums, he soon became bankrupt again. The date is not given in the account from which our abstract is derived; but it is stated that he had now seven children, whom he took to a humble lodging in the Old Bailey, and endeavoured for a time to support by contributing to periodical publications, especially the 'Critical Review' and the 'British Lady's Magazine.' At length, however, he found means to set up once more as a bookseller in a small shop in Fleet Street. Here he was again unfortunate in having his premises twice broken into and plundered, much of the stock that was carried off having been borrowed; but he seems to have weathered these disasters; and in 1815, it is stated, he became publisher of the 'Traveller' newspaper. In that year he exerted himself with most praiseworthy humanity and spirit in the investigation of the case of the unhappy Elizabeth Fenning, executed on a charge of poisoning of which there can scarcely be a doubt that she was innocent; and he published a very striking account of the case, modestly, however, withholding his own name from the title-page (except as the publisher), and giving the literary credit to a Dr. John Watkins, who only contributed three letters, forming the least interesting part of the publication. The volume, an octavo of 240 pages, professes to be 'printed for William Hone, 55, Fleet Street.' In 1816 he commenced a weekly paper called 'The Reformists' Register;' but it does not seem to have gone on long. The next year, however, he brought himself into great notoriety by a series of political satires, published as separate pamphlets, which had immense success, the effect partly of their literary merit, partly also of the wood-cut embellishments from the clever and humorous designs of Mr. George Cruickshank, whom they first made generally known to the public. One of them, 'The Political House that Jack Built,' went through fifty editions, besides producing a host of inferior imitations. Another, entitled 'A Slap at Slop,' was a scourging attack upon the since defunct daily morning paper called 'The New Times,' its editor Dr. (afterwards Sir John) Stoddart, and the Constitutional Association, or 'Bridge Street Gang,' as Hone designated it. But those of the series that turned out the most productive for the author were three composed in the manner of parodies upon various parts of the Book of Common Prayer. For the printing and publishing of these parodies Hone was brought to trial on three several indictments in the Court of King's Bench, on the 18th, 19th, and 20th of December, 1817; the first day before Mr. Justice Abbot (afterwards Lord Tenterden), the second and third days before Lord Ellenborough. He defended himself on all the three trials (which were before special juries); and, notwithstanding the best exertions of the bench to procure a conviction, was acquitted on each indictment. His address to the jury on the third day, especially, which lasted seven hours and a half, when, although fatigued by his previous exertions, he was inspirited by success, was remarkably effective. The feeling of the public was that the alleged libels were really prosecuted for their political tendency, and that if they had been on the other side of the question, written in defence of the ministry instead of in ridicule of it, they never would have been questioned. There is also, we believe, no reason to think, however objectionable their form may have been, that Hone had any design to bring religion into contempt. His acquittal, besides the reputation which it brought him, was followed by the subscription of a considerable sum of money for his use, which enabled him to remove from Fleet Street to a large house on Ludgate Hill. But when he attempted to resume the business of a book auctioneer, he was, we are told, even less successful than before. How long he continued in business is not stated. In 1823 he published the results of researches to which he had been originally directed with a view to his defence, in an octavo volume entitled 'Ancient Mysteries described, especially the English Miracle Plays founded on the Apocryphal New Testament Story, extant among the unpublished MSS. in the British Museum.' This is a curious work, not at all addressed to the multitude, or chargeable with any irreverence of design or manner, but treating an interesting antiquarian subject in the dispassionate style of a studious inquirer. It has now been nearly superseded by more elaborate works that have since appeared; but when it was produced it was by far the fullest account of our old miracle plays that had been given to the public. In 1826 Hone began the publication, in weekly numbers, of his 'Every Day Book.' The sale was large, but his family had now increased to ten children, and he again got into difficulties; the end of which was that he was arrested by a creditor and thrown into the King's Bench prison. Here he remained for about three years, during which time he finished his 'Every Day Book,' in two volumes, and began and finished his 'Table Book,' in one volume, and also his 'Year Book,' in one volume. These three works, which may be considered as forming properly so many series of the same undertaking, are full of curious information, and will probably preserve the name of their compiler after everything else he did shall be forgotten.

The rest of Hone's life was a continuation of vicissitudes such as those to which he had been all his days accustomed. Some time after he got out of prison a number of his friends attempted once more to establish him in the world as landlord of the Grasshopper Coffee-house in Gracechurch Street; but after a few years this speculation also failed. He then fell into the hands of some new acquaintances of the Independent connexion, who persuaded him to try his talents as a preacher; and he appeared frequently in the pulpit of the Weigh House Chapel in East Cheap. He had had an attack of apoplexy so long ago as in 1815; in 1835 he was struck by paralysis at this chapel; in 1837 he was again similarly attacked at the office of the 'Patriot' newspaper, of which he was then sub-editor; soon after he suffered another attack, from which he never recovered; and he died at Tottenham on the 6th of November, 1842. We have mentioned his principal works, but he was the author of a good many more. His last publication was, we believe, an edition of Strutt's 'Sports and Pastimes of the English,' in one volume octavo, which appeared in 1838. We have not seen a work which has appeared since his death, entitled 'Early Life and Conversion of William Hone, a narrative written by himself, edited by his son, William Hone,' 8vo., London, 1841. Hone was a warm-hearted but mild-tempered man, much misconceived by those to whom he was known only through his parodies, which he probably produced in mere thoughtlessness and innocence of heart. It is evident from the above sketch of his history that the unworldliness of his nature was such as is rarely met with.

(*Memoir in Gentleman's Magazine for January*, 1843.)

HONG KONG, one of the group of rocky islands situated at the mouth of the Canton river, about thirty-seven miles from Macao, and one hundred from Canton. It is said to be between 22° 9′ and 22° 21′ N. lat.; but this probably includes some small dependent islands: only one meridian of longitude has been given, 114° 18′ east. The island is separated from the mainland of China by a narrow strait, which varies in width from less than a mile to four or five miles; but one account states that the breadth of the channel is in one part little more than a quarter of a mile. The length of the island from east to west is stated to be about eight miles; but its breadth is very irregular, and varies from about six miles to two miles. The coast-line forms a succession of small bays and headlands. There is excellent anchorage in Hong Kong Roads and Victoria Harbour, both opposite the town of Victoria. There is deep water for a man-of-war within a cable's length of the shore. The harbour lies between the mountains of Hong Kong and those of the mainland; but it is notwithstanding exposed to the violence of typhoons. The northern side of the island is traversed by a ridge of mountains which vary in height from 500 to upwards of 1000 feet. They present a steep declivity towards the coast, and their base approaches nearly to the edge of the sea. In the map of Hong Kong which accompanies Bernard's 'Voyages of the Nemesis' (London, 1844), Mount Victoria is said to be 1827 feet high, and Mount Gough, 1575 feet. These two mountains immediately overlook the town and harbour of Victoria. The elevation of Mount Parker, at the other or eastern end of the island, is said to be 1711 feet. The mountains furnish a supply of excellent granite for building; and there are numerous quarries which are skilfully worked by Chinese labourers. The southern side of the island is much less rugged, and consists of an undulating surface with occasional portions of flat land. The total quantity of land suitable for cultivation is small, and the greater part of it is in one valley. Deep ravines extend from the interior towards the sea, and furnish a constant supply of good water. The words Hong Kong are in fact a corruption of Hoong Keang, 'the red torrent,' so called from the colour of the soil through which flows a stream that tumbles over a cascade adjacent to the harbour. The mean temperature of Hong Kong in July, 1843, was 88°. 'On one occasion the thermometer rose to 92° during the middle of the day, and once only fell to 84° during the night.' (Bernard.) In October, November, and December the variations of the temperature are often from 10° to 20° in the course of twenty-four hours, and the feeling of cold is greater than in many northern countries in the same months. The northern side of the island is fully exposed to the north-western monsoon during the winter season; but it has the serious disadvantage of being deprived by the mountains of the south-western monsoon in the hot season. At that time of the year the rain falls in torrents, and this is succeeded by a hot unclouded sun, which acts upon the undrained parts of the surface and creates malaria. The healthiness of the island may doubtless be improved by attention to drainage and the formation of channels for carrying off the superabundant moisture. In the cold season, when sudden variations of temperature occur, the practice of the natives should be followed, who prudently increase the warmth of their clothing at the proper time. The south side of the island enjoys the benefits of the south-western monsoon, and is healthier than the northern side; but it is destitute of a harbour of sufficient extent. The merchants of Victoria might, it is thought, have their residences on this side, and at the same time proceed daily to their business.

Hong Kong was taken possession of by the British during the war with China. The cession of the island formed one of the conditions of the treaty of peace negotiated by Captain Elliot and Keshen, which the emperor disavowed; but the British continued to hold the island, and by the Treaty of Nankin, signed Aug. 30, 1842, they gave up the island of Chusan, and Hong Kong was ceded in perpetuity to Great Britain. The wisdom of this selection has since been doubted. [CHUSAN, P. C. S.] On the 26th of June, 1843, Hong Kong was regularly constituted a British colony. It is what is called a crown colony, that is, it has no legislative assembly, but is governed by orders from the Colonial Office at home. There is a legislative and executive council to aid the governor with their assistance and advice. The governor, as superintendent of trade, is head of the consular establishments at the five ports opened in pursuance of the Treaty of Nankin. The offices of the government are at Victoria. There is a chief justice and attorney-general, with other law-officers, and the usual departments of a colonial administration. All grave offences committed by British subjects must be tried at Hong Kong. There are four newspapers published at Victoria. At the time when the British first occupied Hong Kong the number of Chinese inhabitants was supposed to amount to about five thousand, exclusive of the boat-people and migratory labourers from the mainland. The resident population consisted chiefly of fishermen and smugglers, who were distributed in about fourteen or fifteen villages. Since the island became a British colony there has been a great increase of Chinese, and their numbers are now estimated at upwards of 30,000. They make themselves generally useful as domestic servants, labourers, tailors, shoemakers, builders, carpenters, &c., and they become tenants of the little shops in the Chinese bazaar. There is a small body of Chinese police. The command of cheap labour to any extent has been one great cause of the rapid progress of the town of Victoria. In June, 1841, when the British forces assembled in the Bay of Hong Kong, on their return from Canton, there was not a house on the island fit for the residence of Europeans, and Sir H. Pottinger, the plenipotentiary, lived, when on shore, in a tent. During the two months that the fleet remained here, a few mat sheds and temporary huts were erected; but in the month of August, 1841, the site of Victoria was still covered with brushwood. Within a year after the first house was completed, there had been constructed regular streets and bazaars for the Chinese, numerous large storehouses, substantial wharfs and jetties, two European hotels and billiard-rooms, and various public buildings. The government had begun the formation of an excellent road along the front of the harbour at the foot of the hills, which was carried to a distance of four miles; and it has since been extended, and other roads have also been made, and bridges erected. In consequence of the limited space between the beach and the base of the mountains, the town necessarily stretches in a line, which is about three miles in front of the harbour. The distance fom one end of the town to the other is already an inconvenience, and a second town in some other situation is thought desirable. In July, 1844, a liberal arrangement was made with a body of Chinese shopkeepers who had been allowed to settle in a district which after the ratification of the Treaty of Nankin became the centre of the European town, and they were removed to another part of Victoria, where a large number of their countrymen were already settled. The government does not grant land in perpetuity, but assigns it on leases for seventy-five years; and there is a clause under which it is to be given up at a valuation assessed by twelve jurors, on oath, if required for public purposes. In 1844 the government derived an income of 9530*l.* from ground-rents; and its revenue from this source was rapidly augmenting.

Early in 1845 the governor of Hong Kong legalized the opium trade. In March the privilege of retailing the drug was farmed by a mercantile house at 720 Spanish dollars a month. All the houses in which opium is sold must adjoin the street, and they may be open from day-light till ten in the evening, except on Sundays, when they are to be closed. No person is to be admitted into these houses with any kind of weapon or edged tool. There is a tax on salt, and a duty of 2½ per cent. on sales by auction. Victoria is a free port, and, like Singapore, its prosperity must depend upon its commerce being freed from all restrictions which can properly be dispensed with. In May, 1845, the currency was regulated by a proclamation which had previously been sanctioned at home by the privy council. The gold mohur, coined since September, 1835, is to be equivalent to 29*s.* 2*d.*; the East India Company's rupee, coined since September, 1845, to 1*s.* 10*d.*; Spanish and Mexican dollars 4*s.* 2*d.*; and 228 cash are declared to be equivalent to 1*s.*

(Bernard, *Voyages and Services of the Nemesis*, London, 1844; McPherson, *Two Years in China*, 1842; Loch, *Campaign in China*, 1843.)

HONTHORST, or HUNDHORST, GERHARD, called by the Italians Gherardo dalle Notti, from his night and candle pieces, was born at Utrecht in 1592. He was the pupil of A. Bloemart, studied some time in Rome, and was engaged for six months by Charles I., in England. He painted Charles's sister, the Queen of Bohemia; the portrait is now at Hampton Court. There are also at Hampton Court—James II., when young; the Duke of Buckingham and family; and a large painting on the queen's staircase, of Charles I. and his queen, as Apollo and Diana, sitting in the clouds, and the Duke of Buckingham below as Mercury, introducing the Arts and Sciences to them, while several genii are driving away Envy and Malice. For these paintings Honthorst received 3000 florins, a service of plate complete for twelve persons, and a beautiful horse. Honthorst was the favourite painter of the Queen of Bohemia, and he was the court painter to the Prince of Orange. He died at the Hague in 1660. He had a remarkable number of scholars, especially among the highest classes. Sandrart also was one of his pupils. His style of execution is much like that of Guercino; his pictures occur frequently in European galleries.

(Sandrart, *Teutsche Academie*, &c.; Walpole, *Anecdotes of Painting*, &c.)

HOOD, THOMAS, was born in 1798, in the Poultry, London, where his father was a bookseller, of the firm of Vernor and Hood. Thomas Hood was sent to a school in Tokenhouse Yard, in the city, as a day-boarder. The two maiden sisters who kept the school, and with whom Hood took his dinner, had the odd name of Hogsflesh, and they had a sensitive brother, who was always addressed as 'Mr. H.,' and who subsequently became the prototype of Charles Lamb's unsuccessful farce called 'Mr. H.' Hood was afterwards sent to a preparatory school, and in due course was transferred to a finishing school in the neighbourhood of London, but derived little benefit from either.

In 1811 Hood's father died, and soon afterwards his elder brother died also. Thomas Hood being then the only remaining son of the widow, she was anxious to have him near her, and recalled him home. In 1812 she sent him to a day-school. His account of this school and its master is so characteristic as to be worth extracting from his 'Literary Reminiscences' ('Hood's Own,' p 292):—'In a house, formerly a suburban seat of the unfortunate Earl of Essex, over a grocer's shop, up two pair of stairs, there was a very select day-school, kept by a decayed Dominie, as he would have been called in his native land. In his better days, when my brother was his pupil, he had been master of one of those wholesale concerns in which so many ignorant men have made fortunes, by favour of high terms, low ushers, gullible parents, and victimized little boys. As our worthy Dominie, on the contrary, had failed to realize even a competence, it may be inferred, logically, that he had done better by his pupils than by himself; and my own experience went to prove that he attended to the interests of his scholars, however he might have neglected his own. Indeed he less resembled, even in externals, the modern worldly trading schoolmaster than the good honest earnest olden pedagogue—a pedant perchance, but a learned one, with whom teaching was a labour of love, who had a proper sense of the dignity and importance of his calling, and was content to find a main portion of his reward in the honourable proficiency of his disciples. Small as was our college, its Principal maintained his state, and walked gowned and covered. His cap was of faded velvet, of black or blue or purple or sad green, or, as it seemed, of all together, with a *nuance* of brown; his robe of crimson damask, lined with the national tartan. A quaint carved highbacked elbowed article, looking like an *émigré* from a set that had been at home in an aristocratical drawing-room under the *ancien régime*, was his professorial chair, which, with his desk, was appropriately elevated on a dais some inches above the common floor. From this moral and material eminence he cast a vigilant yet kindly eye over some dozen of youngsters; for adversity, sharpened by habits of authority, had not soured him, or mingled a single tinge of bile with the peculiar red-streak complexion so common to the healthier natives of the north.' 'In a few months my education progressed infinitely farther than it had done in as many years under the listless superintendence of B.A. and LL.D. and assistants. I picked up *some* Latin, was a tolerable grammarian, and so good a French scholar that I earned a few guineas—my first literary fee—by revising a new edition of "Paul et Virginie" for the press. Moreover, as an accountant, I could work a *summum bonum*, that is, a good sum.'

From this school he was removed to the counting-house of Messrs. Bell and Co., Russia merchants, Warnford Court, City, but his health soon began to fail, and he was sent in a Scotch smack to Dundee, and consigned to a female relation, who however refused to take charge of him, and even reshipped his luggage, and would have sent him back to London, if Hood had not played her an evasive trick, and frustrated her intentions. He immediately took lodgings for himself in Dundee. He was then fifteen years of age, and seems to have been left entirely at his own disposal. Fortunately he was not idle, and had no taste for dissipation, but took great delight in reading, as well as in rambling, fishing, and boating. His health gradually improved, and, after remaining two years at Dundee, he returned to London. He engaged himself to Mr. Robert Sands, an engraver, who was his uncle, in order to learn his art, and was afterwards with Le Keux for the same purpose.

In 1821, Mr. John Scott, then editor of the 'London Magazine,' was killed in a duel; the Magazine passed to other proprietors, who happened to be Hood's friends, and he was offered the situation of sub-editor. He had published some trifles in the Dundee Advertiser and Dundee Magazine, while he remained at that place, which were favourably received, but he had not been stimulated to any further appearance in print. 'My vanity,' says he, 'did not rashly plunge me into authorship, but no sooner was there a legitimate opening than I jumped at it, à la Grimaldi, head foremost, and was speedily behind the scenes.'

Hood, while in this situation, became acquainted with several persons who have distinguished themselves in English literature, and who were then contributors to the 'London Magazine,' with Lamb, Carey, Procter, Cunningham, Bowring, Barton, Hazlitt, Elton, Hartley Coleridge, Talfourd, Soane, Horace Smith, Reynolds, Poole, Clare, Benyon, and others. With Lamb especially Hood afterwards became on terms of great intimacy, which continued till Lamb's death.

Hood's first publication in a separate form was 'Odes and Addresses to Great People,' in which he was assisted by his brother-in-law, J. H. Reynolds, and which was brought out anonymously. 'Whims and Oddities,' published in 1826, in small 8vo., consisted chiefly of his contributions to the 'London Magazine,' with some additions. His next work was in prose, 'National Tales,' sm. 8vo., which was followed by 'The Plea of the Midsummer Fairies, Hero and Leander, Lycus the Centaur, and other Poems,' sm. 8vo., 1827, a volume of serious poetry which obtained praise from the critics, but little favour from the public. His experience of the unpleasant truth that

'Those who live to please must please to live,'

induced him to have recourse again to his lively vein. He published a second series of his 'Whims and Oddities,' and a third series in 1828. He commenced the 'Comic Annual' in 1829, and it was continued nine years. In the same year his comic poem of 'The Epping Hunt' came out, and excited much mirth at the expense of the Cockney sportsmen. He was for one year editor of 'The Gem,' and wrote for it his poem called 'Eugene Aram's Dream.'

In the spring of 1831 Hood became the occupier of a house called Lake House, belonging to the proprietor of Wanstead, in Essex, near which it was situated. While residing here he wrote his novel of 'Tylney Hall.' Pecuniary difficulties compelled him to leave his pleasant residence. The dedication of 'Tylney Hall' is dated Lake House, Oct. 20, 1834. He left it in 1835.

The 'Comic Annual' having terminated in 1837, Hood commenced the publication of 'Hood's Own,' in a series of monthly numbers, in 8vo., 1838. It consisted chiefly of selections from the prose and poetry which he had published in the series of the 'Comic Annual,' with several additions. A portrait of himself, for which he sat at the request of the publisher, is attached to the work, and is, as he says himself, a faithful likeness.

Hood went to the continent for the benefit of his health, but while in Holland the unwholesome air of the marshes produced an accession of illness, which proved of so dangerous a nature that he was compelled to remain abroad much longer than he intended. He went up the Rhine, and was altogether three years in Germany and three years in Belgium. He was in Belgium when he published his 'Up the Rhine;' in the preface of which, dated December 1, 1839, he states that he constructed it on the groundwork of 'Humphrey Clinker.' The work consists of a series of imaginary letters from a hypochondriacal old bachelor, his widowed sister, his nephew, and a servant-maid, who form the imaginary travelling party. Each individual writes to a friend in England, and describes the scenes, manners, and circumstances, in a manner suitable to the assumed character. The nephew's remarks seem to embody the opinions and observations of Hood himself. The book is illustrated with whimsical cuts in Hood's usual rough but effective style, and abounds in good sense as well as humour.

Hood afterwards became editor of the 'New Monthly Magazine;' after his retirement from which, in 1843, he collected his contributions to that work, and, with additions of prose and poetry, published them under the title of 'Whimsicalities.' He still continued to suffer from ill health; and when the secretary of the Manchester Athenæum requested permission to place his name in the list of patrons to a bazaar, he replied in a letter of kindly feeling as well as humour, dated 'From my Bed, 17, Elm Tree Road, St. John's Wood, July 18, 1843.'

In 1844 Hood started his last periodical, 'Hood's Magazine,' and continued to supply the best of its contributions till within about a month before his death. Those who have read the work, and have a taste for wit, humour, and character, will not readily forget his 'Schoolmistress Abroad,' 'Mrs

Gardener,' and his novel of 'Our Family,' which was interrupted by his last illness and death: the last chapters were in fact written by him when he was propped up by pillows in bed. He had the consolation, a short time before his death, of having a government pension of 100*l.* a-year, which was offered to him by Sir Robert Peel, transferred at his own request to his wife. After a lethargy, which continued four days, he died, May 3, 1845. He was buried on the 10th of May in Kensall Green Cemetery.

Hood left two children, a girl and a boy, of whom the girl is the eldest, and is now (1845) about fourteen years of age. Soon after his death a subscription was commenced in order to raise a fund for the benefit of the widow and children. The amount already realized (Nov. 1845) is between 1400*l.* and 1500*l.*

Hood was undoubtedly a man of genius. His mind was stored with a vast collection of materials drawn from a great variety of sources, but especially his own observations; and he possessed the power of working up those materials into combinations of wit and humour and pathos of the most original and varied kinds. His vigilance of observation must have been extraordinary. The appearances of nature, the forms and usages of society, great diversity of characters, all arts, professions, and trades lie ready in his mind to supply the demands of his rapid subtle and versatile imagination. He has wit of the highest quality, as original and as abundant as Butler's or Cowley's, drawn from as extensive an observation of nature and life, if not from so wide a reach of learning, and combined with a richness of humour of which Butler had little and Cowley none. His humour is frequently as extravagantly broad as that of Rabelais, but he has sometimes the delicate touches of Addison. As a punster he stands alone. His puns do not consist merely of double meanings of words, a low kind of punning of which minds of a low order are capable, and with which his imitators have deluged English comedy and comic literature, but of double meanings of words combined with double meanings of sense in such a manner as to produce the most extraordinary effects of surprise and admiration. His power of exciting laughter is wonderful, his drollery indescribable, inimitable. His pathetic power is not equal to his comic, but it is very great. In some of his 'National Tales,' as well as in his singular poem of 'Eugene Aram's Dream,' he produces an effect upon the feelings which is sometimes little less than sublime. 'His Song of the Shirt,' which he wrote a short time before his death, was a burst of poetry and indignant passion by which he produced tears almost as irrepressibly as in other cases he produces laughter.* In his 'Plea of the Midsummer Fairies, Hero and Leander, Lycus the Centaur, and other Poems,' he supports a poetic character quite different from those in which he usually appeared. Without a trace of anything that can be called wit or humour or punning, he displays a gracefulness and delicacy of fancy, a tenderness and sweetness of feeling, a choice of diction, and beauty of versification, which render these serious poems exceedingly delightful; but the poetry is not poetry for the many, though, from its elaborate structure, it may be inferred that it cost him much labour, if not much time. In extenuation of the neglect of the public, it may however be observed that such poems can never be popular. The subjects of the three longest poems are allegorical and mythological, and entirely out of the limits of actual existence. As a novelist Hood has considerable faults. His pages overflow with the exuberance of his imagination to such a degree as to interrupt the course of the narrative, and, by diverting the reader's attention, to weaken his interest in the story. Some of the characters, too, are injured by what may be called the intrusiveness of his wit, by which both the thoughts and language are often rendered less appropriate to the characters than they would have been without it. These objections however are much less applicable to 'Our Family' than they are to 'Tylney Hall.' They are defective as novels, but they are mines of wit and humour.

The rude but graphic and humorous sketches by which many of his comic works are illustrated, are for the most part very slightly connected with the pieces to which they are annexed, and seem to be introduced merely for the sake of the whim, as some pun or odd fancy occurred to him.

* In the course of the year 1843 public feeling had been much excited by cases of distress and destitution which came before the London police magistrates, arising from the excessively low rate of wages paid by dealers in ready-made linen to their workwomen. Taking advantage of a market overstocked with labourers, these tradesmen got their work done for a rate of payment so small that fourteen or fifteen hours' labour were frequently required in order to obtain sixpence. Hood's sympathy was excited, and the 'Song of the Shirt' was the result.

The moral tendency of Hood's works is excellent. In the indulgence of his spirit of fun he is anything but strait-laced as regards the introduction of images and phrases which a fastidious person might call vulgar or coarse; but an indecent description, or even allusion, will not easily be found. He is liberal-minded, a warm eulogist as well as a glowing depictor of the good feelings of our nature and the generous actions which those feelings prompt, and he is an unsparing satirist of vice, pretension, and cant, in all their forms.

Hood, in his person, was thin, pale, and delicate. In his temper he was kind and cheerful; he seems to have imbibed the social and benevolent feeling of his friend Lamb, and he was no less than Lamb a favourite among his friends. His long-continued sufferings only stimulated him to amuse himself and others by the exercise of his extraordinary imagination, and when at last he could no longer bear up under his bodily pains, his complaint was simple, but it indicated a terrible degree of suffering—'I cannot die, I cannot die.'

(*Literary Reminiscences* in *Hood's Own*; *Athenæum*; *Gentleman's Magazine*; and other periodical works.)

HOOK, THEODORE EDWARD, was born September 22nd, 1788, in Charlotte-street, Bedford-Square, London. He was the son of James Hook, a musical composer of some celebrity in his day, by his first wife (Miss Madden), a beautiful, accomplished, and excellent woman. There was only one other child by that marriage, Dr. James Hook, dean of Worcester, who was born in 1773, and died February 5th, 1828. Dr. Hook married a daughter of Sir James Farquhar, physician, in 1797; and wrote two musical pieces, 'Jack of Newbury,' 1795, and 'Diamond cut Diamond,' 1797, which were never printed; and two clever novels, 'Pen Owen,' and 'Percy Mallory,' which have been lately republished. Theodore Hook's mother died in 1802, while he was yet a schoolboy at Harrow: his father did not send him again to school after the funeral; and not long afterwards he married again.

Theodore Hook was a handsome boy and remarkably clever. He had a fine ear, was an expert performer on the pianoforte, had a sweet and powerful voice, and sang a pathetic song well, and a comic song delightfully. His father was employed at Vauxhall and the theatres, and Theodore wrote songs for him, and sometimes composed the airs. The stripling soon received a free admission before the curtain and behind it, and had his share of his father's profits. His brother, who had taken his degrees at St. Mary Hall, Oxford, and was then advancing in the church, seeing the danger to which the young man's character was exposed in this career of dissipation, persuaded his father to send him to the University, and the future dean went with him to be entered at Oxford. But, in order to go through a prescribed course of reading, he was not to commence his residence at the University till after the expiration of a couple of terms, and he returned with his brother to London. He immediately set about writing an operatic farce, 'The Soldier's Return,' 1805, which was very successful, and he gave up all thoughts of the University. He afterwards wrote several other successful operatic pieces and farces:—'Catch him who can,' 1806; 'The Invisible Girl,' 1806; 'Tekeli,' 1806; 'The Fortress,' 1807; 'Music Mad,' 1808; 'Siege of St. Quintin,' 1808; 'Killing no Murder,' 1809; 'Safe and Sound,' 1809; 'Ass-ass-ination,' 1810; 'The Will, or the Widow,' 1810; 'Trial by Jury,' 1811; 'Darkness Visible,' 1811. In 1809 (he was then only twenty) he made his first essay as a novelist by the publication of 'The Man of Sorrow,' under the assumed name of Alfred Allandale, Esq. It was a very flimsy work, and had no success. His life at this time was a series of riotous buffooneries. In 1809 he played off one of the most audacious and reckless hoaxes on record, which is known as the 'Berners-street Hoax.' Not only Berners-street, but all the streets connected with it were rendered almost impassable by vehicles of all descriptions laden with goods of all kinds, from the heaviest to the lightest; and persons of all ranks and professions, including the Commander-in-Chief, the Archbishop of Canterbury, and the Lord Mayor, received invitations, and most of them attended.

Hook was even at this period distinguished for his conversational powers, but his talent as an *improvisatore* is described as marvellous. He was the companion of Charles Matthews; and Mrs. Matthews, in her Memoirs of her husband, relates numerous instances, not only of Hook's displays of improvisation, but of the feats of mimicry which they played off separately and conjointly. Hook was invited to perform before the Prince Regent, who was so much delighted, that after some similar exhibitions at Lady Hertford's and elsewhere, the Regent declared that 'something must be done for Hook;' and late in 1812 something was done for him:—he was appointed Accomptant-General and Treasurer of the Colony of the Mauritius, with a salary and allowances amounting to nearly 2000*l.* a-year. He reached his destination on the 9th of October, 1813, being then only twenty-five years of age. The climate, the society, the amusements, everything delighted him, and he indulged in the most lavish expenditure. Towards the close of 1817, General Farquhar, the governor, sailed for England, and Major-General Hall was sworn in as deputy-governor during his absence. An examination of the accounts and state of the treasury took place, and the report of the examiners declared that everything was correct. Soon afterwards, however, a man of the name of Allan, who was in the treasury department, made a declaration that he knew and had long known that there was a deficiency of 37,000 dollars. Further examinations took place, more deficiencies were discovered, and the result was that Hook was arrested on the 9th of March, 1818; all his property was seized, and he was sent back to England in custody. The ship reached Portsmouth in January, 1819, and the documents were submitted to the law-officers of the crown. The attorney-general's report was, that though Hook might be liable to a civil prosecution for debt, there was no apparent ground for a criminal prosecution, and he was set at liberty with only two gold mohurs in his pocket. He took a small cottage in Somers Town, and formed connections with newspapers and magazines, by which he was enabled to supply himself with the present means of subsistence. He lived in obscurity, and was known only to a few of his old associates, such as Matthews, Terry, and Tom Hill.

In 1820 Sir Walter Scott was in London, and, dining one day with his old friend Terry, met there Matthews, and, for the first time, Hook. The inquiry into Hook's defalcation was still before the audit-board, and the proceedings were represented to Scott as a cruel persecution; he was much pleased with Hook's conversational powers; they were both staunch Tories; and Scott having soon afterwards been applied to by a nobleman of influence to recommend an editor for a provincial newspaper, he named Hook. Hook, however, was not destined for provincial celebrity. The 'John Bull' newspaper was established, with Hook for its editor. The career of the 'John Bull' is well known; its attacks upon Queen Caroline and her supporters, its virulence, its personalities, and the talent which raised its circulation to so great a height. Hook, in its prosperous state, received full 2000*l.* a year from it; and though its circulation gradually diminished, he derived a considerable profit from it up to the time of his death. Meantime the Whigs took care that the inquiry before the audit-board should not be dropped; and the result was, that at first the balance found against him was 20,000*l.*, which on further investigation was reduced to 15,000*l.*, and at last the extent was issued for 12,000*l.* Hook admitted at an early date that the deficiency was 9000*l.*, but afterwards asserted that a strict scrutiny would have struck off 3000*l.* from that sum. There is no proof of actual peculation on the part of Hook; but there is proof that he himself and his officers kept the treasury books with the most culpable and scandalous carelessness, and that the keys of the treasure-chest were frequently left with underlings while he was absent on pleasure excursions. In August, 1823, he was arrested under a writ of Exchequer, his property was sold, and realized about forty pounds, and he was taken to a spunging-house in Shire-lane, Fleet-street, where he remained till April, 1824, whence he was transferred to the Rules of the King's Bench, and he remained there till May, 1825, when he was released from custody, but with an intimation that the crown abandoned nothing of its claim for the debt. He then took a cottage at Putney.

Hook published his first series of 'Sayings and Doings' in Feb. 1824, while confined in the spunging-house, and his diary records the profit to have been 2000*l.*, and he realized sums almost as large by the novels and other works which he published in rapid succession afterwards. The following is a list of the whole of them:—'Sayings and Doings,' First Series, 3 vols., 1824; Second Series, 3 vols., 1825; Third Series, 3 vols., 1828; 'Maxwell,' 3 vols., 1830; 'Life of Sir David Baird,' 2 vols. 8vo., 1832; 'Parson's Daughter,' 3 vols., 1833; 'Love and Pride,' 3 vols., 1833; 'Gilbert Gurney,' 3 vols., 1835; 'Jack Brag,' 3 vols., 1837; 'Births, Deaths, and Marriages,' 3 vols., 1839; 'Gurney Married,' 3 vols., 1839; 'Precepts and Practice,' 3 vols., 1840; 'Fathers and Sons,' 3 vols., 1840; 'Peregrine Bunce,' 3 vols., 1841, some months after his death. In 1836 he became editor of the 'New Monthly Magazine,' and 'Gilbert Gurney,' 'Gurney Married,' 'Precepts and Practice,' and 'Fathers and Sons,' were originally published in periodical portions in that work. He also wrote 'Kelly's Reminiscences,' from Kelly's notes, in 1836, without remuneration, and merely out of kindness to his old friend.

While residing at Putney he gradually mixed more and more freely in society; and in 1827 took a house in Cleveland Row, St. James's, which has since been the residence of a wealthy nobleman; he became a member of divers first-rate clubs, received invitations from persons of the highest distinction, in town and country, and ran himself rapidly and deeply into debt, notwithstanding the large sums which he obtained by his literary labours. By his ambitious and criminal extravagance, which he supplied at a ruinous expense of labour of mind and body, his constitution, excellent as it was originally, was completely broken up. In July, 1841, when dining at Brompton, he was observed to be unwell, and as he stood with the coffee in his hand, turned suddenly to the mirror, and said, 'Ay, I see I look as I am; done up in purse, in mind, and in body too at last.'

From that time he was confined to his house. About the middle of August he requested the Rev. Mr. Gleig, chaplain of Chelsea Hospital, who was an old acquaintance, but had never been at his house, to pay him a visit. He did so, and being known to the servant as a clergyman, was admitted without announcement. Hook was somewhat confused at being caught in dishabille, but after a moment's pause, observed, 'Well, you see me as I am at last—all the bucklings, and paddings, and washings, and brushings, dropt for ever—a poor old grey-headed man, with my belly about my knees.' He had latterly been much *made-up.* He died Aug. 24, 1841, in the fifty-third year of his age. His novel of 'Gilbert Gurney' contains a sort of autobiography of himself.

While living at Somers Town he had become acquainted with a young woman, and by her he had six children: she was respectable, and he always behaved well to her, but he had not the moral courage to marry her, though, according to his diary, he had sometimes thoughts of doing so. A few hundred pounds were subscribed for her and the children after Hook's death. He was a good-natured man, and willing to do acts of kindness, but he had no moral principle sufficiently strong to restrain the impulses of the moment.

Hook's conversational power was greater than his power as a writer. He was an admirable narrator, abounded in smart sayings, which, if not of the highest quality of wit and humour, were so said as to appear the best things ever uttered, and could intermix serious remarks full of good sense and derived from a wide observation of life. His novels are not of the highest order; they contain indeed excellent descriptions of the various forms of life with which he had been conversant, rapid but striking sketches of character, and laughable extravagances, conveyed in a clear, fluent, and often picturesque style. He was well calculated for a popular writer, but is not likely to continue popular long. His novels will shortly share the fate of his dramatic pieces, and be forgotten. His satirical poems are little better than doggrel, and the points, now that the circumstances which gave rise to them have passed away, seem very blunt indeed: his power in these poems was generally in the coarseness of his invectives, not in satirical wit, of which indeed he had little, and that of inferior quality. There are many songs written by him which have never been published, and it is doubtful if they are worth publication.

(*Quarterly Review*, May, 1842, an entertaining and instructive article, written in a fair spirit, by one who knew Hook well; *Gent.'s Mag.*, Oct. 1841, a bad article, written in a spirit of absurd encomium.)

HOOLE. [Tasso, P. C.]

HOPE, THOMAS. Descended from the wealthy family of the 'Hopes' of Amsterdam, and possessing with more than ordinary taste far more than ordinary means of cultivating and gratifying it, this gentleman established for himself a reputation in art, exceeding that of a mere patron of it, or of a mere amateur and collector, since he did much in behalf of art, both with his pencil and his pen.

Mr. Hope, who was born about the year 1770, gave very precocious indications of his decided attachment to that branch of art which seems more than any other to depend upon acquired rather than natural and instinctive taste. 'From an infant,' as he himself tells us, 'architecture was always my favourite amusement. I was scarcely able to hold a pencil, when, instead of flowers, landscapes, and all those other familia· objects of which the imitation chiefly delights the generality of such children as show a turn for design, I already began dealing in those straight lines which seem so little attractive to the greatest number even of good draughtsmen of a more advanced age. No sooner did I become master of myself, which unfortunately happened at the early age of eighteen, than disdaining any longer to ride my favourite hobby only in the confinement of a closet, I hastened in quest of food for it in all the different countries where any could be expected.' This valuable little scrap of autobiography amply indemnifies us for the absence of more matter-of-fact account of his youth and education. At the age of eighteen or nineteen, then, he went abroad, and remained there several years, occupied all the while very differently from most young men of fortune who visit other countries, for his passion for architecture induced him to explore regions that were then considered almost beyond the track of civilization—to study the monuments of Egypt on the banks of the Nile; those of Ionia, Northern Greece, the Peloponnesus, and Sicily; those of the Tartar and Persian styles in Turkey and Syria; of the Moorish and Arabian on the coasts of Africa and in Spain; those of the Etruscan, Lombardic styles, &c. in Italy; and finally, those of the Gothic, in France, Germany, Spain, Portugal, and afterwards here at home.

Eight years, he tells us, were thus occupied by him with a persevering application that would have daunted most professional students, more especially as his researches were attended with many fatigues and privations, and frequently with great risks.

Soon after his return to England he began to apply his studies practically by remodelling and enlarging his mansion in Duchess Street, Portland Place, extending the plan of the original house very considerably by galleries carried round three sides of the court-yard. Of these rooms, which are in continuation of the apartments on the principal floor, the largest one (about 100 feet by 24) is on the north side, and the others, consisting respectively of a suite of small cabinets filled with Etruscan or Greek fictile vases, on the east side, and the statue gallery on the west. And in addition to these, Mr. Hope added several years afterwards (1820) the Flemish Gallery, so called from being entirely occupied by productions of that school. He thus rendered his house one of the largest private mansions in the metropolis; and though he did not bestow on it the slightest beauty of exterior or even any regard at all to appearance, he fitted up and furnished the interior in a style of refined classical taste that was then a decided novelty in this country. His first and memorable publication on 'Household Furniture,' in 1805 (a splendid folio volume with sixty plates exquisitely engraved in outline, and representing together with views of the rooms the furniture and decorations of his own mansion), created a revolution in taste. But it also drew down upon him the merciless ridicule of the 'Edinburgh Review,' which could not resist sneering at the gentleman-upholsterer. Yet, unless it be perfectly indifferent whether good or bad taste be shown in such matters, the reform in furniture of which Mr. Hope set the example, and further promoted by that publication, was assuredly a desirable one, and though there was a good deal of absurdity and caricature in the *ultra-classical* affectations of vulgar and parodying imitators, a very improved style of furniture—one marked by greater simplicity and intrinsic beauty of form has taken place and still prevails, where it has not been superseded by the tawdry frivolity of the *Louis Quatorze* and other fashions.

In 1809 appeared his 'Costume of the Ancients,' which had also great influence in promoting a taste for classical design and study; and in the same year he contributed to a periodical (by J. Landseer) entitled 'Review of Publications of Art,' an essay on the 'Architecture of Theatres.' Mr. Hope had been the first to discern and patronize the talent of Thorwaldsen, whom he commissioned to execute his Jason for him in marble, now in the gallery in Duchess Street. But he was not always so fortunate as to select worthy objects of patronage, for in one instance he bestowed it where it was altogether unmerited. Some dispute arising between him and a French artist named Dubost, the latter painted and made a public exhibition of a libellous icture professing to be the portraits of Mr. and Mrs. Hope, and announced under the title of 'Beauty and the Beast.' As may be supposed, the affair, which occurred in 1810, made a very great noise at the time, but the exhibition was soon brought to a close in a very summary manner by Mrs. Hope's brother, who mutilated the picture by thrusting his stick through the canvas. Dubost brought his action for the injury, but did not succeed in obtaining damages.

With the exception of a minor work entitled 'Modern Costumes,' in 1812, Mr. Hope did not publish anything further till 1819, when appeared his 'Anastasius, or Memoirs of a Modern Greek at the close of the Eighteenth Century,' but as his name was not attached to it, he was so far from being known or even suspected to be the author, that it was at first confidently attributed by many to Lord Byron, as the only person capable of having produced it; and certainly Mr. Hope's previous pursuits and publications were by no means of a kind to point him out as likely to be the author of so powerful a work of fiction. Of his two last works, both of them published posthumously, one of them was even still more remote from what may be supposed to have been the constant tenour of his studies, for that 'On the Origin and Prospects of Man' was almost the very last subject that would have been expected from his pen: from furniture to cosmogony the distance is immeasurable. Abstruse in its speculations, it was also considered unorthodox in some of its opinions, on which account it was afterwards withdrawn from publication, while his 'Historical Essay on Architecture,' first published in 1835, has, on the contrary, become a popular and standard work, having reached a third edition in about eight years. Still it is nothing more than a mere Essay,—which touches indeed upon a good deal that is passed over in other treatises on the subject, yet very slightly; and towards the end it becomes very little more than a series of hasty fragmentary notes. In fact it seems to have been left by the author in an unfinished state, and not to have been prepared by publication by any one else. Probably the plates showing specimens of Lombardic and other styles scarcely ever before represented in English publications, contributed not a little to the popularity of the 'Essay,' but the information they afford is of a very imperfect kind, as they consist of little more than outline elevations of the façades alone of the respective buildings, without even so much as a scale to enable us to judge of their dimensions, nor does the text supply any information as to the plates. Besides being sadly disfigured by typographical errors and other mistakes, the first edition was brought out with so little regard to convenience as a book of study and reference, that there was not even an index to it; wherefore Mr. E. Cressy published, the following year, an 'Analytical Index,' but it ought to have been accompanied by an alphabetical one also.

Besides the above works, Mr. Hope was author of several minor productions and pieces of criticism, one of them being a 'Letter to James Wyatt,' relative to his designs for Downing College, Cambridge, upon which he animadverted very freely and apparently very justly. Another work—if so it may be called—of his, was his villa of Deepdene, in Surrey, which, if he did not entirely build, he very greatly enlarged, and greatly embellished both the house and the grounds, which contain a handsome family mausoleum.

Mr. Hope died February 3, 1831.

HOPPNER, JOHN, R. A., was born in London in 1759. 'There is a mystery,' says Cunningham, 'about his birth, which no one has ventured to explain: all that is known with certainty is, that his mother was one of the German attendants at the Royal Palace.'

When young he was one of the choristers in the Chapel Royal. He studied afterwards in the Royal Academy of Arts; and before he was thirty years of age he had, owing to the active patronage of the Prince of Wales, painted more royal and noble portraits than usually falls to the lot of distinguished portrait painters during the whole of a long life. Hoppner soon distanced Opie and Owen in fashionable favour, and for eighteen years Lawrence was his only rival: Lawrence was patronized by the king, while the prince and his party patronized Hoppner. Hoppner's style is easy and effective, but gaudy; his heads have frequently much character, and are well modelled, though perhaps the opposite case occurs more frequently, especially in his male heads: he had also great skill in landscape painting. He died of dropsy in 1810. His son was for some years British consul at Venice.

At the exhibition of works of 'deceased British artists,' at the British Institution in 1817, there were seven portraits by Hoppner, including his own, a very spirited work, which he presented to the Royal Academy in 1809, upon his election as a member of that body. His portrait of Nelson was in the exhibition at the same institution, in 1820, of 'Portraits representing distinguished persons in the history and literature of the United Kingdom:' it is, however, a less manly head than the one painted by Lemuel Abbot, which was engraved by J. Heath in 1801.

(Cunningham, *Lives of British Painters*, &c.; *An Account of all the Pictures exhibited in the rooms of the British Institution, from* 1813 *to* 1823.)

HORN. Mr. Arthur Aikin, in a paper on the manufacture of horn, tortoiseshell, and whalebone, read before the Society of Arts in 1832, and published in the fifty-second volume of their 'Transactions' (part ii., pp. 334-349), observes that 'in the English language we have only one word to express two quite different substances, namely, the branched bony horns of the stag genus, and the simple laminated horns of the ox genus, and other kindred genera.' Of the former kind, which are, with few exceptions, confined to the male sex, and which are reproduced annually, an account is given under DEER, P. C., p. 349. The uses to which they are applied are the same as those of bone and ivory, and the manufacture presents no point which requires notice. The other kind of horn, to which the French appropriate the name *corne* (while they apply the name *bois* to bony horns), is found in the ox, the antelope, and the goat and sheep kinds. Such horns, with the exception of those of the prongbuck [ANTELOPE, P. C., p. 71], which are not referred to by Aikin, are, he observes, 'never branched or palmated, but are always of a simple conical figure, more or less curved, and, in some of the antelopes, spirally twisted; they are found in both sexes, but, in the goats and sheep, are much larger in the male than in the female.' 'In all these animals,' he adds, 'a bony core, of a loose texture and conical figure, rises from the bone of the forehead, covered by a permanent vascular membrane, from the surface of which are produced or secreted thin layers of horn in constant succession.' 'It is supposed that one layer, or rather one set of layers, is produced every year; but, as the former layer remains closely adherent to the new one, such horns are permanent, lamellar in texture, and exfoliate only very slowly from the outside by exposure to weather and friction.' The structure of such horns may therefore be described as a number of conical sheaths inserted into one another, the innermost of which lies upon the vascular membrane which covers the bony core. The tip, or that portion of the point of the horn which projects beyond the core, is very dense, and the several layers of which it is composed are scarcely distinguishable; while towards the base the layers may be readily distinguished, owing to their successive terminations forming prominent rings. The horn proper is quite insensible, so that the tip may be cut off without giving pain to the animal; but if the core be cut into, bleeding ensues, and it becomes evident that pain is inflicted. Horn appears to consist of coagulated albumen; and Aikin traces the connection between the substance of horns, nails, claws, hoofs, the scales of animals of the armadillo and tortoise kind, of lizards, serpents, and fishes, hair, feathers, and even skin. In the case of tortoiseshell and the armour, or covering shell, of the pangolin and armadillo, the identity of the substance in appearance as well as in chemical character is sufficiently obvious; and the horns of the rhinoceros appear to form a link with the hairy covering of land mammalia generally, the bristles of the boar tribe, and the spines of the hedgehog and porcupine. These horns are not formed upon a bony core, but are described as merely an aggregation of flattened hairs or bristles adhering by their sides, and presenting longitudinal pores or interstices of considerable magnitude at the base of the horn, and which become smaller towards the point, these interstices being, in the living animal, filled with a pulpy matter. Whalebone, also [WHALES, P. C., pp. 294, 295], is another substance illustrating the transition from horn to hair; but its uses in the arts differ much from those of horn. It is softened by boiling in water for some hours, and then cut into suitable lengths for the various purposes to which it is applied, its longitudinal division being effected by splitting, or separating its fibres. It is usually of a dark colour, but that which appears jet black is dyed. It is much used in the manufacture of umbrellas and parasols, in stiffening stays and other articles of female dress, in whip-making, and in various other ways. White whalebone is also manufactured into very elegant bonnets, and occasionally into artificial flowers of great delicacy and beauty, which may be dyed by the usual processes.

The principal kinds of horn employed in manufacturing operations are those of oxen, to which the hoofs of the same animals may be added. The horns of bulls and cows are preferred, those of bullocks being thin and of a coarse texture: a circumstance which seems to indicate some connection between the sexual functions and the development of the horns, similar to that mentioned under DEER, P. C., p. 350. Our domestic supply being unequal to the demand, great quantities of horns are imported from Russia, the Cape of Good Hope, and South America. The horns of goats and sheep, according to Dr. Ure (*Dictionary of Arts*, &c. art. 'Horn'), are to be preferred as whiter and more transparent than those of any other animals.

The first process in the manufacture of horn is to remove the bony core or pith, which is accomplished by steeping the horns in water for a month or six weeks, according to Aikin's account, or for about fifteen days in summer or a month in winter, according to Dr. Ure, by which operation the membrane which lies between the core and the horny sheath is so destroyed or softened by putrefaction that the cores may be easily extracted. These, Aikin observes, are not thrown away, but are burnt to ashes, in which state they form the best material for the small tests or cupella employed by assayers of gold and silver. In some cases, according to Babbage (*Economy of Machinery and Manufactures*, sec. 270), instead of being thus used, the cores are boiled down in water, by which a quantity of fat is extracted, which, rising to the surface, is skimmed off and sold to the makers of yellow soap; while the liquid itself is used as a kind of glue, and is purchased by cloth-dressers for stiffening; and the remaining insoluble substance is crushed in a bone-mill for manure. The solid tip of the horn is sawn off with a frame-saw, and is employed for making knife-handles, umbrella-handles, the tops of whips, buttons, and various other articles. The remainder of the horn, which is employed for purposes for which thin laminæ are required, may either be left entire, or sawn into two or more lengths, according to the use to which it is to be applied. When divided, the lower part, or that next the root of the horn, is frequently employed for making combs, while the portion which has formed the middle of the horn is used for lanterns and similar purposes. To prepare the horn for use, it is immersed in boiling water for about half an hour, by which it is softened; and, while hot from this operation, it is usually held in the flame of a coal or wood fire, until it acquires about the temperature of melting lead, and becomes so soft as to be semi-fluid. If the horn be from an old animal, care must be taken to expose the inside as well as the outside to the action of the flame. Mr. James, of Lambeth, a worker in horn, was rewarded by the Society of Arts in 1827 for a machine for accomplishing this object much better than in the usual way. His apparatus, which is described in the forty-fifth volume of the Society's 'Transactions,' p. 164, consists simply of a block of cast iron pierced with a conical hole, and a conical plug of the same metal, about one-eighth of an inch less in diameter than the hole. These are heated in a stove or common fire to about the temperature of melting lead. The block is then taken out and placed on a firm support. A piece of horn, which, if intended to be spread out flat, should be previously slit longitudinally, is then put into the hole, and the heated plug is dropped into the cavity of the horn. As the horn becomes softened by the heat, the plug is carefully driven in with a mallet; and by its pressure any original crookedness of the horn is removed. After remaining about a minute in this state the block is turned on one side, the plug is driven out, and the horn, which is sufficiently soft to be opened out flat, is removed. This apparatus is said to effect considerable saving of time, in addition to avoiding all risk of overheating the horn. In the more ordinary process, as described by Aikin, the heat is applied before the horn is slit; the slitting is performed while it is in the semi-fluid state, by a strong pointed knife resembling a pruning-knife; and, by the application of two pairs of pincers, one to each edge of the slit, the cylinder or cone of horn is opened until it is nearly flat. Several such pieces are then exposed to pressure between alternate plates of iron, previously heated and greased, to prevent the horn adhering to them, either in a press, or by placing them vertically in a strong iron trough, and compressing them by means of wedges. The degree of pressure applied depends on the intended use of the horn; if it be intended to form very thin leaves for making lanterns (or *lanthorns*, as the word was formerly written, apparently with reference to the use of this material), the pressure should be sufficiently strong to break the grain, or cause the laminæ of the horn to separate a little, so that the edge of a round-pointed knife may be inserted between them to complete the splitting or separation. The thin sheets of horn are then scraped with a blunt or wire-edged draw-knife, upon a board covered with bull's hide, and when thus smoothed and brought to the required thickness, they are polished by a woollen rag dipped in charcoal dust, a little water being added from time to time. They are afterwards rubbed with rotten-stone, and finally with horn shavings. Dr. Ure states that the polish is advantageously completed by rubbing with sub-nitrate of bismuth, applied with the palm of the hand. The painted toys known under the name of Chinese sensitive leaves, which possess the curious property of curling up is if they were alive when laid upon a warm hand, or near a fire, are made of the best of the thin films removed by the draw-knife. When the horn is to be converted into combs, the pressure applied in flattening must be as slight as possible, lest, by the breaking of the grain, the teeth of the comb become liable to split at the points. If a comb or any other article be required of greater size than can be made out of a single plate of horn, two or more may be united by the dexterous application of a degree of heat sufficient to melt but not to decompose the horn, assisted by pressure. When this is well managed, the junction cannot be perceived. 'The Chinese,' Aikin observes, 'are remarkably skilful in this kind of work, as may be seen in the large globular lantern in the museum at the East India House, about four feet in diameter, composed entirely of small plates of coloured and painted horn.'

Combs are roughly cut by a hatchet or saw to the required shape, and then finished by rasps and scrapers. The mode of cutting the teeth is described under COMB, P. C. S., p. 398. If required to be of a curved shape, they are first made flat, and after the teeth are cut they are softened in boiling water, and pressed until cold in a die of hard wood. Horn combs ornamented with openwork are not, according to Aikin, made in this country, because the expense of cutting them in the way practised upon tortoiseshell would be greater than the selling price of the article would repay. Such are, however, extensively imported from France, where they are produced by pressure in steel dies, which are made in London for the French manufacturers. From an examination of such combs, it appears that the horn, when put into the die, must have been in a soft state, approaching to fusion. Aikin states that, according to French authorities, 'horn steeped for a week in a liquor, the active ingredient of which is caustic fixed alkali, becomes so soft that it may be easily moulded into any required shape.' 'Horn shavings subjected to the same process become semi-gelatinous, and may be pressed in a mould into the form of snuff-boxes and other articles;' but he adds that horn so treated becomes hard and brittle, probably in consequence of its laminated texture being obliterated by the joint action of the alkali and strong pressure.

Drinking-horns, respecting which some curious notices are quoted under BISON, P. C., pp. 461, 462, are now made by sawing the horn to the required length, scalding and roasting it over the fire, as above described, but, instead of slitting and opening it, placing it while hot in a conical wooden mould, and driving a wooden plug firmly into the interior, to bring it to accurate shape. When cold and hard, it is fixed on a lathe, and turned and polished both inside and outside, and a groove, or *chime*, is cut with a gage-tool within the smaller end, for receiving the bottom. The horn is then softened before a fire, and the bottom, which is a round flat piece of horn cut out of a plate with a crown-saw, is dropped in at the larger end, and forced down until it reaches the chime. By the subsequent contraction of the horn in cooling, the bottom becomes so firmly fixed as to be perfectly water-tight.

In the manufacture of all articles made of fragments of horn compressed into a solid mass, great care is necessary to avoid the presence of grease, which would prevent perfect union. The masses of horn should be moved with wooden instruments while at the fire, and in carrying them to the moulds. Bell-pulls, the handles of table-knives and forks, knobs for drawers, and many other useful articles, are thus formed, care being taken, whenever the article is put into the mould in two or more pieces, to fit them together so that they may dovetail into one another.

Horn is easily dyed of various colours; but in this country it is usually coloured of a rich reddish brown, and spotted to imitate tortoiseshell, by a mixture of pearl-ash, quicklime, and litharge, or red lead, with water and a little pounded dragon's blood. These are boiled together for half an hour, and applied hot to the parts of the horn which it is desired to colour. For a deeper colour the mixture may be applied twice, and for a blacker brown the dragon's blood may be omitted. This process,' Aikin observes, 'is nearly the same as that employed for giving a brown or black colour to white hair; and depends on the combination of the sulphur, which is an essential ingredient in albumen, with the lead dissolved in the alkali, and thus introduced into the substance of the horn.' Some other dyes are mentioned by Dr. Ure.

No part of the refuse of the horn manufacture is without its value. When exposed to a decomposing heat in close vessels, horn produces a large quantity of the gaseous compound which forms the base of prussic acid, on which account hoofs and horn cuttings are in great request among the manufacturers of Prussian blue, and of the beautiful yellow prussiate of potash. The clippings of the comb-maker are also used as manure. 'In the first year after they are spread over the soil,' observes Babbage in the work above quoted, 'they have comparatively little effect, but during the next four or five their efficiency is considerable.' The shavings of the lantern-maker, from their extremely thin and divided form, produce their full effect on the first crop.

Among the various uses to which horn has been applied, Aikin alludes to bows, both antient and modern, made either entirely or partly of this material, and to armour. He had seen a complete suit of scale armour, which was said to have come from Arabia, made entirely of horn. The employment of this substance for glazing windows has long been superseded by the use of glass.

Hebert (*Engineer's and Mechanic's Encyclopædia*, vol. i. p. 683) alludes to a kind of artificial horn, the manufacture of which is said to have been established in France. It consists of gelatine, usually obtained from bones by treating them with muriatic acid, converted into a horny substance by tanning. Upon becoming hard and dry it resembles horn or tortoiseshell, both in appearance and in the facility with which it may be softened, by boiling in water with potash, and moulded to any required form. By inlaying with gold and silver, and staining with various colours, it may be rendered highly ornamental.

HORNER, FRANCIS, was born, Aug. 12, 1778, in the city of Edinburgh, where his father was a merchant. He was educated at the High School of Edinburgh; in 1792 he matriculated at the University of Edinburgh, where he pursued his studies till the summer of 1795. He was then seventeen years of age, and being disposed to select the law as his profession, his father sent him to England, and placed him under the care of the Rev. John Hewlett, of Shacklewell, in Middlesex, in order that he might get rid of his Scottish dialect, and gain some experience among strangers, as he had hitherto constantly lived at home. He returned to Edinburgh in Nov. 1797, and, having fixed upon the Scottish bar as his profession, at the age of twenty he laid down for himself a scheme of study which included almost every branch of science and literature. He studied Scotch law with his friend Henry Brougham, and with another friend, Lord Webb Seymour, he studied metaphysics and political economy.

In 1802 Horner began to have thoughts of exchanging the Scottish for the English bar, and in April of that year he came to London in order to observe the proceedings in the courts of law, and fix his determination. His friendships and political opinions had associated him with the rising Whigs in Edinburgh; he was now received with alacrity by men of congenial opinions in London, by Mr. Abercromby, Sir James Mackintosh, Sir Samuel Romilly, and others. He resolved to attach himself to the English bar, and in the spring of 1803 he took up his permanent residence in London. It was an eventful and a stirring time. The French war was again breaking out, the King's sanity was doubtful, and the Addington administration was giving way before the cross-firing of Pitt and Fox. Horner was not allowed to remain an unengaged spectator. As his abilities became more known, his connections with the leading Whigs were extended. On the death of Mr. Pitt in 1806 the government was placed in the hands of Lord Grenville and Mr. Fox. Horner accepted a seat at the Board of Commissioners established by the East India Company for settling the Nabob of Arcot's debts, an unsalaried office, which however was to be remunerated at the close of the investigation. On the 23rd of June, 1806, Lord Henry Petty made him an offer, through the intervention of Lord Kinnaird, of a ministerial seat in the House of Commons, which, after consultation with his friends, was accepted, and in Nov. 1806, he was returned for St. Ives. Fox had died in September, and the old Whig party, which he had held together, immediately fell to pieces. A new parliament was summoned, and met on the 15th of December. This parliament was very short-lived. A change of ministers took place on the 24th of March, 1807; parliament was prorogued on the 27th of April, and was immediately afterwards dissolved. Horner did not obtain a seat at the general election, but in the following July was elected for the borough of Wendover through the interest of Lord Carrington. He spoke little at first, on matters of business only, and briefly. By degrees he began to take a part in great questions. He entirely coincided with the Whig party in their condemnation of the seizure of the Danish fleet; he differed from them in their shrinking policy on the question of the Spanish war. In May, 1809, he resigned his seat at the Board of Commissioners for investigating the debts of the Nabob of Arcot, in consequence of finding its duties interfere too much with the pursuit of his profession. On the 1st of February, 1810, Horner made a motion for an inquiry into an alleged depreciation of bank notes. The subject was one which he had studied extensively, and he made a very decided impression on the House. He was appointed a member of the Bullion Committee, and by the part which he took in it, by his share in drawing up the report, and by his speeches on the question in the House, he acquired a solid reputation and a position and influence there which he afterwards rather augmented than diminished. On the Regency question he spoke on the side of his friends with great power and effect. In the negotiations for the formation of a ministry by Lord Grenville in 1811, Horner was offered the situation of one of the Secretaries of the Treasury, but he declined the offer. In the general election in 1812 he was not returned as a member, but by the intervention of Lord Grenville he was elected for St. Mawes, through the interest of the Marquess of Buckingham. In the sessions of 1813 and 1814 he took a prominent part in the debates, and became one of the acknowledged leaders of his party. He took advantage of the opening of the continent, in 1814, and made the tour of Geneva and the north of Italy. In the great crisis arising from the return of Bonaparte from Elba, when Lord Grenville urged the necessity of a war and Lord Grey deprecated the haste with which the country seemed disposed to enter upon it, Mr. Horner supported Lord Grey, and the difference of opinion seemed to be so irreconcilable that he offered to surrender his seat, but the Marquess of Buckingham declined to accept his resignation. On the 25th of June, 1816, he made his last speech in parliament, in favour of the Catholic claims, and against the intolerant and harsh treatment which Ireland had experienced from the government of this country. Symptoms of a pulmonary disease had already begun to show themselves in his constitution, and he was advised by his physicians to spend the winter in the south of Europe. Accompanied by his brother, Mr. Leonard Horner, he set out on his journey, and arrived at Pisa in the latter part of November. His disease grew rapidly worse, but he had no suspicion that it was dangerous, and he continued to lay down for himself plans for future studies of the most comprehensive extent. On the 6th of February his difficulty of breathing came on with increased severity. He died on the 8th of February, 1817. His body was opened, and his complaint was found to be, not consumption, but induration of the substance of the lungs and enlargement of the air-cells to an extraordinary extent. He was buried in the Protestant cemetery at Leghorn, where a marble table-tomb was erected to his memory by his father. At one of the ends of the monument is a likeness of him in relief, of the size of life, by Chantrey. A marble statue of him, also by Chantrey, is placed in the north transept of Westminster Abbey, the cost of which was defrayed by subscription among his personal and political friends. It is one of Chantrey's best works, and indeed one of the finest portrait-statues in the Abbey.

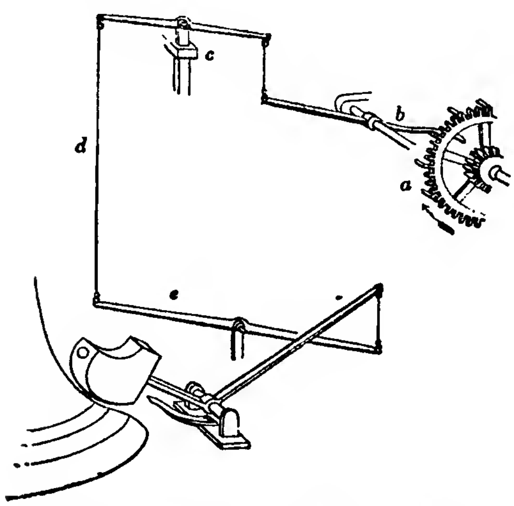
The character of Horner's understanding was that of vigorous reasoning in pursuit of important and often difficult truth. He had no wit, and made no pretence to any. His knowledge was extensive, and his judgment accurate, not only in the various branches of political economy, but in a great many other departments of literature. He was one of the projectors of the Edinburgh Review, and wrote many articles for it. As a public man his independence was unquestionable; his integrity, sincerity, and moderation were acknowledged by all parties. He was modest, free from pretension, and equally free from any kind of affectation or any trace of rancour. As a public speaker he was grave and forcible, without imagery or any of the accessories of oratory, but with an earnestness and evident sincerity of manner which produced an effect greater than he could have done by any appeals to the imagination or the passions.

(*Memoirs and Correspondence of Francis Horner, M.P.*, edited by his brother, Leonard Horner, Esq., F.R.S.; *Quarterly Review*, May, 1843.)

HOROLOGY. A general notice of the history and of the chief peculiarities in the construction of the principal kinds of machines for measuring time is given under this head in P. C. p. 297; and under CHRONOMETER, P. C. p. 134; JEWELLING OF WATCHES, P. C. p. 117; PENDULUM, P. C. p. 402; and WATCH, REPEATING, P. C., p. 107, are further details respecting some branches of the science of horology. The principal object of this article is to supply information respecting some important modern improvements in the construction of the large clocks used in church towers and public buildings, which, from their most usual position, are generally known by the name of church or turret clocks.

Turret-clocks differ from other machines employed for measuring time, not only in their greatly superior size, but also in the arrangement of their parts, and in the circumstance that they are usually made to strike the hours, and often the quarters also, upon large bells, and are occasionally connected with machinery for chiming whole tunes at certain intervals upon a set of bells which, when mounted in a church-tower, are so hung, that by disconnecting the hammers of the chimes and striking apparatus, they may also be rung in the ordinary manner by means of ropes. A popular description of the mechanism of such a clock is given in a paper in the 'Penny Magazine' for 1842 (No. 641), describing a visit to a church-clock factory and bell-foundry, which is illustrated by a representation of the clock of St. Anne's Church, Limehouse. One of the most curious peculiarities of a turret-clock consists in the circumstance that it is frequently required to indicate the time upon as many as four different dials, on the four external faces of the tower in which it is mounted. This apparently difficult matter is accomplished in a simple and beautiful manner, by placing the clock in or near the centre of an apartment either on a level with the external faces, or above or below them, and causing the motion of the axis which under ordinary circumstances would carry the minute-hand (which revolves once in an hour), to be transmitted by bevil-gear to a vertical rod, the opposite end of which carries a horizontal bevil-wheel nearly on a level with, and situated centrically with reference to, the four external dials. The motion of this central wheel is communicated, by four vertical bevil-wheels of the same size and number of teeth, ranged round its circumference, to four horizontal rods, the opposite ends of which, passing through the several dials, carry the four minute-hands. At the back of each dial is a series of wheels and pinions, technically called the *motion-work*, precisely resembling that described in the account of a vertical watch under HOROLOGY, P. C., p. 302, by which motion is imparted to the hour-hand, which revolves once in twelve hours. As in the case of the eight-days' spring clock, described under HOROLOGY, P. C., the movement of the hands and that of the striking apparatus are provided for by separate trains of wheel-work, each of which is impelled by its own moving power. In a turret-clock, the moving power is supplied by the descent of a weight, regulated in the case of the movement, or going-train, by the oscillations of a large pendulum, and in that of the striking-train by the resistance of the air to the rapid revolutions of a fly or fan set in motion by the wheelwork. In the arrangement of these trains, and in their connection with each other, there is nothing which requires special notice here, as these matters may be readily understood from the account of a spring-clock above referred to. Owing to the necessity for using a very heavy hammer to strike the hours in a church-clock, the power required for working the striking-train considerably exceeds that of the going-train. In the Limehouse clock above referred to, the going weight is about sixty pounds, while that of the striking-train is about five hundred pounds. These weights are wound up (in most cases, weekly) by means of winch handles and toothed wheels connected with the massive drums round which their ropes are coiled; and, for convenience, they do not descend immediately from the drums or barrels, but in the angles of the tower, or any convenient situation, the course of their ropes being directed by guide-pulleys. In this clock the pendulum-rod, which, as is usual in large clocks, is made of wood, is about thirteen or fourteen feet long, its bob, or weight, being a mass of cast iron shaped like a double convex lens, about thirty inches in diameter, and weighing two hundred pounds. Each of the four clock-faces is thirteen feet in diameter, and each pair of hands weighs about sixty pounds; but as the hands are very nicely balanced by weights attached to the extremity opposite to the pointed end, the power required for moving them is much less than might be supposed. In some turret-clocks, indeed, the small size of the going-train and of the apparatus by which motion is communicated to the hands appears strangely disproportionate to the magnitude of the dials. In the Limehouse clock, the head of the hammer by which the hours are struck weighs fifty-six pounds, and it is set in motion by the apparatus represented in *Fig.* 1., which may serve as an example of the striking mechanism of turret-clocks in general, although the details of course vary according to the relative situation of the clock and the bell, which, in some cases, is the reverse of that here represented: the bell being above, instead of beneath the level of the clock itself.

Fig. 1.



In this cut *a* represents the pin-wheel, corresponding to the wheel *f* in the striking-train of the clock represented in HOROLOGY, P. C., p. 300, *Fig.* 1, by the action of the projecting pins of which upon the end of the lever *b*, communicated through the levers *c* and *e*, the tail *f* of the hammer is depressed, and the hammer-head is consequently raised ready for a stroke. By the continued revolution of *a*, the end of the lever *b*, after being raised to a considerable height, is suddenly released, by which the hammer falls upon the rim of the bell, and the connecting apparatus resumes its original position ready for the next stroke. It must be borne in mind that the rod or wire *d* by which the levers *c* and *e* are connected, is here represented much too short. In ordinary cases, it is of sufficient length to reach from one story of the tower to another.

Musical chimes, which form a pleasing though not very common addition to the mechanism of turret-clocks, require the addition of another train of mechanism, somewhat like to that which constitutes the striking-train, inasmuch as, like it, it is perfectly at rest for considerable periods of time, and is brought into action only at certain predetermined intervals by the action of the going-train of the clock upon a detent. The mechanism of the chimes very nearly resembles, on a large scale, that of a musical snuff-box; levers connected with hammers which strike upon a series of bells, being substituted for the springs which in the musical snuff-box are caused to vibrate by the projecting pins on the revolving barrel. Beautiful machinery has been introduced to facilitate the accurate *pricking* of the barrel, or insertion in their proper places of the pins which project from its surface; but the principle by which the operation is regulated may be sufficiently explained by an account of the old method of performing it. A sheet of paper exactly equal in size to the surface of the barrel, and which, therefore, would completely cover it if wrapped round its circumference, was ruled in a direction perpendicular to, or at right angles with, the axis of the barrel, with as many parallel and equidistant lines as there are different notes in the tune to be performed, each of these lines indicating the position of one of the series of levers worked by the barrel, and on each of these lines was marked the name of the note represented by it. This series of lines was then crossed by another series lying parallel with the axis of the barrel, which divided the circumference of the barrel into as many equal parts as there are bars or equal divisions of time in the tune. These spaces being then subdivided by other lines, according to the number of minims, crotchets, or quavers in each bar, the notes of the required tune were marked by ink dots upon the paper on their respective lines and in the order of time in which they should be produced, as regulated by the bar-lines and by the subdivisions of the bar. This done, the paper was pasted upon the barrel, and the pins were inserted at the points indicated by the marks on the paper. This comparatively rude process, though inefficient for cases in which one barrel is made, by shifting a little longitudinally upon its axis, to perform several tunes, indicates the principle common to the pricked barrels of chimes, musical snuff-boxes, and barrel-organs.

Owing to the very limited demand for turret-clocks, and their great durability when well made and carefully preserved, the business of making them is confined to very few establishments, and has hardly been systematised into a manufacture, in the more definite sense of that term. Every clock being, in ordinary cases, made individually, and with comparatively little aid from machinery, turret-clocks have been very expensive, and in many cases inferior in accuracy of workmanship to many far simpler cheaper and more common machines, in the manufacture of which more extensive use is made of the lathe, slide-rest, planing-machine, and other contrivances for abridging labour and attaining a higher degree of perfection than could be secured by hand-labour. Mr. Dent, who had previously succeeded, in the face of much prejudice and opposition, in remedying a similar defect in the manufacture of chronometers, determined, when engaged by the Gresham Committee to make a turret-clock of unprecedented perfection for the new Royal Exchange, under the superintendence of Mr. Airy, the astronomer royal, to meet this deficiency by establishing a clock-factory supplied with all the aids and appliances of modern ingenuity, in which the several parts of a turret-clock should be produced as far as possible in the same way as the component parts of a power-loom or other machine manufactured upon an extensive scale. By such a judicious outlay of capital it becomes easy, having once made the required models, to produce as many clocks as may be desired, the component parts of which are perfectly alike, and which, while finished in a very superior manner, can be supplied at a cost greatly below that of what may be termed hand-made clocks. In the manufacture of smaller clocks and other horological machines, for which there is a more extensive demand, the application of manufacturing principles is even more important; and we may express a hope that the prejudices which have hitherto stood in the way of such improvements, and restrained the application of capital to this branch of ingenuity, are giving way. When the gentleman referred to above first introduced the use of the slide-rest in the manufacture of turret-clocks, his machines were found to be, in consequence of the jealousy of the clockmakers employed to use them, so continually out of order that he was compelled to call in the assistance of engineers to repair and work them; but now the clockmakers and engineers work together in the most cordial manner, and with the most satisfactory result.

One of the first points which would strike an observer in the Exchange clock, and in other turret clocks made on the same principle, is the use of a simple but strong cast-iron framing, in which every strain is so completely self-contained that the operation of fixing the clock in its destined position is one requiring but little skill; scarcely any adjustment being required beyond the fixing of the frame on a firm and level base. Another, and a more unusual feature, which Mr. Dent has introduced into the turret-clock manufacture, although it is not adopted in the Exchange clock, is the use of cast iron wheels for the striking train, which is considerably larger than the going train. This peculiarity, which will be of great advantage, not only on account of the superior durability of the metal, but also as tending greatly to reduce the cost of the clock, is not claimed as an invention by Mr. Dent, such wheels having been, according to information with which he has favoured the writer, used in France for forty years past. In some old English clocks, we may state on the same authority, wheels of wrought iron were used, but the teeth of these had to be cut in the same manner as those of the ordinary gun-metal wheels used for the same purpose, while those of the cast-iron wheels are formed by the casting operation alone, from an accurate model. The wheels of the going train, which are not only smaller but require greater accuracy from the circumstance that any irregularity in their action would impair the correctness of the clock, which is not the case with the striking train, are best made of hammered brass, which is a material more to be depended upon than gun-metal. The wheels of both trains are formed with teeth of a peculiar shape, on the subject of which Mr. Dent presented a paper to the British Association in September, 1844, in which he states that the geometrical form of the wheel-teeth in chronometers, watches, and clocks is seldom attended to by the persons who either cut the wheels or make the pinions; which he thinks may be explained from the circumstance of these operations being separated into two distinct trades. 'The system pursued by workmen to insure what they suppose to be the proper form of the wheel-teeth is,' he observes, 'that it should, as nearly as possible, resemble *the shape of a bay-leaf;* while the terms geometrical circles or pitch-lines are not understood.' Mr. Dent then proceeds to show that 'as the wheels of a clock move in one direction, an opportunity is afforded of the teeth being so shaped that the contact, or commencement of the force, may take place at the line of centres, and, if possible, it should not take place before. 'After cutting many experimental segments of wheels and pinions,' he adds, 'adopting various proportions in each case beyond the geometrical circles, I came to the conclusion to use for the wheel-teeth (the driver) the epicycloidal curve, and for the pinion (the driven) the hypocycloidal curve, putting nearly the whole of the curve on the wheel-teeth, increasing the circumference beyond the geometrical circle, by the addition of three teeth and spaces, allowing only 0·5 of the pitch of the tooth for the increased circumference of the pinion, just to remove the possibility of any sharp edge. In every case the epicycloidal curve has been described by rolling the semi-diameter of the driven on the geometrical circle of the driver. It is very necessary that segments of the teeth should be cut for the purpose of ascertaining the breadth that the wheel-teeth should be in excess above those of the pinion-leaves; for as the breadth of the wheel-teeth is increased, and the leaves of the pinion narrowed, the effect of driving before and after the line of centres is varied.' Mr. Dent has also applied this theory to the lifting of the hammers, both for the striking apparatus and the chimes, by using projections of an epicycloidal shape instead of the ordinary round pins in the pin-wheel.

Among the other important features of the Royal Exchange clock, which are applicable to all others of similar character, whether constructed with its peculiar contrivances for insuring perfect accuracy or not, we may mention the use of hollow iron drums instead of wooden cylinders for the driving barrels, and the use of wire instead of hempen ropes for suspending the weights. The first-mentioned of these improvements renders permanent accuracy of form more attainable, while the latter obviates, in consequence of the much smaller size of the cord, the necessity for overlaying it, since a sufficient length of rope may be coiled in a single layer upon the barrel without increasing its length or diameter in an inconvenient degree. The result is that the weight continually exerts the same force to turn the barrel, while with a thicker rope, covering the barrel in two or three layers, its effective force is of necessity greater at the commencement of its descent, when it acts upon the circumference of the barrel *plus* the thickness of the first or innermost layer of rope, than at the latter part of its descent, when it acts on the circumference of the barrel alone. Another important arrangement, which, though formerly in use, had been departed from, and is revived in this clock, is the driving of the hands of the clock, and the raising of the hammers of the striking apparatus directly from the axis of the driving-barrel, without the intervention of any wheels and pinions.

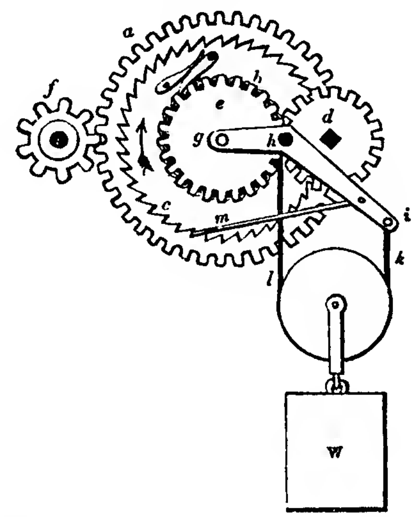
In their determination to secure a public clock of unexampled accuracy, the Gresham Committee required that the Exchange clock should have a compensation-pendulum, and that it should be so constructed as not only to show perfectly correct time upon the dials, but also to tell it with accuracy by making the first stroke of the hour upon the bell true *to a second*. This degree of precision is unattainable with the ordinary striking-apparatus, as the effect of variations in the state of the atmosphere upon the motion of the fly by which its action is regulated, and of various circumstances affecting the inertia of the machinery to be brought into motion, together with the uncertainty as to the precise moment when the tail of the lever by which the hammer is moved will become disengaged from the pin or tooth of the pin-wheel by which it is raised or depressed, render it impossible to adjust the mechanism with certainty to produce such a result. In the Exchange clock this difficulty is provided for by an arrangement for moving the lever and hammer to nearly the utmost degree required before the time of striking, and causing the end of the lever, which is formed in a peculiar manner for the purpose, to remain poised delicately upon the rounded point of the projecting tooth of the pin-wheel until the moment of striking, when it is instantaneously released, and thus the stroke is produced without being affected by the preliminary operation of raising the hammer.

The principles upon which pendulums are provided with compensations for changes of temperature are explained under PENDULUM, P. C., pp. 402, 403. That of the Exchange clock is of a comparatively simple construction, which appears well adapted for large clocks. The centre rod of the pendulum is of steel, and is sufficiently long to pass completely through the bob or weight, which, however, is not immediately attached to it. Upon the bottom of this rod is fixed a nut, by turning which the length of the pendulum may be nicely adjusted, and upon which stands a hollow or tubular column of zinc, through which the steel rod passes freely. On the top of the zinc column is a metal cap, from projecting portions of which descend two slender steel rods, to the lower ends of which the weight, which is a hollow cylinder of iron, capable of sliding freely upon the zinc column, is suspended. Thus, while both the central steel rod and the two smaller steel rods by which the weight is suspended, expand *downwards* upon any increase of heat, the position of the weight in reference to the point of suspension of the pendulum remains nearly the same, because the zinc column, though shorter than the central steel rod, expands, owing to the different nature of the metal, to an equal extent *upwards*, and consequently raises the weight just as much as it is depressed by the lengthening of the steel rod. As the pendulum of the clock we are describing weighs nearly four cwt., the operation of 'setting' it to the required nicety, that its beats might be correct to within a *fraction of a second*, was a matter of extreme difficulty. This was met by a contrivance suggested by Mr. Airy: the clock being started at a very small losing rate, a slender spring so mounted as to touch the pendulum slightly, and to cause a gain in the going of the clock, was brought in contact with the pendulum-bob nearly at the centre of percussion by means of a line in the clock-room. By this means the beats of a large turret-clock may be brought to coincide perfectly with those of a chronometer by which it is set. The regulating screw by which the length of the pendulum is adjusted is not moved for the correction of small errors in the rate of going, such being provided for by the use of small supplementary weights laid upon each side of the top of the pendulum-bob, which weights may be applied or removed without stopping the clock.

While on the subject of compensation-pendulums we may notice a paper presented by Mr. Dent to the British Association in 1838, in which, among other matters, he explains an improvement which he had introduced in the construction of the mercurial pendulum, which is that generally adopted for the very perfect kind of time-keeper known as an Astronomical Clock. The ordinary construction of this admirable pendulum, which is described and illustrated under PENDULUM, P. C., has the mercury in a glass jar, the fragility of which not only exposes it to the risk of fracture, but also renders it unsafe to boil the mercury after filling it, to drive off the air which it always contains. Further than this, while it is possible to give, externally, a mathematically correct form to a glass jar, the interior cannot be made of a perfect figure, and consequently the column of mercury which it contains cannot be a perfectly regular cylinder. 'This condition,' Mr. Dent observes, 'combined with the irregularity of expansion which glass is peculiarly liable to from its compound nature, renders measurement and calculation, with regard to the column, so vague and deceptive that they are never employed.' These defects he has removed by substituting a jar or cistern of cast iron, with which mercury is as little disposed to amalgamate as it is with glass, for the ordinary glass jar. This material may be wrought with the utmost accuracy into the required form, and although, from the effects of expansion and contraction, the figure of the vessel is not perfectly permanent and unchangeable, its changes are of a nature which is well understood, and may be calculated upon with accuracy. In such a cistern, again, the mercury may be boiled at any time. 'The clock-maker may do it himself on the first putting of the machine together,—may adjust the column,—may then hermetically seal it, and dispatch the pendulum to the most distant countries with the adjustment so perfect that it may be instantly attached to the wheel-work by any workman capable of setting the clock upon its supports;' and 'if at any subsequent period, minute portions of air have, from any cause, again mingled with the mercury, and rendered the pendulum susceptible of barometric changes, the air may again be driven off with the greatest facility by repeating the process of boiling, without removing the mercury from the cistern.' In connection with this improvement Mr. Dent has introduced some other alterations in the construction of the mercurial pendulum, among which is the attachment of the cistern directly to the pendulum-rod, and consequent removal of the metal stirrup or frame formerly used to carry it, and the prolongation of the rod so as to plunge its lower end into the mercury, nearly to the bottom of the cistern, an arrangement favourable to uniformity of temperature in the rod and mercury; and since the date of the paper we have quoted, he has, with a view to obtaining additional precision in the performance of the astronomical clock, taken out a patent for giving impulse to the pendulum at, as nearly as can be determined, the centre of percussion. In this arrangement, the pendulum, instead of being suspended below the clock, is suspended from a fixed point at the top of the clock-case, while the clock itself is at the bottom, the only connection between the two being effected by momentary contact, at the extremities of the range of the pendulum's vibration, with two slender pieces attached to the escapement. 'In the old arrangement,' the inventor observes in his published 'Abstract from Two Lectures on the Construction and Management of Chronometers, Watches, and Clocks, delivered before the members of the United Service Institution, May, 1841,' 'the pendulum never vibrates independently of the mechanism of the clock; besides which, the impulse is given under very disadvantageous circumstances, as the greater part of the force communicated by the escapement is lost at the point of suspension.' In his patent astronomical clock, with the detached pendulum, these defects are in a great measure remedied, for he states that 'if the pendulum vibrates two degrees from the perpendicular, one degree and forty-five minutes will be entirely detached from the mechanism, and the irregularities occasioned by friction and other disturbing causes are avoided.'

Returning to the turret-clock at the Royal Exchange, in which the connection of the pendulum with the wheel-work is of the more ordinary nature, the escapement is the next point which claims notice, though it is too complicated to be fully described without several figures. Its chief peculiarity is that it is of the *remontoire* kind, a circumstance in which it resembles some of the best public clocks in France; among others, that of the Bourse at Paris. To explain this it may be sufficient to state that the impulses imparted to the pendulum are not given immediately from the large going-train of the clock, which is exposed to variations of force and resistance from varying friction, from changes in the state of the oil used to lubricate the mechanism (the use of which, however, is limited to the least possible degree), and from the effect of the wind upon the large hands of the four external dials, which in this case are nine feet in diameter; but these impulses are given by a small secondary train, set in motion by the descent of a ball or weight, which is itself raised at intervals of twenty seconds by the mechanism of the going-train. The action is therefore very similar to that of a *remontoire-spring*, which, as used in some horological machines, is a small spring employed only to set the escapement in motion, it being itself wound up at very short intervals by the going-train, which receives its impulse from the prime mover. Such a contrivance favours accuracy of performance by detaching the escapement, by which the velocity of the machine is determined, or, in other words, by which the measurement of time is effected, from the power, necessarily subject to some irregularities, by which the greater part of the machinery is kept in motion, whether that power be supplied by a weight or a spring. The escapement of the Exchange clock is Graham's dead-beat escapement, and has the pallet jewelled with large sapphires; but in his ordinary turret-clocks Mr. Dent uses a modification of Lepaute's escapement, over a single pin. In this clock has been introduced a beautiful contrivance for maintaining the motion of the wheels during the time of winding up, which was invented a few years since by Mr. Airy for the clock-work of the great Northumberland telescope at the university of Cambridge, and of which he published a description in the 'Transactions of the Cambridge Philosophical Society,' vol. vii. part ii. p. 217. Harrison's beautiful contrivance of the *going-fusee*, of which a description is given under HOROLOGY, P. C., p. 301, is not sufficiently powerful for application to large clocks, in which the strain of very heavy weights has to be provided for; but Mr. Airy's contrivance, which he describes as 'a new construction of the going-fusee,' supplies the deficiency. Its action will be understood from the annexed diagram, *Fig.* 2, which represents

Fig. 2.



one of several forms of the apparatus shown in the illustrations of Mr. Airy's paper. In this diagram *a* represents the first wheel of the clock, which is mounted, as usual, upon the axis of the rope-barrel *b*, with a ratchet and click so arranged that the two must turn together whenever the rope-barrel is turned, by the action of the weight W, through the line *l*, in the direction indicated by the arrow; while, when the rope-barrel is turned in the opposite direction, to wind up the weight, by the action of a windlass on the axis of the wheel *d*, which engages the toothed wheel *e* on the axis of the barrel, the wheel *a* will not turn back with the barrel. *f* is the pinion which is turned immediately by connection with the first wheel *a*; and both this and the winding-wheel, or pinion, *d*, have their axes mounted in the plates of the clock-frame. The axis of the barrel and first wheel *a*, instead of being thus mounted, is attached to what may be termed a lever-frame, one side of which is seen in the cut at *g*, *h*, *i*, which is itself pivoted to the clock-plates at *h*, and to the end *i* of which the end of the line *k*, *l*, is attached, after passing under a running pulley attached to the weight W. *c* is an internal ratchet on the first wheel *a*, acted upon by the long click *m*, which has its opposite end attached to the lever-frame near its extremity *i*. While the clock is going in the ordinary way the descent of W causes that part of the line marked *l* to turn the barrel in the direction of the arrow, carrying with it the first wheel *a*, the internal ratchet of which slips under, without being affected by, the click *m*. Under these circumstances the action of the weight W (through the line *l*), and the resistance of the pinion *f*, produce a certain pressure on the lever-frame at *g*, which causes the end *i* to assume a determinate position, in which it remains without motion so long as the weight continues to descend, and consequently to draw down the line *l*; but so soon as, by the operation of winding up the clock, the pressure upon *l* ceases to operate, the stress of the weight upon the portion of the line marked *k* causes the end *i* of the lever-frame to be depressed, and the click *m*, which is connected with it, to be thrust against the internal ratchet *c* with sufficient force to maintain the action of the first-wheel *a*, which turns as it were in one piece with the lever-frame round the axis *h*, thereby producing a pressure upon the pinion *f* exactly corresponding, if the axis *h* corresponds with the point at which the strain of the line *l* is applied to the rope-barrel, to the pressure which is exerted during the ordinary action of the machine.

The machinery connected with the Exchange clock for chiming tunes upon a set of large bells in the turret has been constructed by the same gentleman as the mechanism of the clock itself; but, owing to difficulties in the tuning of the bells, it is not yet (Nov. 1845) brought into action. These chimes will be the first constructed in this country to play tunes in harmony, two or more notes being struck simultaneously upon different bells, whereas in most cases the melody is produced in single notes, without the introduction of chords, which not only requires the machinery to be more complex, but renders it necessary to bring the bells into more perfect tune than is necessary for ordinary chimes.

HORSE-RADISH. [COCHLEARIA ARMORACIA, P. C. S.]

HORSE-SHOE. [HORSE, P. C.]

HOSIERY. [WEAVING, P. C.]

HOSPITALLERS. [TEMPLARS, P. C.]

HOTTO'NIA, a genus of plants belonging to the natural order Primulaceæ. It has a 5-parted calyx, divided almost to its base; the seeds, with the hilum, close to one end; the stamens, 5, inserted and included in the tube of the corolla; the capsules many-seeded and 5-valved, with 10 teeth. *H. palustris* has the flowers whorled, stalked, and seated upon a long solitary cylindrical common peduncle, the corolla longer than the calyx, the leaves pectinated. It is a native of Great Britain in ponds and ditches, and is called the Water-Violet. The leaves are submerged and crowded; the flowers rising above the water are of a purple and yellow colour. It is a pretty plant, but possesses no useful available properties.

(Babington, *Manual of British Botany.*)

HOUBRAKEN, the name of two distinguished Dutch artists, father and son—

ARNOLD HOUBRAKEN, the father, was born of a good family at Dort, in 1660, and was the pupil of Samuel van Hoogstraten. He painted history and portrait, and executed many designs for booksellers. He lived chiefly at Amsterdam; and he visited this country and remained here eight or nine months, for the purpose of making drawings of some portraits by Vandyck, which were engraved by Van Gunst. Houbraken is, however, chiefly known for his account of the lives of Dutch painters, with portraits engraved by his son, in continuation of Van Mander—'Groote Schouburg der Nederlantsche Konstschilders en Skilderessen,' in three parts. The first and second parts were published at Amsterdam in 1718 and 1719, for the author; the third part was published in 1721 for his widow: Houbraken died in 1719.

JACOB HOUBRAKEN was an admirable engraver; in execution he has never been surpassed, and perhaps seldom equalled. He was born at Dort in 1698, and accompanied his father when very young to Amsterdam. The excellent etched portraits of painters in his father's 'Groote Schouburg' are among his earliest works, yet they are certainly some of the finest etchings in existence. The most beautiful specimens, however, of Houbraken's engravings are some of 'The Heads of Illustrious Persons of Great Britain,' published in London by the Knaptons in 1748: the excellence of some of these heads must be seen to be comprehended. Vertue was a good engraver, and executed a few of the heads in this collection; but his inferiority to Houbraken was so apparent that the Knaptons ceased to employ him on that work. Some of the heads, however, which were engraved by Houbraken, though of the highest excellence as works of art, want authenticity as portraits, as, for instance, those of Carr, Earl of Somerset, and Secretary Thurloe, which Walpole says are spurious. [VERTUE, GEORGE, P. C.] The collection is notwithstanding of great historical interest. Houbraken engraved also a great number of portraits of distinguished Dutch characters. He died in 1780.

(Van Gool, *Nieuwe Schouburg der Nederlantsche Kunstschilders*, &c.; Watelet, *Dictionnaire des Arts*, &c.; Huber, *Manuel des Amateurs*, &c.)

HOUSE. [HOUSE, P. C.] A general outline of the principal features in the construction of houses being given under BUILDING, P. C. S., and in the various articles in P. C. and P. C. S. which are referred to under that head, the sole object of this article is to supply one of the articles of the series there pointed out, which, in consequence of an accident, was unavoidably omitted under its proper title, FLOOR.

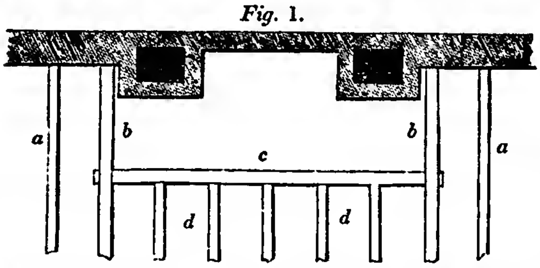
In an extended sense, the name floor is sometimes applied, collectively, to all the apartments and passages in a house upon one and the same level, in which sense it is almost synonymous with story. In a more literal sense however the floor is the level platform which forms the lower horizontal side of such apartments, and the under surface of which either constitutes or supports the upper horizontal side, or ceiling, of the apartments of the story immediately beneath it. While the external walls of a house usually afford the principal support of the floors, the internal or partition walls should be made to bear their share of the weight and strain; and where, as in the case of shops, warehouses, and public buildings, partition walls cannot be allowed, the support of the upper floors, supposing the span to be too great for being sustained by the external walls alone, may be assisted by means of brick piers or iron columns. Where, owing to the subdivision of the upper stories into smaller rooms than the lower stories, quarter partitions are fixed without any support from beneath, they may, as explained under CARPENTRY, P. C. S., p. 293, not only be so constructed as not to throw any weight upon the floor, but, if necessary, so as to assist in supporting it.

An ordinary wooden floor may be considered as consisting of two distinct parts: the actual flooring, or platform of boards upon which we tread; and the framework of timbers, commonly called the *naked* or *carcass flooring*, upon which the boards are laid, and which may be constructed in various ways, according to the strength required, and the span or width of the area to be covered. The simplest, and, under ordinary circumstances, the strongest kind of carcass flooring, or, as it is sometimes called, *floor of joists*, is that known among carpenters as a single framed floor, or, according to some writers, single flooring, which consists of a single row or horizontal tier of timbers called *joists*, or, more specifically, *floor* or *flooring joists*, which, in order to dispose their strength in the most efficient manner, are made much deeper than they are wide, the ends of which are supported upon the walls, or in some cases, where the walls are too far apart, upon stout beams called girders, which may be strengthened by trussing. To the upper edges of these joists the flooring-boards, which lie across them at right angles, are secured, while their lower edges support the laths upon which the ceiling of the room beneath is formed. The ends of the joists rest upon timbers let into the wall, called *wall-plates* [BUILDING, P. C. S., p. 248], by which the weight of the floor is equally distributed along the wall; the connection between the joists and the wall-plates being formed by cogging or cocking, or, as it is sometimes termed, *corking* or *caulking*, as illustrated under ROOF, P. C., p. 148, *Fig.* 25. Sometimes, in inferior buildings, the ends of the joists are laid immediately upon the brickwork, without the intervention of wall-plates; but such a practice is highly reprehensible, as it not only causes the stress of each joist to press on the bricks immediately beneath it, to the exclusion of those on each side, but also prevents that evenness and solidity of bearing which is necessary to keep the joists to a true level, that the pressure of the flooring-boards upon them may be uniform. Joists for a single framed floor should never be less than about two inches thick or wide, because of their liability to splitting with the operation of nailing down the boards, nor should they be much more, because, as will be better understood from PLASTERING, P. C. S., any increase in the width of their under edges interferes with the key or hold of the plaster, which arises from its passing up between, and swelling over, the laths. To remedy this inconvenience, where thick joists are used, narrow fillets may be nailed along their lower edges to receive the laths, instead of nailing the laths immediately to the joists. Such fillets are called *furrings*, and their application, either for the above-mentioned purpose, or for the purpose of rendering the ceiling perfectly flat, which a floor of joists never is, especially upon its under surface, owing to the roughness and warping of the timbers, is termed *furring-down*. *Furring-up* is the contrary operation of laying slips on the upper edges of such joists as may happen to be below the proper level, in order to produce a perfectly horizontal bed for the flooring-boards. The depth of the joists, and their distance apart, may be varied according to circumstances, the former ranging from about nine inches to fifteen, and the latter being usually twelve inches, though a distance of twelve inches from centre to centre, leaving an interval of about ten inches, is to be preferred. The strength of such a floor may be increased to any degree by increasing the depth of the joists and diminishing the intervals between them.

The buckling or twisting of the joists, by which the strength of the floor would be greatly impaired, is guarded against by the introduction between them of small diagonal struts or braces, as represented in the cut *Fig.* 2, in a subsequent column; these struts being introduced in lines or rows extending completely across the width of the floor, at right angles with the direction of the joists, and at intervals of not more than five or six feet. These struts are not commonly notched into, but simply skew-nailed to the joists, but their effect would be increased by either notching the joists to give them a proper bearing, or, without cutting into the joists, by nailing triangular fillets to them to afford abutments for the struts. In some cases solid pieces of wood cut to fit the intervals between the joists are used instead of diagonal, or, as it is sometimes called, *herring-bone* strutting; and, whatever be the form of strutting employed, it is advisable in cases where the floor will have to bear great weight to make the struts approximate very slightly to the wedge-shaped form of the voussoirs of an arch, in which case the floor may, by the addition of iron tie-rods passing through the joists, rather below the middle of their depth, be forced up into a convex form, whereby its strength will be enormously increased.

When a timber floor is carried near to a chimney or fire-place it is necessary to cut off the joists at some distance from the brickwork, to prevent the risk of fire. In such a situation the carpenter has recourse to what is termed *trimming*, which may be understood from the subjoined ground-plan of part of a floor of joists, abutting against a wall in which is a fire-place with chimney-flues in the jambs. In this cut *a*, *a* are two of the ordinary joists, the ends of which are supported in the

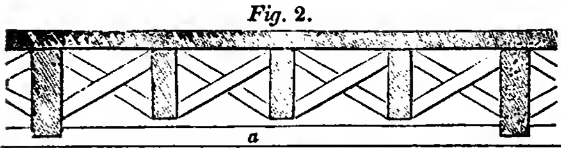
Fig. 1.



usual way upon wall-plates; *b*, *b* are two joists made somewhat thicker than the rest, on account of the extra strain thrown upon them, and called *trimming-joists*; *c* is a piece of timber called a *trimmer* or *trimmer-joist*, the ends of which are formed into tusk-tenons, which pass completely through the trimming-joists, and are secured by keying or wedging in such a way as to prevent them from separating; and *d*, *d* are the *trimmed joists*, or those which, being cut off short of the wall, have their ends supported by being framed into the trimmer. The stone slab in front of the fire-place is supported over the vacant space between the trimmer and trimming-joists by a flat brick arch, sometimes called a *brick trimmer*, turned between the wall on the one side, and a piece of wood called a *springing-piece*, which answers the purpose of what engineers term a skew-back, attached to the trimmer, on the other side. When the direction of the joists is parallel to that of the wall in which the chimney is formed, the arrangement is of course somewhat different; one strong trimming-joist then takes the place of the trimmer *c*, and two short trimmers are put in the place of *b*, *b*.

The chief objections to the use of single flooring are, that the construction offers little obstruction to the transmission of sound from one story to another, and that, for the sake of the ceiling, the joists must be made thin. Both of these defects may be in some measure overcome by the arrangement shown in *Fig.* 2, in which every third or fourth joist is made an inch

Fig. 2.



or an inch and a half deeper than the rest, and a series of slight bars called *ceiling-joists*, one of which is shown in the cut at *a*, is nailed, or notched and nailed, to these deeper joists, so as not to touch the intermediate joists, and to these the ceiling laths are nailed. By this arrangement the joists may be made of any required thickness, and the ceiling is in a great degree relieved from the injurious vibration of the floor: and the effect of the shrinkage of the joists, which would cause the ceiling to crack.

In a *double*, or more properly a *double-framed floor*, three sets or tiers of joists are used, of which the middle set, called *binding-joists*, or simply *binders*, form the real support. These reach from wall to wall, or from one primary point of support to another, at intervals which may vary according to circumstances, but are usually about six feet; and they are surmounted, at right angles with their own direction, by a series of smaller joists, called *bridging-joists*, which may, if it be important to save depth, be notched on to them, and upon which the flooring-boards are laid. Beneath the binding-joists is a set of yet smaller *ceiling-joists*, similar to those in the construction illustrated by *Fig.* 2. If it be necessary to save depth in fixing these also, care must be taken to notch only the ceiling-joists themselves, because, as should always be remembered, the fibres at the lower edge of the binding-joists (or of the flooring-joists in a single floor) are always in a state of tension, and therefore cannot be cut through without materially impairing the strength of the joist, while those towards the upper edge are in the opposite state of compression, and may consequently be cut without danger, provided that the notches made in them are filled with an incompressible substance. As, however, timber, even when well seasoned, is more compressible laterally than longitudinally, or across than along the grain, it is obviously better to avoid cutting into even the upper edge of the binders, because the bridging-joist, though it may fit the notch in the binder very tightly, will inevitably be more liable to compression than the portion of the binder which is cut away to receive it. Sometimes the ceiling-joists, instead of being fixed underneath the binders, are cut into short lengths and fixed between them, with only a sufficient degree of projection below them to keep the ceiling clear of the binders. Some builders, in such a case, mortice the ceiling-joists into the binders, employing a chase mortice at one end to allow the ceiling-joist to be slipped laterally into its place after the binders are fixed; but as the mortices cannot fail to weaken the binders, it is far better to nail projecting slips within the lower edges of the binders, and to notch the ends of the ceiling-joists so as to fit on to, and be supported by them. In either plan it is necessary to nail small pieces of wood beneath the binders to connect the ends of the short ceiling-joists, in order that the hold for the laths may not be interrupted. Bridging-joists must be distinguished from the short pieces of timber called *bridgings* which are fitted between the joists when a quarter partition is to be put up across them, to support and afford facilities for nailing down the sill of the partition.

In floors of great span, girders, which are large beams usually supported by templates let into the walls [Building, P. C. S., p. 248], or by iron columns, are used in conjunction with binding, bridging, and ceiling joists. *Girders*, which are used for longer bearings or spans than binding-joists can be trusted for, are, when of timber, made of one or more pieces according to the length required and the size and strength of timber that can be obtained; but in modern buildings they are very frequently made of cast-iron, pieces of wood being sometimes bolted along each side, to afford facilities for fitting the binding-joists, which are usually secured to the girders by tusk-tenons. By the aid of trussing, which, however, is of very doubtful value if the depth of the truss be, as it frequently is, limited to that of the beam, girders may be strengthened to any required degree, whether they be made of wood or iron. The principles upon which this is effected are explained under Trussing, P. C., pp. 318, 319, where is also a notice of Mr. Smart's suggestions for the further introduction of wrought-iron into floors and roofs.

The size or scantling of the various timbers in a double framed floor must of course vary with circumstances. Nicholson, in his 'Architectural Dictionary,' art. 'Carcase Flooring,' says that binding-joists may be about ten inches by four, bridging-joists five inches by two and a half, and ceiling-joists about three inches by two inches and a half; the intervals being from four to six feet between the binders and eleven or twelve inches between the bridging and ceiling-joists. In the article 'Naked Flooring' in the same work he gives a minute account and illustrations of plans for constructing floors with very short timbers only; but however valuable such plans may be in peculiar cases, they are, so far as the ordinary operations of the carpenter are concerned, more curious than useful.

Thorough seasoning is highly important for all the timbers of a floor, and especially so for the boards which constitute the flooring itself. For this purpose yellow deal is considered the best, especially when exposed to damp. For good work, flooring-boards should be planed and exposed to the air for at least twelve months before they are used, the reason for planing them before this exposure being that the operation of planing opens the pores and causes the sap to flow. Many builders rear up their flooring-boards against a rack formed of scaffold-poles, the boards being placed alternately on each side of the rack, with their edges presented outwards, and a sufficient space between them to allow the air to circulate freely. The chief objection to this plan, as commonly practised, is that the lower ends of the boards become damp by resting on the ground; but this is easily remedied hy the simple plan of laying a horizontal pole along the foot of the rack to support the lower ends of the planks, and securing it a few inches above the ground, either hy lashing it to the rack or propping it up with hricks. The laying of the floors should in no case be commenced until the building is covered in, and is better delayed until the windows are glazed and the plaster dry; it being very essential both to appearance and comfort that the shrinkage of the boards after they are laid should be reduced to the least possible amount. On this account, also, narrow boards are preferred for flooring, battens of seven inches wide being very extensively used. Sometimes much narrower pieces, formed by cutting planks into two or more widths, are employed, especially in superior houses, where a second planking of wide but very thin boards is laid over the principal floor as a kind of veneering or finish. An inch may be considered the least thickness which can be proper for flooring-boards, although, as shown under BATTENS, P. C., p. 42, inferior rooms are frequently laid with boards of which three are cut from a batten originally undor three inches thick. Ingenious machinery has been contrived and extensively used for the sawing and planing of flooring-boards; but such machines are frequently ohjected to as causing a considerable waste of timber, by cutting away much more, in width as well as in thickness, than it is needful to do in dressing them by hand. Hebert (*Engineer's and Mechanic's Encyclopædia*, art. 'Flooring-Machine') gives a description and representation of such a machine, invented hy Mr. Muir, of Glasgow, and which has been hrought into use in several extensive estahlishments, by which, whilo the simple planing of the surface may be performed with facility, it is also easy to saw the edges at the same time, and, if required, to cut grooves in them for the purpose of tongueing the joints.

The most common mode of laying floors is by the operation termed *folding*, the floors thus laid being termed *folded floors*. In this operation one board is first laid down and secured firmly by nailing to the joists. Another is then laid down and fastened in like manner precisely parallel with it, but at such a distance from it as barely to leave room for two, three, four, or any other determinate number of intervening boards. When, therefore, these intervening boards are laid in the place provided for them, being rather too wide for the space, they buckle up in the form of an arch. Boards arc then laid across them, and upon these boards two or three men jump until the flooring-boards are forced down flat to the joists, to which they are securely nailed. Another portion of the floor is then laid in the same manner.

The edges of the boards in a folded floor must of necessity be plain or square, and the boards must be nailed to the joists near both edges, in consequence of which it frequently happens that in shrinking they split or crack along the middle. In superior floors joints formed hy ploughing and tongueing, or by rebating and lapping the adjoining edges, are often used. Boards thus jointed may be nailed at one edge only, therehy allowing for the movement consequent upon shrinkage, without impairing the air-tight character of the floor, which is not only important for comfort, but also as a check to the progress of fire. The best floors are dowelled, and nailed at one edge only, the nails being driven in ohliquely through the edge, so as not to show at all on the surface. Some workmen insert the dowels over the joists only, and others only over the interjoists, but perhaps tho best way is to put them sufficiently close to have one over every joist, and one over every interval or interjoist. The gauge for the dowels should be run from the under surface of the board, which should be straightened for the purpose. Flooring-boards, when worked hy hand, are generally left rough on the under surface, excepting for a short distance from each edge, the intervening portion being merely smoothed with an adze at the points where the board crosses the joists, to enahle them to find a level bed. In order to force the boards of a floor laid otherwise than hy folding up to one another as close as possihle, some carpenters employ an ingenious and very efficient machine called a *flooring-cramp*, invented by Mr. Andrew Smith, and fully described, with an engraving, in Hebert's work above referred to. It consists of a lever of what is termed the second class, in which the fulcrum is at tho lower end, pivoted to an iron box made to fit and slide upon one of the joists, upon which it may be fixed at any desired point by driving a wedge. Being brought close to tho edge of a fresh-laid board, the workman seizes a handle at the end of the lever, and by drawing it towards him, forces a plate of iron with great energy against the edge of the board, and makes the joint exceedingly close. In using either this cramp, or the cheaper substitute for it called a *dog*, it is wel. to lay a loose fillet between the cramp and the edge of the board, to preserve it from injury by the force exerted. Any floor thus laid a plank at a time is said to be *straight-jointed*, as distinguished from a folded floor.

The heading-joints, or those between the ends of the flooring-boards, may be either square, bevelled, or ploughed and tongued. In dowelled floors the heading-joints must be hroken, or so arranged as not to come opposite to one another, and the same precaution is advisable in other floors also, though impossihle in a folding floor.

Flooring is measured hy the *square* of 100 square feet.

Respecting the construction of floors with special reference to safety from fire something is said under FIRE-PROOF BUILDINGS, P. C. S., p. 576. The mere circumstance of a floor being air-tight, which it can only be hy virtue of excellent workmanship and some peculiarity of construction, is a very important preservative against the spread of fire, and is also useful hy enabling the builder to introduce a current of air among the timbers hy means of iron air-hricks, without occasioning any unpleasant draught in the rooms. It is always highly important, for the preservation of the timber, to do this in the case of floors laid in a basement story, which rest upon what are termed *ground-joists* laid upon brick or stone piers or dwarf walls; and in many of the best London houses it is also done for upper floors, the air-hricks being sometimes concealed hy architectural decorations. Besides preserving the floor, the air thus admitted is sometimes allowed to enter the chimneys through the jambs for the sake of producing a good draught, while the connection with the atmosphere affords the means of ventilating the rooms beneath by concealed apertures in the ornaments of the ceiling. A method of laying floors which is adopted in some buildings of a superior character, and which is very effectual both in rendering the floor air-tight and in checking the transmission of sound through it, consists in laying a kind of secondary floor of short rough pieces of wood upon fillets nailed to the sides of the joists, about midway between their top and bottom edges, and covering it with a kind of coarse mortar called *pugging*, which is allowed to dry before the flooring-boards are laid, and upon which is sometimes laid a stratum of hroken sea-shells. This secondary floor, or *sound-boarding*, consists of thick laths, or slips of wood not exceeding an inch or an inch and a half in width, with the joists a little open, that the pugging may key to it like plaster to the laths of a ceiling. In the first-rate houses in which this plan is adopted, the floor is first laid with very narrow boards, often not exceeding two or three inches, between which, at intervals of a few feet, a small opening is left to allow the perfect evaporation of moisture from the pugging. This first floor of narrow boards, which, from their trifling width, are incapahle of warping to any serious extent, is the only one laid until the completion of the painting, and all that is likely to occasion injury to the boards, after which they are covered with a surface flooring of thin boards of superior quality, which, if it be desired in order to produce any ornamental pattern, may cross the joints of the under flooring in any direction.

Tho practice of laying wooden floors above a vaulting of hrickwork is alluded to under FIRE-PROOF BUILDINGS. This is accomplished in various ways, the joists frequently resting upon wooden sleepers laid along the crowns of the arches and the upper ribs of the iron girders from which they spring; dwarf walls or piers being raised where it is necessary to provide a level support for the sleepers. Though the spandrils may be filled up with brickwork or concrete, a space for the free passage of air should always be left between the hrickwork and the timbers of the floor. Stone floors or pavements are also noticed in the article above referred to. Under ordinary circumstances they are laid upon brick arches, hut they are occasionally laid upon timber framework. Slate pavements are occasionally used in puhlic buildings, and have been very highly recommended for the floors of warehouses. The extraordinary strength and durahility of this material, which may be safely employed much thinner than the best flagstones, render it peculiarly fit for such an application; and the facility with which, owing to its non-absorbent character, it may be cleaned by washing, has been found a great recommendation for the floors of dock-warehouses, where sugar and other things are liable to be spilt. Floors of sheet-iron have been constructed in some fire-proof huildings, the Pantechnicon, for example; but they are inconvenient from their extreme slipperyness.

In the basement story of some houses, and more especially in out-buildings, floors or pavements of bricks and tiles are used. Brick paving may be either flat or on edge, and may be laid either in dry sand, in mortar, or in cement. The better kinds of brick pavement are laid with a peculiar kind of hard brick made for the purpose, and sometimes used also in building, under the name of *marl* or *malm paviours* or *pavers*. Flat brick pavement is very fragile, and is damp from the earth upon which it is laid; but brick-on-edge pavement is in some cases superior to stone, supposing the stone to be laid immediately upon the ground. When used for beer-cellars, pantries, dairies, or stables, brick-on-edge pavement laid in dry sand is convenient from the facility which it affords for the escape of fluids spilt upon it. Some paving bricks are made to differ from common bricks in having both sides flat, and being only two inches or two inches and a half thick. A small hard kind, called Dutch clinkers, is used almost exclusively for brick-on-edge *herring-bone* pavements, in which the bricks of each course are inclined at an angle of 45° to the direction of the course; and each course is inclined in the opposite direction to the adjoining one. Square paving tiles, laid in courses like stone pavements, make a very neat-looking but not very durable pavement. Brick-and-tile pavements admit of considerable variety and ornament in the colours and disposition of the component parts, especially in connection with the use of encaustic or enamelled tiles bearing devices in several colours. [TILES AND PAVEMENTS, P. C. S.]

Floors of cement are occasionally used in fire-proof buildings over brick vaulting, the spandrils being filled up with concrete to form a level surface to receive the cement. This is occasionally done in private houses in preference to surmounting the vaulting with a wooden floor. In some places floors, even for upper stories, are formed of a kind of coarse plaster, spread upon laths or reeds. Such floors are cheap, and in some degree fire-proof, but their surface is very apt to wear into holes. Floors of tempered earth, or of various compositions of lime, sand, and ashes, thoroughly incorporated with each other and bound together by mixing with ox-blood, are also occasionally used for cottages and agricultural buildings, and may be made very durable. Floors or pavements of asphalte are noticed under ASPHALTE, P. C. S., p. 145.

(Nicholson, *Architectural Dictionary*, arts. 'Floor,' 'Carcase Flooring,' and 'Naked Flooring;' *Encyclopædia Britannica*, art. 'Building,' by Mr. Hosking; &c. &c.)

HOUSE-BREAKING. [LAW, CRIMINAL, P. C. S.]

HOUSE-LEEK. [SEMPERVIVUM, P. C.]

HOWELL, JAMES, the son of a clergyman in Wales, was born near Brecknock, about the year 1596. He was educated at Jesus College, Oxford, where, in 1613, he took his bachelor's degree, but then left the university. His father's family was numerous, and he had to shift for himself. Several men of rank having set up a patent glass-manufactory in London, Howell was appointed to be their steward or manager; and in 1619 he undertook for his employers a tour on the continent, in the course of which he visited Holland, Flanders, France, Spain, and Italy. Returning home in 1621, he was elected a fellow of Jesus College. He next travelled as tutor to a young gentleman; after which he was sent to Madrid to negotiate the restoration of a confiscated merchant vessel. His skill and activity in business had now made him well known. In 1626, after having been treated with for a diplomatic appointment, he became secretary to Lord Scrope, the president of the North, and was next year chosen to sit in parliament for the borough of Richmond. In 1632 he went to Denmark as secretary to an extraordinary embassy; and on his return he continued to be for some time unemployed, visiting Ireland to seek service under Strafford, but being disappointed by that nobleman's fall. In 1640 his diversified services were rewarded by an appointment to the clerkship of the council at Whitehall; but the breaking out of the civil war soon made his place dangerous, and in no long time deprived him of it. In 1643 he was committed to the Fleet, where he was detained till after the king's death. He was penniless, and even in debt; but, with his characteristic versatility and spirit, he set about writing for the press, by which he contrived to maintain himself, both during his imprisonment and afterwards under the Protectorate. A little flattery which he had found it convenient to administer to Cromwell was forgiven at the Restoration, when the place of historiographer royal was created as a means of providing for him. He retained this office till his death, which happened in November, 1666. He was buried in the Temple church. Howell's writings are very numerous. A few of them are in verse, the principal being his 'Dodona's Grove, or the Vocal Forest,' 1640, which he himself translated into French. But his prose works alone deserve remembrance; and of these there are not a few which either were pamphlets of temporary interest or translations of historical pieces from the French and Italian, and were forgotten even in his own time. Howell's name is preserved by the good sense, sagacity, and liveliness of his letters, which were the earliest collection of the kind published in our country. They were whimsically called 'Epistolæ Ho-Elianæ; familiar Letters, domestic and foreign, partly historical, partly political, and partly philosophical.' The first volume appeared in 1645, the fourth and last in 1655, and they have since gone through many editions.

HUCHTENBURG, JOHAN VAN, a celebrated Dutch battle-painter, was born at Haarlem in 1646. He studied with Vandermeulen at Paris, and etched some of his designs. In 1708 or 1709 he was commissioned by Prince Eugene to paint the series of battles which he and the Duke of Marlborough had gained together. Huchtenburg himself made etchings of these battles in copper: they were published at the Hague in 1725. His pictures are much in the style of Wouverman, and are scarcely inferior to the works of that master. He lived chiefly at the Hague, but died at Amsterdam in 1733.

(Van Gool, *Nieuwe Schouburg*, &c.)

HUDSON, THOMAS, was born in Devonshire in 1701. He came to London and became the pupil of Richardson the painter, and married his daughter. After the death of Jervas and Richardson, Hudson was the most successful portrait painter in London, and, notwithstanding the rivalry of Vanloo and Liotard, he enjoyed the chief business in portrait painting until the return of his pupil Reynolds from Italy, when, though he professed not to admire his pupil's innovation in portraiture, he gave up business and retired to his villa at Twickenham. Northcote describes an interview between Hudson and Reynolds in 1752, soon after the return of the latter from Italy, though he does not vouch for the fact: —Hudson called on Reynolds to see a much-talked-of head of a boy with a Turkish head-dress—it was the portrait of the Italian boy Marchi, whom Reynolds had brought with him from Italy; 'perceiving,' says Northcote, 'no trace of his own manner left,' Hudson exclaimed, 'By God, Reynolds, you don't paint so well as when you left England!' Hudson himself had also just returned from Italy: he visited Rome, together with Roubiliac. He entered Italy as Reynolds was leaving it, and the rising and setting stars of portraiture in England met on Mount Cenis in their passage over the Alps.

There is little to be said of Hudson's style: he was of the Kneller school; he made fair transcripts of his models, with little variety of posture, and not much more of costume. His masterpiece is the family piece of Charles Duke of Marlborough, now in the hall at Blenheim: many of his works were engraved in mezzotint by the younger John Faber. There is a portrait of Handel by Hudson in the Picture Gallery at Oxford, which is said to be the only portrait that the great composer ever sat for: there is a portrait by him of Archbishop Potter in the same collection. Hudson was rich and contented. He had at his villa at Twickenham a very good collection of cabinet pictures and drawings by great masters; many of the latter were purchased at the sale of Richardson's excellent collection. He survived Richardson's daughter, and married Mrs. Fiennes, a lady of fortune, and to her he bequeathed his villa. He died in January, 1779.

(Walpole, *Anecdotes of Painting*, &c.; Northcote, *Life of Sir Joshua Reynolds*.)

HUGHES, JOHN, the son of a respectable citizen of London, was born in 1677, at the town of Marlborough, in Wiltshire. He was educated in London, chiefly at a dissenting academy, where Isaac Watts was one of his fellow-pupils. His natural turn for study was encouraged by the delicacy of his health, which made his friends well pleased to obtain for him a small income in the public service. He held a clerkship in the Ordnance-office, and was secretary to several commissions issued under the great seal for improving harbours. In 1717, too late to permit him to enjoy affluence long, he was appointed by Earl Cowper to be clerk to the commissions of the peace. Several occasional poems and translations, the earliest of which, in 1697, celebrated the peace of Ryswick, introduced him to the acquaintance of Addison, Pope, and other literary men, whose liking he was well qualified to secure by his good temper and want of pretension. When Addison's critical friends, on reading the first four acts of

'Cato,' had condemned it, Hughes dissented, and insisted on its being completed; and although the author afterwards completed it himself, yet Hughes was in the first instance intrusted with that task. Hughes wrote a tragedy called 'The Siege of Damascus,' which is inserted in several modern collections, and merits its place for the excellence it possesses in language and in lofty and refined feeling. It was acted for the first time on the 17th of February, 1720, and received much applause. The author that night lay on his death-bed; and he e.pired before morning. Hughes was skilled also in music, and was frequently employed to write poetical pieces for musical accompaniment. Among his productions of this kind wore English operas on the Italian model. But his best claim to remembrance rests on his having been one of the most frequent assistants of Addison and Steele in their periodical essays. He wrote some papers for the 'Tatler' and 'Guardian;' and to the 'Spectator' he contributed eleven numbers and a good many letters, being more than the quantity furnished by any other of the minor writers, except Tickell and Budgell. He edited respectably the works of Edmund Spenser, and translated Molière's 'Misanthrope,' and Fontenelle's 'Dialogues of the Dead.'

HUMBOLDT, KARL WILHELM, BARON VON, one of the most distinguished linguists of his time, was born at Potsdam, near Berlin, on the 22nd of June, 1767, and after having received a careful education, together with his celebrated younger brother, the Baron Alexander von Humboldt, studied law in the universities of Göttingen and Jena. At Jena he formed an intimate and lasting friendship with the poet Schiller, who had great influence over him, and early turned his attention towards those studies in which he afterward rose to great eminence,—philology, philosophy, and æsthetics. Humboldt wrote at an early age several essays and memoirs, and made translations from the Greek philosophers and poets, which appeared in different Reviews in Germany; but though he was distinguished by his talents from most of his equals in age, he examined himself carefully before he entered upon any subject with a view to publish his ideas. He was thirty-three when he published his first great production, a critical essay on Göthe's poem Hermann and Dorothea: but this work at once established his fame, and it is still considered as a model of æsthetical criticism. After Humboldt had left Jena (1793) he carried on a correspondence with Schiller, which was published at Stuttgart, in 1830, and which is one of the most remarkable collections of private letters that have ever been printed. They exchanged their ideas on various topics, especially on metaphysics, poetry, and history; the letters are extremely clear and well written, and those of Humboldt are quite as interesting as those of Schiller. It is pleasant to see that these two eminent men were just towards each other with regard to their respective accomplishments and deficiencies, as will be seen from Schiller's judgment of Humboldt in another part of this article. In 1802 Humboldt was appointed resident, and a few years afterwards minister plenipotentiary at the Holy See. After his return from Rome, in 1808, he was made chief of the departments of religion and public instruction in the home ministry, but tendered his resignation two years afterwards, and for some time retired to his seat at Tegel, near Berlin, where he devoted his time exclusively to literature, till, in 1812, he was sent as ambassador to Vienna. In this capacity he took part at the Conferences of Prague in the summer of 1813, where, after long negotiations, Austria gave up her neutral position and espoused the cause of Prussia and Russia. During the campaigns of 1813 and 1814 he was in the head-quarters of the King of Prussia, Frederic William III.; assisted at the conferences of Châtillon; signed with Hardenberg the Treaty of Paris; and after the peace returned to Vienna, where he discharged the functions of minister-plenipotentiary of Prussia, together with Hardenberg, at the Congress of Vienna. The treaty of 1815, through which the King of Saxony lost one-half of his kingdom, which was given to Prussia, was contrived and signed by Humboldt. He continued his diplomatic career at Frankfort, where he made himself conspicuous through his conciliatory eloquence in the delicate business of dividing Germany among its princes, and afterwards as ambassador at the court of St. James's, which he left during a short time in order to assist at the Congress of Aix-la-Chapelle. In 1819 he was appointed minister and a privy councillor at Berlin. The retrograde policy of the King of Prussia was supported by the state-chancellor, Prince Hardenberg; but Humboldt and the ministers von Beyme and von Boyen tried to persuade the king to be faithful to those liberal principles which he had proclaimed in 1813, and especially advised him to keep the solemn promise he had given to introduce a general national representation. Unable to oppose a barrier to the king's policy, Humboldt, Beyme, and Boyen tendered their resignation, and Humboldt again retired to Tegel, where he henceforth devoted all his time to literature: he died on the 8th of April, 1835. During forty years he had enjoyed the well-deserved reputation of one of the greatest philosophers and linguists of Europe, and he was certainly an extraordinary man. The number of languages, most of them barbarous or half civilized, which he had thoroughly studied, besides the classical languages, was very great. He acquired the most difficult languages, as, for instance, the Basque, in fewer months than others would have spent years in learning them. He was equally distinguished for the views he took in comparing the development of languages with the development of the human mind, as well as in comparative grammar; and as a critic of the ideal in poetry, philosophy, and the fine arts, he had few equals in Germany. Humboldt was mediocre as a poet, and it seems he felt his inferiority in this respect, for after having published a few poems, he stopped. He left a great number of poems in MS., chiefly sonnets, most of which were afterwards published by his brother Alexander; but though they are beautifully written and of a most elegant and delicate versification, they are decidedly vague and too sentimental. Schiller, in a letter which was written when Humboldt first attempted authorship, speaks thus to his friend:—'I am convinced that the principal cause which seems to prevent your success as an author is the predominance of the reasoning faculties of your mind over the creating faculties, and consequently the preventive influence of criticism over invention, which always proves destructive to mental production. Your "subject" becomes immediately an "object" to you, although even in abstract sciences nothing can be created but by "subjective" activity. In many concerns I cannot call you a genius; yet I must avow that you are a genius in others. For your mind is of so particular a description that you are sometimes exactly the contrary of all those who are merely conspicuous through their reasoning faculties, through learning, or through abstract speculation. You will of course not attain perfection within the sphere of mental creation, but within the sphere of reasoning.' Schiller's judgment was at once frank and correct: the spirit of universal criticism was embodied in Humboldt, who, with the exception of one large work which he left unfinished in MS., composed only minor works, most of them critical essays, which he published at different periods. The greater part of them was collected by his brother Alexander, and published under the title, 'Wilhelm von Humboldt's Gesammelte Werke,' Berlin, 1841, 4 vols. 8vo.

The principal productions contained in the first volume are —Two Memoirs on the 'Bhagavadgita,' a Sanscrit poem, the first of which was first printed in the Memoirs of the Royal Academy of Berlin, and in Schlegel's 'Indische Bibliothek;' A Critique on F. A. Wolf's second edition of Homer's Odyssey, previously printed in the 'Jenaische Literatur-Zeitung' (1795); 'Rom,' a poem, first published at Berlin, 1806; 'Die Sonne' (the Sun), a poem, first published at Berlin, 1820; Twenty-five Sonnets, not printed during the author's lifetime. Those of the second volume are—'Prüfung der Untersuchungen über die Urbewohner Hispaniens vermittelst der Vaskischen Sprache' (Examination of the Researches on the Aborigines of Spain, by means of the Basque Language), first published at Berlin, 1821, 4to. This is a celebrated work, and has become the type on which many similar investigations have been modelled. Humboldt purposely went to the Basque provinces in order to learn the Basque language, and he confounded for ever the absurd theories of Laramendi and many other Basque and Spanish scholars on the origin of the Basque language, which most of them endeavoured to establish as the primitive language of mankind, and consequently of paradise. Humboldt's opinion is that the present Basques are the only unmixed descendants of the antient Iberians, and he shows that in remote times the Iberians inhabited the whole peninsula south of the Pyrenees, the southernmost part of France (Aquitania included), Liguria in Italy, and the islands of Sardinia, Corsica, part of Sicily, and the Baleares. In the time of the Romans the central part of Spain was inhabited by Celtiberians, a mixture of Celts and Iberians: the limits assigned by Humboldt to this mixed race, that is, the extent of country where the antient local names were not purely Iberian or Celtic, but mostly Celtic and Iberian compounds, correspond with those assigned to the Celtiberians by

Cæsar, Strabo, and other antient writers. In the countries inhabited by the Celtici (the southernmost part of Portugal) and tho Tamarici (Galicia), the antient names are so exclusively Celtic that the author concludes that both those nations were pure Celts. The Iberians, according to Humboldt, were of North African origin, and 'Berber' and 'Iber' are probably the same. The second volume also contains a Memoir on the Limits within which Governments ought to confine themselves in their care for the welfare of their Subjects; A metrical German translation of the 1st-6th, the 12th and 14th of Pindar's Olympic Odes; the 1st, 2nd, and 4th-9th of the Pythian Odes, among which No. 4 appeared first, with a commentary, in the 'Neue Deutsche Monatsschrift' (1795), and No. 9, with a commentary, in Schiller's 'Horen' (1797); the 4th, 6th, and 10th of the Nemean Odes; Forty-one Sonnets printed from MS., &c. The contents of the third volume are :—A metrical German translation of the Agamemnon of Aeschylus, first published, Leipzig, 1816, 4to., considered to be a masterpiece; a metrical German translation of the Choruses of the Eumenides; An Essay on the Drama in Franco, first printed in Goethe's 'Propylaeen;' Travelling Sketches from Biscay; A most interesting Memoir on Comparative Linguistic, treated historically, and first printed in the Memoirs of the Royal Academy of Berlin; Forty-two Sonnets from MS.; &c. The fourth volume contains—the celebrated critical essay on Goethe's 'Hermann and Dorothea' (268 pages), which the author first published in the first volume of his 'Aesthetische Versuche,' Brunswick, 1799, 2 vols. 8vo; An Essay on the influence of different Sexes on Organic Nature; Fifty-seven Sonnets, from MS. Humboldt's Essay on the Dual (Ueber den Dualis), Berlin, 1828, 4to., is not in this collection. During the last ten years of his life Humboldt was actively engaged in investigating the Malay and American languages; but finding the task above his strength, he abandoned the American languages to his friend Dr. Buschmann, for whom he afterwards obtained the place of chief librarian of the Royal library at Berlin, and he devoted his time exclusively to the Malay languages, on which he intended to write an extensive work. When he died, the first volume was nearly finished, and it was prepared for the press by Dr. Buschmann and Alexander von Humboldt, who published it, with a preface of his own, under the title, 'Ueber die Kawi Sprache auf der Insel Java,' Berlin, 1836, 8vo., which attracted the attention of all Europe. The greater portion of this work comprehends investigations of the progress of civilization from the continent of India towards the large islands in the Indian Sea, which he traces in the monuments, the languages, and the literature of the different Malay nations; and only a small portion is devoted to the examination of the Kawi language. The death of the author is the cause of this imperfection; but there is reason to hope that the subject will be thoroughly treated in a second volume, the materials of which he collected, but left in such a state as to require the labour of a perfect scholar before they can be published. Humboldt bequeathed all these and many other valuable materials, as well as a collection of rare MSS. and books, chiefly on linguistic, to the Royal Library at Berlin.

(*Neuer Nekrolog der Deutschen; Allgemeine Deutsche Real-Encyklopädie.*)

HUME, JAMES DEACON, born 28th of April, 1774, at Newington in the county of Surrey, was the son of Mr. James Hume, sometime secretary and afterwards a commissioner of the customs, and who was nephew of Dr. Hume, bishop of Salisbury. The subject of this notice was sent when very young to Westminster School, and in that establishment received during the head mastersships of Dr. Smith and Dr. Vincent the whole of his school education.

In 1790, when at the age of sixteen, Mr. Hume was appointed to a clerkship in the Custom House, where he soon became conspicuous for that energy of character which accompanied him through life, so that at an unusually early age he was appointed to fill an office of much responsibility in the department. It was a maxim with him, which he frequently uttered, that a man should never content himself with performing merely his own duty, but that he should at all times show alacrity in assisting every one requiring assistance, and in extending to the utmost of his ability the field of his usefulness. By carrying this maxim into his every-day practice, Mr. Hume undoubtedly secured his own advancement in life, and attained to his deservedly high reputation.

In 1798 Mr. Hume married. He had twelve children, eight of whom (daughters) lived to be women, and seven, with his widow, survived him. Shortly after his marriage he fixed his residence at Pinner, near Harrow, where he rented a considerable extent of land, and commenced practical farmer upon a large scale, not however neglecting his official duties, but giving daily attendance at his office, for which purpose he was, during a part of the year, obliged to leave home before daylight, returning to it after dark. He was always deeply interested in the science of agriculture in all its branches, and frequently in after-life referred to his practical experience as a farmer in support of those doctrines of political economy of which he became a zealous and enlightened advocate. In 1822 he was induced to relinquish his rural pursuits and again to take up his residence in London. By this time, his value had come to be highly appreciated by the government, by means of reports which it became his duty to prepare upon subjects connected with the revenue; and in the following year he was appointed to reduce into one simple code the many hundred statutes (upwards of 1500), often contradictory of each other, and not unfrequently unintelligible, which at that time formed 'the intricate and labyrinthine chaos' of our custom-house legislation. This work had become one of necessity for the guidance as well of tho government as of tho commercial world. To no other man could its performance have been intrusted with anything like the same propriety. Three of the most valuable years of his life were devoted to the task; and to the unremitting labour which he applied to its accomplishment, his friends attributed that inroad upon his bodily powers which was visible in the latter years of his life, and which, too probably, brought him to the grave sooner than with his originally excellent constitution was to be expected. The labour of the task was intense. During its progress he allowed himself no relaxation, and acquired the habit, which he afterwards continued, of working through the hours of the night and far into the morning. Of tho value of the work thus performed it is hardly possible for any one to form an adequate estimate who should not have been practically acquainted with the condition of disorder that previously accompanied an important branch of the public business, and into which the acts prepared by Mr. Hume introduced clearness, harmony, and regularity. In the eleven intelligible acts of parliament prepared under Mr. Hume's direction, and passed in 1825, everything was preserved that it was desirable to retain, while all that had become worthless in the many hundreds of repealed statutes was discarded. So intricate and confused had the laws indeed been rendered by successive patch-work pieces of legislation, that even those persons who had made it the study of their lives were often at fault in its application, and the practice of our tribunals upon this branch was frequently contradictory.

So sensible were the ministers by whom this work was intrusted to Mr. Hume of the ability with which it was performed, that he was presented by the treasury on its completion with the sum of 5000*l*. over and above the salary of his office, from the duties of which he had been relieved during the period devoted to the task; and thereafter scarcely any question of importance was decided having reference to the trade of the country without his opinion concerning it having first been obtained. So frequent did these consultations become, that a room was fitted up for his use in the office of the Board of Trade; and at length, in July 1829, his services were wholly transferred to that department, where an office was created for him as Joint-Assistant Secretary. In the performance of tho important duties thus intrusted to him, Mr. Hume used the same degree of zeal and intelligence which had marked his previous course, and which secured for him the respect and confidence of the successive chiefs of the department.

At the beginning of 1840 the inroads upon his health, caused by a long life of unremitting labour, were so apparent, that Mr. Hume's retirement from the public service became in a manner necessary. By this time he had completed forty-nine years of active service, forty-four of those years having been passed in situations of responsibility, and he was allowed to retire on a pension of the same amount as the salary attached to his office, which appears by a treasury minute presented to parliament, in which was expressed their lordships' 'full approval of his long and faithful services, accompanied by their regret that the public service would be deprived by his retirement of his great experience and of his profound and intimate acquaintance with the mercantile system of this country.' The regret thus expressed was in effect uncalled for, as on all occasions, up to the close of his life, on which his advice and experience were desirable, they were freely sought and communicated; and it is probable that at no time during his active career was he able to render more essential services to the best interests of commerce, than by the suggestions made by him after his nominal retirement, and especially by the evidence given by him before the Import Duties Committee of 1840, evidence which, having been frequently quoted with commendation by all parties in the House of Commons, has been brought forward to support measures of reform in our fiscal system proposed and carried in conformity with his recommendations.

After an illness of some weeks' duration, but from which no serious result was apprehended, Mr. Hume was seized with a stupor of an apoplectic character, and two days thereafter died, on the 12th of January, 1842, in the sixty-eighth year of his age.

Although Mr. Hume may be almost said to have lived with the pen in his hand, he published but little, the object of his labours being for the most part confined to the preparation of official papers, which may, nevertheless, have exercised a greater influence upon society than could have followed from the publication of his opinions. He wrote several papers upon subjects connected with commerce, which appeared from time to time in the British and Foreign Review. One of these papers, on the timber trade and duties, may be said to have exhausted the subject. He is better known as the author of a series of letters which, under the signature H. B. T., appeared first in the 'Morning Chronicle' and have since been collected, and more than once reprinted. These letters contain, within a very small compass, the most admirable and unanswerable arguments for various changes in our fiscal system, many of which have since been carried out, while others are evidently on the eve of adoption. Mr. Hume's style partook of the characteristics of his mind, which was vigorous and original.

In the private relations of life, Mr. Hume was remarkable for the most perfect sweetness of temper. With fewer of human weaknesses than are usually found to accompany even the more correct among us, he was ever indulgent to the failings of others; just in his dealings; true to his promises; with a largeness of generosity that, as such things are usually measured, ran beyond his means, and that was ever attended by the most scrupulous delicacy towards those who were its objects. His attachments were strong and stable, and he was the object of the most earnest affection to all who enjoyed the privilege of his close acquaintanceship.

HUMIDITY is that property of a substance by which it communicates to a body in contact with it some of a liquid which it may have absorbed; and the term is commonly applied to the atmosphere when it is in a state to deposit moisture upon bodies in it.

The humidity of the atmosphere is caused in a great measure by the evaporation of water from the seas, lakes, &c. of the earth; and the quantity of moisture which a volume of air is capable of containing depends upon the temperature: when the latter is low at any part of the earth's surface, the air may be saturated with moisture so as to be incapable of holding any more, but the quantity of moisture in a given volume will then be small. If the temperature be increased, the atmosphere, becoming thereby comparatively dry, acquires immediately the power of receiving more vapour, and the power increases with the temperature, so that, in a given volume of air, the quantity which consists with the state of saturation is also increased. Whatever be the quantity of vapour which constitutes the state of saturation, if the temperature be suddenly lowered, or if there be presented a body which has an affinity for water, a precipitation of the latter takes place, or water becomes absorbed in the body. [Dew, P. C.; Rain, P. C.]

The temperature of the atmosphere over any place on the surface of the earth diminishes as the distance of the stratum of air from the surface increases: the power of the air to hold vapour diminishes accordingly; and, as a general law, it may be stated that the humidity of the atmosphere decreases from the surface of the earth upwards. The great dryness of the atmosphere near the summits of mountains has been frequently remarked by travellers, but the quantity of moisture in the different strata is, from local influences, subject to many irregularities. The temperature of the lower strata of the atmosphere diminishing as the latitudes of places on the earth increase, a given volume of air, as a cubic foot, when completely saturated, will contain less water as a station is farther from the equator; and the like may be said of the entire column of the atmosphere over a station. This may serve to account for the fact that, in general, the weather becomes fine when the mercury rises in the tube of a barometer; for then, by the increased density of the air, the clouds are made to ascend in the atmosphere to a region where, the dryness being great, they are readily dissipated. On the contrary, when the mercurial column diminishes in length, the clouds descend; and arriving near the earth, they enter a region in which the atmosphere is at or near the state of saturation; when, consequently, the vapours are easily precipitated. Biot observes, on this subject, that the descent of the mercury is a more certain prognostication of rain than its ascent is of fair weather; the ascent of the clouds in consequence of an increased density of the air not being necessarily accompanied by their dispersion. From the agitation produced by high winds, the upper regions of the atmosphere are often charged with aqueous vapour; and rain may then fall while the top of the column of mercury is above its mean height, and even while it is rising in the tube.

The atmosphere often becomes humid from the evaporation of liquids by artificial means. In establishments for brewing, dyeing, and the like processes, the vapours produced from liquids which are constantly in a state of ebullition rise in the atmosphere, and even render it opaque. The breathing of men and animals produces a watery vapour which renders the atmosphere humid; and when a number of persons are assembled in a close apartment the humidity is sometimes so great that water flows down the walls. The leaves of plants also discharge, in the form of vapour, the water which is imbibed by the roots; and in conservatories this effect is particularly sensible.

In order to determine the quantity of water which is contained in earth when completely saturated with rain, Dr. Dalton took a quantity of garden mould, on which rain had fallen copiously during the preceding day, and exposed it to different degrees of heat. When it seemed to have about the same degree of moisture as soil at the depth of two inches from the surface in dry summer weather, he weighed it, and found that it had lost one-twelfth of its weight; and when it had lost two-ninths of its weight it seemed like the upper soil in summer. His conclusion is that a body of earth one foot in depth, when saturated with moisture, contains seven inches in depth of water, and that it may lose one-fourth or one-half of that quantity without becoming incapable of supporting vegetation.

The effects of humidity on the dimensions of bodies are various: when a watery vapour penetrates between the twisted fibres of cordage, which are vegetable materials, the cordage swells out transversely, and thus becomes shortened; while cords made of animal substances become relaxed by humidity and increase in length. Most salts absorb water, and thereby increase in weight.

HUMIRIA'CEÆ, a natural order of plants belonging to the syncarpous group of Polypetalous Exogens. It has the following essential character:—the calyx is in 5 divisions; the petals alternate with the lobes of the calyx and equal to them; the stamens hypogynous, 4 or many times as numerous as the petals, monadelphous; the anthers 2-celled, with a fleshy connective, extended beyond the 2 lobes; the ovary superior, usually surrounded by an auricular or toothed disk, 5-celled, with from 1 to 2 suspended ovules in each cell; the style simple, the stigma lobed; the fruit drupaceous, with 5 or fewer cells; the seed with a membranous integument, the embryo straight, oblong, lying in fleshy albumen; the radicle superior. The plants belonging to the order are trees or shrubs abounding in a resinous juice, with alternate, simple, coriaceous exstipulate leaves, and axillary corymbs of flowers.

The affinities of this order are not well made out. In their albuminous seeds and slender embryo they agree with Styraceæ, as also in their balsamic wood. They resemble Meliaceæ very much in habit and in their fructification, but the anthers and seeds of Humiriaceæ differ very much from those of Meliaceæ. Von Martius compares this order with Chlenaceæ, whilst Lindley thinks that their real affinity is with Aurantiaceæ; 'an affinity,' he observes, 'indicated by their inflorescence, the texture of their stamens, their disk, their winged petioles, and their balsamic juices.' There are three genera belonging to this order, *Humirium*, *Helleria*, and *Sacoglottis*.

Humirium (from *Oumiri*, the Guyanese name of one of the species) has 20 stamens joined into a tube, the alternate ones shortest, ciliated above, an annular disk 20-lobed, the stigma 5-lobed, the fruit containing a 5-celled nut, the cells 2-seeded. One of the species, *H. balsamiferum*, is a tree forty feet in height, with ovate oblong leaves half-clasping the stem, with a decurrent nerve on the back, the inflorescence longer than the leaves, the peduncles smooth as well as the petals This tree is a native of Guyana and Cayenne. Its bark is thick, and abounds with a red balsamic fluid, which resembles styrax in smell; after it has exuded from the tree it becomes hard and transparent, and when burnt affords an agreeable odour. The negroes and natives of Guyana use the bark in slips for the purpose of flambeaux; they also use the wood in building their houses. We have no account of the composition of this resinous juice, but Aublet suggests that it might be used as a substitute for the Peruvian balsam. The Creoles call this tree 'Red-wood,' on account of the colour of the wood. The other species of Humirium, and also those of Helleria and Sacoglottis, yield resinous juices.

(Lindley, *Natural System*; Burnett, *Outlines of Botany*; Don, *Gardener's Dictionary*.)

HUNGARY. Among the kings of Hungary there are three of the name of Andrew, or Andreas, who deserve a short notice.

ANDREW I., the son of Prince Ladislaus the Bald, and the fourth king of the house of Arpad, reigned from 1046 till 1061. His predecessor, King Peter, in 1045, had offered Hungary as a fief to the Emperor Henry III. of Germany; but Andrew refused to take the oath of vassalage, and after a protracted war with the emperor, made a peace with him, in 1052, through which all feudal ties between Hungary and the empire were abolished. During the reign of this king the majority of the Hungarians were still pagans; but Andrew succeeded in introducing the Christian religion throughout his kingdom. Andrew fell in a battle with his brother Bela, who succeeded him on the throne.

ANDREW II., surnamed Hierosolymitanus, was the son of King Bela III.: he succeeded his elder brother Emeric in 1205, and reigned till 1235. During his long reign Hungary was shaken by disturbances and civil and foreign wars, caused by the reckless and ambitious character of Andrew, whose passions however were more violent than strong. Previous to his accession he waged war with his own brother Emeric, and raised a numerous army. They were encamped in sight of each other, when Emeric, a noble minded man, who knew that the partisans of Andrew followed him only through fear, went alone and unarmed, with only a white staff as the symbol of peace in his hand, to the camp of the rebels. When he was in sight of them, 'I shall see,' said he, with quiet dignity, 'whether you will shed royal blood.' None of them dared to stop him, and he thus surprised his brother Andrew in his own tent, and after having reproached him for his conduct, prevailed upon him to submit without making even an appeal to his followers. In this way Emeric carried Andrew from the midst of his own army, and kept him in prison till 1204, when Emeric, feeling his end approach, ordered Andrew to be brought before him, and appointed him guardian of his son Ladislaus, who was a minor. After Emeric's death, Andrew seized the royal authority and reigned in his own name, and fortunately for Hungary, the young Ladislaus died in 1205, so that Andrew became legally possessed of the supreme power which he had usurped. Andrew was a slave to his beautiful but ambitious queen Gertrud, a princess of Meran, whose conduct became so unsupportable that the principal Hungarian nobles conspired against her life, and during the absence of Andrew in Galicia, in 1213, they surprised her and put her to death. The conspirators were headed by the Magnate Banco, whom the queen had mortally offended; for in order to take revenge for a slight offence which she pretended to have received from Banco's wife, who was famed for her beauty and virtue, she prevailed upon her brother Berthold to violate the person of this lady, and she afforded him an opportunity of effecting his purpose in the queen's own apartments in the royal palace. In 1217 Andrew undertook a crusade, and made himself conspicuous in Palestine through his gallant deeds, but his final success was trifling, and he returned in 1222: thence he was called 'Hierosolymitanus.' Andrew took an important part in the Byzantine affairs of his time. After the death of the Latin Emperor of Constantinople, Peter of Courtenay, in 1217, the crown of Greece was offered to Andrew, who however declined it, and, in 1218, made a treaty of alliance with Theodore Lascaris, the Greek Emperor of Nicæa, who gave his daughter Maria in marriage to Andrew's eldest son Bela. When Andrew returned from Palestine, he found this prince at the head of an army of rebels, and his kingdom disturbed by a civil war. The power of the nobles was so great that in the diet in 1222, which Andrew convoked immediately after his return, they forced the king to subscribe the 'Aurea Bulla,' or 'Golden Bull,' which has justly been compared with the English Magna Charta, and by which great privileges were given to the Hungarian nobles, while the royal authority was curtailed. This Aurea Bulla is still the charter and fundamental law of the kingdom of Hungary and its appurtenances. During the following years Hungary continued to be shaken by civil factions, which the king was unable to quiet, since his natural abilities and his good will were not supported by sufficient steadiness of character. Andrew II. died in 1236, and was succeeded by his eldest son Bela IV.

ANDREW III., the son of Prince Stephanus, who was the posthumous son of King Andrew II., succeeded King Ladislaus IV. in 1290. His short reign of ten years was signalized by civil disturbances and foreign wars. Andrew compelled Duke Albert of Austria to give up his claims upon Hungary, with which he pretended to have been invested by his father the Emperor Rodolph I. of Germany; whereupon the two princes joined against Charles Martel, Prince of Naples, who founded his claim to the Hungarian crown upon his descent from Maria the sister of the late king Ladislaus IV. Charles Martel having died before he was able to prepare an expedition against Hungary, his case was taken up by his son Charles Robert, who, having found support among a powerful faction of the nobles and the clergy of Hungary, entered that country in 1300, and took the field against Andrew. The failure of the royal arms against the invader preyed upon the mind of Andrew, and he died through grief in the same year. Andrew III. was the last king of the house of Arpad, the founder of the Hungarian kingdom: and his successor, the fortunate Charles Robert, was the first king of the Anjou or Neapolitan dynasty which reigned over Hungary during nearly a century.

(Mailáth, Count of, *Geschichte der Magyaren*; Pray, *Historia Regum Hungariæ*.)

HUNTINGTON, ROBERT, D.D., was born in February, 1636, at Deorhyrst, in Gloucestershire, where his father, of the same names, was parish clergyman. After having received the rudiments of a classical education at the free school of Bristol, he was admitted in 1652 a portionist of Merton College, Oxford; and, having taken his bachelor's degree in 1658, he was soon after elected to a fellowship in that college. He took his degree of Master of Arts in 1663; and, having then applied himself with great success to the study of the Oriental languages, he was in 1670 appointed to the situation of chaplain to the English factory at Aleppo. This post he held for above eleven years, during which time he visited Jerusalem, Galilee, Samaria, Cyprus in 1677, and Egypt in 1680, and again in 1681, besides making an unsuccessful attempt in 1678 to reach Palmyra. He returned home in 1682, through Italy and France, and, resuming his college life, accumulated the degrees of bachelor and doctor in divinity in June of the following year. In the latter part of that year he was prevailed upon with much reluctance to accept the place of provost or master of Trinity College, Dublin; but, after first taking flight on the invasion of Ireland by the deposed king after the Revolution, and then returning to that country for a short time, he resigned in 1691, and once more came over to England. In August, 1692, he was presented by Sir Edward Turner to the rectory of Great Hallingbury in Essex; and while here he married a sister of Sir John Powell, one of the justices of the King's Bench. He seems still, however, to have felt uncomfortable in what he describes in some of his printed letters as a rustic solitude, where he was banished alike from books and friends, from the living and the dead; and, although he had some years before refused the bishopric of Kilmore in Ireland, his aversion to that country gave way so far that in 1701 he consented to accept of that of Raphoe. But he died there on the 2nd of September in the same year, twelve days after his consecration.

The only literary performance that Bishop Huntington published was a short paper in the 'Philosophical Transactions' (No. 161), entitled 'A Letter from Dublin concerning the Porphyry Pillars in Egypt.' The writer of his Life in the 'Biographia Britannica' states that some of his observations are printed in Ray's 'Collection of curious Travels and Voyages,' 2 vols. 8vo., 1693; but all which that work contains is the Letter on the Porphyry Pillars, which is in volume ii., pp. 149-155. At the end of the reprint is a notice extracted from the 'Journal des Sçavans' (No. 25, A.D. 1692), of a letter from M. Cuper to the Abbé Nicaire, intimating that he had just heard from Aleppo 'that some English gentlemen, out of curiosity going to visit the ruins of Palmyra, had found 400 marble columns, of a sort of porphyry, and also observed some temples yet entire, with tombs, monuments, Greek and Latin inscriptions,' of all of which he hoped to get copies. This would probably be the earliest information received by the English public of the successful accomplishment of the first modern journey to Palmyra, which was achieved by some gentlemen of the factory at Aleppo in 1691, and of which a full account was given in the 'Philosophical Transactions' for 1695. Ray's book may have been printed in the latter part of 1692, though not published till May, 1693, on the 3rd of which month the imprimatur is dated.

Dr. Huntington is principally remembered for the numerous Oriental manuscripts which he procured while in the East and brought with him to this country. Besides those which he purchased for Archbishop Marsh and Bishop Fell, he obtained between six and seven hundred for himself, which are now in the Bodleian Library, to which he first presented thirty-five of them, and then sold the rest in 1691 for the small sum of 700*l.* Huntington, however, missed what was the principal object of his search, the very important Syriac version of the epistles of St. Ignatius, a large portion of which was at length recovered in 1843 by Mr. Tattam from one of the very monasteries in Nitria which Huntington had visited in the course of his inquiries, and, having been deposited by him in the British Museum, has been published in the present year under the care of the Reverend William Cureton, keeper of the Oriental manuscripts in that establishment. Several of Huntington's letters, which are addressed to the Archbishop of Mount Sinai, contain inquiries about the MS. of St. Ignatius; and the same earnest inquiries are made in his letters to the Patriarch of Antioch.

There is a Life of Bishop Huntington, in Latin, by Dr. Thomas Smith, at the end of which are thirty-nine of his Letters, all in Latin, published in 8vo. at London, in 1704; and he is the subject of an article in the 'Biographia Britannica.'

HURA, a genus of plants belonging to the natural order Euphorbiaceæ. It has monœcious, amentaceous flowers; the staminiferous flowers with the calyx truncate; the stamens united into a solid column; the pistiliferous flowers with the style single, and the stigma with 12-18 rays, and the capsule with 12-18 cocci. *H. crepitans* is a tree abounding with milky juice. It is a native of the West Indian Islands, Mexico, and Guyana, where it is called 'Sandbox,' or 'Monkey's Dinner-Bell.' It has cordate, acuminate, entire or very slightly toothed, stalked, smooth, coriaceous leaves, with simple veins passing from the midrib to the margin in a curved direction, within a quarter of an inch or so of each other, and connected by numerous oblique veinlets; large, ovate, leafy, deciduous stipules, and petioles as long or rather longer than the leaves, with 2 glands at the apex. The fruit of this tree is a depressed umbilicated woody capsule, about the size of a middling apple, with from 12-18 furrows which separate into as many cocci; each of these separates into 2 valves, and flies asunder with great elasticity when dry and fully ripe. The noise the fruit makes during this process has obtained for the tree its common names. The juice of the plant, like that of the allied genus Excæcaria [EXCÆCARIA, P. C. S.] is exceedingly acrid, and a small quantity touching the eye will produce blindness. The seeds, like those of Croton and Ricinus, contain an acrid oil which is a drastic and dangerous cathartic.

(Lindley, *Flora Medica*; Burnett, *Outlines of Botany*.)

HURRAR, called also *Harrar* and *Adhari*, is a country with a large commercial town in the eastern part of Africa, and situated between Ankober, the capital of Shoa [ABYSSINIA, P. C. S.], and the harbour of Burburah. As the place has not been visited by Europeans, its true situation is not known, and our information about it is derived from the accounts of some natives of the adjacent countries.

According to these accounts, the town is so large that it takes two hours to go round it at a quick pace. It is surrounded by a wall of stone and mud, which is about twelve feet high and three feet thick, and kept in good repair. There are five gates. The houses are generally built of stone and whitewashed, with flat roofs. There are however some few huts resembling those in Shoa. The emir and the principal inhabitants have houses of two stories. There are said to be many mosques within the town, forty-four of which are the abodes of learned men. The town is well supplied with water from numerous springs in its vicinity. Close to the town is a river called Sambi

The inhabitants are rigid Mohammedans, and pay strict attention to the fasts and ceremonies enjoined by that religion. According to D'Abbadie there is a law in force which prohibits any white man, that is, any Turk or European, from entering the town; but this is very doubtful. The population must be large, as the houses are said to be built very close together. The principal occupation of the people is that of tilling the soil, which for several miles around is highly cultivated, producing coffee, wheat, jowari, barley, and a variety of fruits and vegetables. The *kaat* (a small plant, the leaves of which are said to possess an intoxicating quality, and of which the Arabs in Yemen, where it is also found, are exceedingly fond) is said to be very abundant. The ground is irrigated by artificial means from numerous springs. Coffee is the most important article produced; at least 2000 bales are annually exported to the sea-coast, to the ports of Burburah and Zeila, and thence to Arabia, where it is mixed with that of Mocha, which is improved by it. It is said to differ from that of Arabia, the fruit being a large flat berry. A few families are occupied in manufacturing industry. There are weavers, blacksmiths, and gold and silver smiths. The lances made in Hurrar are in high estimation.

Hurrar may certainly be considered, for that country, a great commercial town. Kafilas arrive there or depart at all seasons. The principal are those which pass between Hurrar and Burburah and Zeila, which two last-mentioned places may be considered as the ports of Hurrar. Three kafilas depart for Burburah between the months of October and March. That of March is the largest, and consists usually of 2000 camels. They export coffee, jowari, ghee, ostrich feathers, gum, myrrh, and *wur;* the last-mentioned article is like saffron in appearance, and is used by the Arabs as ointment for cooling the body; it is also mixed up with flour and made up into cakes, which are said to be very palatable. They export also to Burburah slaves, both male and female, and receive in return blue and white coarse cloth, Indian piece goods, European prints, silk, silk-thread, red cotton-yarn, beads, zinc, copper-wire, frankincense, and some smaller articles. There are also annually three kafilas to Zeila. The imports are the same as those from Burburah, but the exports are increased by some articles, as wheat, millet, beans, &c.

Smaller kafilas depart almost every month to Shoa, except during the rainy season. They chiefly export articles obtained from Burburah and Zeila, especially blue cloth, red cotton-yarn, &c., and receive in return slaves, mules, and horses. Other kafilas trade between Hurrar and Arusic and Chercher, two towns or encampments of the Galla, situated west and south-west of Hurrar; the articles of export and import are imperfectly known.

The climate of Hurrar is said to be similar to that of Shoa, but not quite so cold. The language bears an affinity to the Amharic [ABYSSINIA, P. C. and P. C. S.], but the Arabic character is used in writing. The ruler of Hurrar has the title of Emir, and the succession is hereditary. He is frequently at war with the Galla tribes which surround his country, but he keeps them in check by a small force armed with matchlocks, as the Gallas have a great dread of fire-arms.

(Barker, *Report on the probable Geographical Position of Hurrar*, in *London Geographical Journal*, vol. xii.; Christopher, *Account of the North-East Coast of Africa*, in *London Geographical Journal*, vol. xiv.; D'Abbadie, *Letter;* Rigby, *Remarks on the North-East Coast of Africa*, in the *Transactions of the Bombay Geographical Society*, vol. ii.)

HUSKISSON, WILLIAM, was born March 11, 1770, at Birch Moreton Court, Worcestershire, where his father occupied an extensive farm. The family had long been settled in Staffordshire, and for several generations had been in the possession of a moderate landed estate on which they resided. On the death of his mother, in 1774, his father removed into Staffordshire, married a second wife, and resided upon his patrimony until his death in 1790. He had alienated a considerable portion of his property in order to make provision for his younger children. The entailed property descended to the subject of the present notice, who cut off the entail and disposed of the landed property altogether.

In 1783, when in his fourteenth year, William Huskisson was sent to Paris, at the request of his maternal uncle, Dr. Gem, physician to the English Embassy. Dr. Gem was on terms of intimacy with Franklin and Jefferson, and the party known as the 'Encyclopædists.' William Huskisson, as was natural to a young man, became an enthusiast in the cause of the French Revolution. He was present at the taking of the Bastile in 1789, and became a member of the 'Société de 1789,' established in 1790. The object of this club was to sustain the new constitutional principles. His connexion with it led to the charge which was often brought against him of having been a member of the Jacobin Club. In August, 1790, he pronounced a 'Discours' at the 'Société de 1789' against the proposed creation of paper-money to a large extent, which obtained for him at the time considerable celebrity in the French capital. He withdrew from the 'Société' after the legislature had determined upon the issue of assignats. In the same year (1790) he became private secretary to Lord Gower (afterwards the Marquis of Stafford), who was then the English ambassador. A letter dated a few days after the attack on the Tuileries on the 20th June, 1792, shows that Mr. Huskisson's views respecting the Revolution had undergone a change. After the events of the 10th of August, 1792, the English ambassador was recalled, and Mr. Huskisson returned with him to England. He continued to pass the greater part of his time with Lord Gower at Wimbledon, where he often met Mr. Pitt and Mr. Dundas. In January, 1793, by desire of Mr. Dundas, he undertook the duties of a small office which had just been created for investigating the claims of French emigrants who were then thronging in crowds to England. Early in 1795 he was appointed under-secretary of state in the department of War and Colonies under Mr. Dundas. In this situation he soon became distinguished by his talents for business. In the 'Biographical Memoirs,' attached to the edition of his 'Speeches,' it is stated that he was often called to the private councils of Mr. Pitt. He conducted the equipment of Sir Charles (afterwards Earl) Grey's expedition to the West Indies. Towards the end of 1796 he was brought into parliament as member for Morpeth, by the Earl of Carlisle; but he does not appear as a speaker before February, 1798. On the retirement of Mr. Pitt he resigned his official situation. He was unsuccessful in procuring a seat at the general election in 1802, and did not appear again in Parliament until 1804, when he sat for Liskeard. He was secretary of the Treasury under the administration formed by Mr. Pitt in 1804; and after the death of that minister, and during the Whig administration of 1806-1807, he was an active member of the opposition. At the general election in 1806 he was re-elected for Liskeard; and after the dissolution of parliament in 1807 he sat for Harwich, and continued to do so until 1812. From this period until 1823 he represented Chichester, in which neighbourhood he had, in 1801, purchased a small estate. From 1823 until his death he represented Liverpool. On the retirement of the Whigs from office, in 1807, Mr. Huskisson resumed his former post as secretary of the Treasury. In 1807 he was strongly invited by the Duke of Richmond, then viceroy of Ireland, to become chief secretary; but his services could not at the time be dispensed with in the office he already filled. He resigned office in 1809, along with Mr. Canning, when the latter left the ministry on account of differences with Lord Castlereagh. He refused from motives of friendship and personal attachment to accept any official appointment during Mr. Canning's exclusion from power; and it was not until Mr. Canning accepted the post of ambassador at Lisbon, that Mr. Huskisson again entered the public service. In August, 1814, he was appointed Chief Commissioner of Woods and Forests. In 1823 he became President of the Board of Trade, and Treasurer of the Navy. His predecessor had been a cabinet minister, and Mr. Huskisson considered that his position entitled him to the same distinction, and after some delay, occasioned by the cabinet already consisting of a larger number than usual, he became one of its members. After the death of Mr. Canning, in 1827, Mr. Huskisson held the office of secretary for the Colonies in Lord Goderich's cabinet; and he retained his post when this cabinet was broken up and the Duke of Wellington became the head of a new ministry. He had to defend himself for remaining in office after his friends in the former cabinet were excluded from power; and he did so on the ground that the measures to which he was more particularly pledged would be followed up by the then existing administration. On the 19th of May, 1829, the debate on the East Retford Disfranchisement took an unexpected turn, and Mr. Huskisson was called upon to redeem a pledge which he had given in a former discussion on the question; and he accordingly voted in favour of the bill and in opposition to his colleagues. After the debate, at 2 A.M. he wrote a note, as a matter of delicacy and courtesy to the Duke of Wellington, the head of the cabinet, placing his resignation in his hands. Without any communication with Mr. Huskisson, the duke laid it before the king. In the correspondence which ensued it is evident that the Duke of Wellington was desirous of getting rid of Mr. Huskisson. He had once before voted against his ministerial colleagues, in opposing, in 1822, Lord Londonderry's resolutions for relieving the agriculturists; but at the request of Lord Liverpool, the prime minister, he remained in office. The resignation of Mr. Huskisson was followed by that of Lord Palmerston, Mr. Grant, and several others who had belonged to what was called 'Mr. Canning's party.' In the session of 1830 he appeared on several occasions as a formidable opponent of some of the measures of the government, and, but for his death so soon afterwards, there is every probability that he would have become a member of the Whig cabinet. His commercial principles were held by him in common with them, and in his general views he was approximating towards the Whig party. He had always been in favour of the Catholic claims, and in opposing the repeal of the Corporation and Test Acts, he did so on the ground of its being a partial measure, and likely to retard Catholic emancipation. He supported in May, 1829, Mr. Grant's bill for relieving the Jews of their disabilities. He had left the ministry for having supported a measure of reform, and in the same session he had voted in favour of giving representatives to Manchester, Leeds, and Birmingham.

In parliament Mr. Huskisson seldom spoke except upon financial or commercial subjects. He was an active member of the Bullion Committee, and defended the principles in the Report of that committee in a pamphlet entitled 'The Question concerning the Depreciation of our Currency stated and examined,' which was published in 1810. In the debates on the corn laws, in 1814, he supported the system of protecting agriculture by high duties, on the ground that commerce and manufactures were similarly protected, and that our whole system was one of artificial restraints. He was at that time merely for free trade in the abstract. He alluded to the possibility of imported corn becoming one-fifth, instead of one thirty-fifth of our consumption, if proper means were not taken to encourage the home cultivation. He was averse to the country being dependent on foreigners, and thought such a circumstance might be used to the injury of its interests. He proposed a sliding scale of duties, according to which the duty would be 24*s.* 3*d.* when the average price of wheat per quarter was 63*s.*; and as the price rose the duty would fall, so that at 86*s.* there would be no duty at all. Corn from the colonies he would have admitted at one-half the rates of foreign corn. The question was postponed to the following year, and he supported the corn-bill of 1815, and thought that less than 80*s.* as a protecting price would not remunerate the farmer. In the session of 1822 he moved a series of resolutions on the state of agriculture, one of which proposed that when wheat should again reach 70*s.* the quarter, a fixed duty of 15*s.* should be permanently charged on the importation of foreign wheat. The experience of the last twenty-five years does not prove the profoundness of Mr. Huskisson's views on this subject. In 1827 however he acknowledged that the policy of the corn-laws must be viewed in relation to the changes in the growth and price of corn abroad as well as at home; and he abandoned the corn-bill which had been brought in by the government, after the Duke of Wellington had carried an amendment the effect of which would have been to prohibit the release of bonded wheat so long as the price should be less than 63*s.* the quarter. In 1819 he was appointed a member of the Committee of Finance. It is understood that he was principally concerned in drawing up the long Report of the Committee of Agriculture which sat in 1821. It advocated a relaxation of the corn-laws, for which he was never forgiven by the landed interest. In 1822 Mr. Wallace and Mr. Robinson (now Earl of Ripon) had taken some preliminary steps for relaxing restrictions on commerce; and these efforts were carried on more actively and on a larger scale by Mr. Huskisson. In 1823 he carried through parliament an act for enabling the king in council to place the shipping of foreign states on the same footing with British shipping, provided that similar privileges were given to British ships in the ports of such states. He abandoned the old restrictive system of colonial trade, and, under certain regulations, threw open the commerce of the colonies to other countries. He reduced a great number of duties which had been imposed for the protection of the home produce. The shipowners, and the silk manufacturers, and a host of other interests were now in arms against him. They represented him as a cold and heartless theorist, and he was attacked very generally, both in and out of parliament, for his departure from the antient commercial policy of the country. His speeches in Parliament in defence of his measures are his best; and his expositions of the commercial condition of the country always excited great interest. Sir H. Parnell (Lord Congleton) has denied that Mr. Huskisson established free trade, but he states that in his speeches in 1825 he certainly proclaimed and proved the policy of this system. He adds—'He did no more than strike a balance between the free-traders and the prohibitionists in taking a duty of 30 per cent. as the standard of regulation;' and hints, that had he ever thoroughly espoused the cause of free trade, he would not have thrown away as he did the opportunities he had of making improvements in his plan of 1825. (*Financial Reform*, p. 73.) But even the reforms which he did effect excited great clamour and opposition; and the advantages of the changes he had effected were not recognised until some time afterwards. Mr. Huskisson was active in procuring the repeal of the combination laws; and he relaxed the restrictions on the exportation of machinery.

At the close of the session of 1830 Mr. Huskisson left London to be present at the opening of the Liverpool and Manchester Railway, on the 15th of September. When the train reached Parkside, near Newton, he got out of the carriage with many others, and had just been speaking to the Duke of Wellington, when an alarm was raised on the approach of an engine on the other line. Mr. Huskisson attempted to regain his seat, but fell to the ground at the moment the engine passed, and was dreadfully injured. He was conveyed to the house of the Rev. Mr. Blackburne, of Eccles, but the shock to the system was so great, that after enduring great agony with much fortitude and resignation, he died at nine o'clock the same evening. At the request of a large and influential portion of the mercantile classes of Liverpool his remains were interred in the new cemetery, where a handsome monument with a statue was erected to his memory by his constituents.

Mr. Huskisson was married in 1799 to the youngest daughter of Admiral Milbanke, but had no family. On retiring from office in 1828 he entered upon the receipt of one of six pensions of 3000*l.* a year, which the Crown was empowered to grant for long public services. He was nominated for this pension by Lord Liverpool shortly before his political demise. He was for many years Agent for Ceylon, the salary of which was increased from 800*l.* to 1200*l.* a-year: he resigned this post when appointed to the Board of Trade in 1823.

(*Speeches of the Right Hon. W. Huskisson, with a Biographical Memoir*, 3 vols. 8vo., London, 1831.)

HUTCHINSIA. [Thlaspideæ, P. C.]

HUTTON, WILLIAM, was born at Derby, of poor parents, September 30th, 1723. By frugality, industry, and integrity he raised himself to opulence and eminence. It has been said of him that 'in many particulars of energy, perseverance, and prudence he deserves to be called the English Franklin.' At the age of seven he was sent by his father to work in the silk-mill at Derby, which occupation he quitted at seventeen, and was bound apprentice to an uncle at Nottingham, who was a stocking-maker. He ran away during his apprenticeship, and wandered as far as Birmingham, the town in which he subsequently acquired a fortune; but distress compelled him to return to his uncle. The poor remuneration which he obtained for his labours at the stocking-frame induced him to look anxiously towards some other means of gaining a livelihood; and in 1746 he bought an old worn-down press, and taught himself the art of bookbinding. In 1749 he walked to London and back to purchase a few bookbinders' tools. In the same year he commenced attending Southwell, fourteen miles distant from Nottingham, on the market-day; and here he rented a shop at twenty shillings a year, and opened it for the sale of books. In his autobiography he says: 'During this rainy winter I set out at five every Saturday morning, carried a burthen of from three pounds' weight to thirty, opened shop at ten, starved in it all day upon bread, cheese, and half a pint of ale, took from one to six shillings, shut up at four, and by trudging through the solitary night and tho deep roads five hours more, I arrived at Nottingham by nine, where I always found a mess of milk-porridge by the fire, prepared by my valuable sister.' Hutton's sister was a woman of superior mind, and he owed much to her encouragement. His object was to save a small sum to enable him to commence business in a large town; and in 1750, after having twice visited Birmingham in order to see the chances of success which the place offered, he on the third visit took the lesser half of a small shop, at a rent of one shilling per week, and furnished it with a small supply of books. The overseers teased him for two years under the idea that he would become chargeable to the parish. Five shillings a week covered all his expenses, and at the end of the first year he had saved 20*l.* Fortune continued to smile upon him, and in 1755 he married. In 1791 his property was destroyed during the Church and King Riots at Birmingham in that year, but after great difficulty he succeeded in recovering 5390*l.* from the county. He now relinquished business in favour of his son. He had filled successively all the local offices of the town. In 1781 he published his 'History of Birmingham;' and this was followed by other works in the following order: 'Journey to London,' 1784; 'The Court of Requests,' 1784; 'The Hundred Court,' 1788; 'History of Blackpool,' 1788; 'Battle of Bosworth Field,' 1789; 'History of Derby,' 1790; 'The Barbers, a Poem,' 1793; 'Edgar and Elfrida, a Poem,' 1793; 'The Roman Wall,' 1801; 'Remarks upon North Wales,' 1801; 'Tour to Scarborough,' 1803; 'Poems, chiefly Tales,' 1804; 'Trip to Coatham,' 1808.

Mr. Hutton died September 20th, 1815, a few days before the completion of his ninety-second year. In 1816 his daughter published 'The Life of William Hutton, Stationer, of Birmingham, and the History of his Family: Written by Himself.' This work is one of the most entertaining and instructive pieces of autobiography in the language. An edition of this work was published in 1841, in the series of 'Knight's English Miscellanies.' This edition contains some interesting notes by Catherine Hutton, Mr. Hutton's daughter, who was then in her eighty-fifth year; and passages of a personal nature from Hutton's works are added as notes.

HYBRID PLANTS. [Sexes of Plants, P. C.]

HYDA'TICA, a genus of fossil plants (probably aquatic) from the coal formation. (Artis.)

HYDE, SIR NICHOLAS, was appointed chief justice of the King's Bench in 1626. He was the uncle and preceptor of the first Earl of Clarendon, whose mind he had great share in forming, by proposing daily to him legal questions for solution. He owed his promotion to the patronage of the Duke of Buckingham, who having employed him to draw his successful answer to the impeachment of the House of Commons, afterwards procured him to be appointed chief justice, when Sir Randulph Crewe was removed from that post in consequence of his lukewarmness in advancing a loan which Charles I. attempted to raise without the authority of parliament. The most important trial upon which Sir Nicholas Hyde presided after his elevation to the bench was the one in which Eliot, Hollis, and Valentine were indicted for forcibly holding down in his chair the speaker of the House of Commons, at the violent close of the parliament of 1627. The court refused to allow to the prisoners their Habeas Corpus, and inflicted fines upon them of considerable amount. This conduct (Sir Nicholas Hyde's curious apology for which may be seen in Rushworth, vol. i. p. 461) was afterwards voted by the long parliament a delay of justice. He died at his seat (Hinton Lodge), in the parish of Catherington, Hampshire, on the 26th August, 1631, aged 59.

Whitelock, his colleague on the bench, and political opponent, records that 'the cause of his death was a hot fever, rendered incurable by reason of an imposthume breaking in his head; and that he lived in his place of chief justice with great integrity and uprightness, and with great wisdom of temper, considering the ticklishness of the times.' (Rushworth, vol. ii. p. 111.) Four of his letters are extant in the Bodleian library. A very beautiful full-length marble effigy of him still exists in the obscure parish church of Catherington, Hants. He was succeeded in his estate by his son,

Lawrence Hyde, who became principally remarkable for the personal share which he had in furthering the escape of Charles II. after the battle of Worcester. The king in his memorable wanderings was concealed for a night at the house of one of Mr. Hyde's tenants. But as this tenant was too hot-headed a royalist to be safely intrusted with the secret of his guest's quality, the king was accordingly passed off as a roundhead, and was in that character compelled to drink what must then have appeared hopeless success to the royal cause. After some difficulty Charles was withdrawn from the man's house by Lord Southampton and Mr. Hyde, and by them safely conducted the next day to Shoreham, where they succeeded in procuring a passage for him to Fécamp. The circumstances are told in detail in a manuscript written by Mr

Hyde's cousin Colonel Gounter, himself an actor in the events. This manuscript is now deposited in the British Museum, and contains the only authentic account of the escape of the king. There are notices of it in Jesse's 'History of the Stuarts;' and in Parry's 'Account of the Coast of Sussex.' Lawrence Hyde was M.P. for Winchester after the Restoration; he married the only daughter of Sir John Grenville, the negociator between General Monk and Charles II. for the restoration of the king; and died in 1682: his granddaughter married Mr. Tooker, a Somersetshire gentleman, in whose family the estate still continues.

HYDRASTIS. [WARNERA, P. C.]

HYDROCOTYLE (from ὕδωρ, water, and κοτύλη, a cavity), a genus of plants belonging to the natural order Umbelliferæ, and to the sub-order Orthospermeæ. It has the tube of the calyx rather compressed, the limb with an obsolete margin, the petals ovate, entire, acute, with a straight apex; the fruit flatly compressed from the sides; the carpels without vittæ; the 5 ribs or nerves nearly filiform, the carinal and lateral ones usually obsolete, and the two intermediate ones joined. The species of this genus are generally bog-herbs; but few of them are under-shrubs. The umbel is single, surrounded by a few-leaved involucrum. The flowers sessile or pedicillate, white.

Upwards of 90 species of plants have been referred to this genus. It is not however improbable that a more attentive study of them will lead to the distinction of other genera amongst them.

H. vulgaris has peltate, orbiculate, double crenate leaves; the umbels capitate, of 5 flowers, often proliferous; the fruit emarginate below. This plant is a native of Great Britain and throughout nearly the whole of Europe, in marshy boggy places, and on the margins of rivulets on a peat soil. This plant is commonly called 'Pennywort,' on account of its leaves lying flat on the ground and having the size and form of a piece of money. It is also known by the names of 'water pennywort,' 'sheep-killing pennygrass,' 'white-rot,' 'fluke-wort,' and 'sheep's-bane.' These latter names it has obtained on account of its being supposed to produce the rot and other diseases in animals that feed on it. This is, however, an error, as this plant will not produce disease in animals, but it occurs in damp moist situations, where animals that feed are likely to be attacked with rot and other diseases. It is in this way that other marsh plants, as the species of Drosera and Pinguicula, have been supposed to cause disease in sheep and oxen.

Of the large number of species of this genus few if any are used in the arts or medicine, and none of them are sufficiently ornamental to lead to their cultivation. *H. Asiatica* is said to be used in India as a diuretic and occasionally as a culinary vegetable. *H. umbellata* is recommended by Martius as a remedy in hypochondriasis, but on what grounds is not stated. The fresh juice acts as an emetic. It is said to possess an aromatic odour and an agreeable taste. The species of Hydrocotyle are easily cultivated; they must all be kept moist. The stove-greenhouse and frame kinds should be grown in pots placed in pans of water.

(Don, *Gardener's Dictionary*; Burnett, *Outlines*; Babington, *Manual of British Botany*.)

HYDROCYANIC ACID. [PRUSSIC ACID, P. C. S.]

HYDROSTATIC BED. [BEDSTEAD, P. C. S.]

HYGROMETRY is that part of natural philosophy which relates to the determination of the humidity of bodies, particularly of the atmosphere: it comprehends also the theory of the instruments which have been invented for the purpose of ascertaining the quantity of water contained in a given volume of air.

The experiments of Dr. Dalton have proved that the water received from the earth is not dissolved in the atmosphere, and that it exists there in the form of vapour. That philosopher discovered also that the quantity of vapour contained in a portion of the atmosphere depends greatly upon the temperature of the latter, and that it is very variable even when the temperature is constant. He ascertained moreover that when a quantity of aqueous vapour at a given temperature is diffused through any space, it will support the same external pressure, whether previously that space had been void or occupied by air. On these principles are founded the methods which have been used for determining the absolute quantity of moisture in a given volume of air by means of the hygrometer: the requisite data being the elasticities of aqueous vapour at different temperatures, and the corresponding indications of the instrument.

The tension or elasticity of watery vapour corresponding to every degree of Fahrenheit's thermometer, from zero to the point of boiling water (measured by the height in inches of the column of mercury which the vapour will support when the density of the atmosphere is represented by 30 inches), has been determined by Drs. Dalton and Ure, who for this purpose introduced a small quantity of water into the vacuum of a barometer, and observed how much, at different temperatures, the vapour arising from it depressed the column of mercury; and a table of such tensions is published in the fifth volume of the 'Manchester Memoirs.'

Previously to stating the manner of determining the relation between the indications of an hygrometer and the state of aqueous vapour with respect to tension, it will be proper to notice the following circumstances:—When an hygrometer, like that of Saussure or De Luc [HYGROMETER, P. C.], is introduced in a close vessel, or in any part of space fully saturated with aqueous vapour, it is observed that, whatever be the temperature, the index points to the same graduation: from which it may be inferred that equal quantities of vapour have been absorbed by the material (hair or whalebone) of which the instrument consists, notwithstanding the difference of temperature. In fact the vapour in the vessel, or space, is in such a state that the presence of a material having the least possible affinity for water is sufficient to produce a precipitation of the latter: the hygroscopic material has an affinity for water, and thus it absorbs that which is precipitated. But the quantity absorbed is so small as not to diminish sensibly the elasticity of the vapour in the vessel; and therefore the absorption continues to the full extent of the affinity of the material: the quantity thus absorbed is necessarily constant, unless the affinity undergo some change by a change of temperature; but experience proves that the affinity of the material is not sensibly altered by such change within the limits of the usual thermometric scale.

When the vessel into which the hygrometer is introduced is not completely saturated with water, the quantity of water absorbed by the hygroscopic material is limited by the power of the latter to absorb the precipitated moisture: that power diminishes in proportion to the quantity received, so that the affinity of the material for water ceases to act when it is equivalent to the pressure which the vapour can support without becoming liquid; and the elongation of the hair or whalebone then ceases, or the index remains stationary on the scale.

In order, then, to determine the law according to which the affinity of the hygroscopic material for water diminishes as the precipitated water is absorbed by it, or, in other words, to find on the scale of the hygrometer a number of points corresponding to any given elasticities of the vapour, Gay Lussac put water into a vessel of glass; and, having determined the elasticity of the vapour arising from it, he suspended from the upper part of the vessel a delicate hygrometer of the kind invented by Saussure. The vessel was then closely covered, so that there might be no communication between the vapour within and the external air; when, after a short time, the index of the hygrometer became stationary at a certain point on the circumference of the graduated ring which served as a scale; this point thus became an indication of the elasticity of the vapour. Experiments of the like kind being made with vapour of equal temperature, but in different states of elasticity, between those which correspond to extreme dryness and complete saturation, there were obtained so many points on the scale of the instrument as indications of the elasticities of the vapour.

From the results of these experiments M. Biot found, by interpolation, a table of the elasticities of vapour for every degree of Saussure's hygrometer, the temperature being 10° of the centigrade thermometer (50° Fahr.). He also formed a table showing the degrees of the hygrometer corresponding to every degree of elasticity. The extremes of dryness and moisture on the scale, and also the corresponding extremes of elasticity, were indicated respectively by 0 and 100 (Biot, *Traité de Physique*, liv. i. ch. 13); but the elasticities or tensions would be more conveniently expressed in terms of the elasticity at the point of complete saturation, which is then represented by unity.

The numbers in the table are formed from the observed tensions at a constant temperature equal to 50° (Fahr.); and it might be supposed, since the index of the hygrometer stands constantly at 100° when the material is acted on by vapour in the state of maximum tension whatever be the temperature, that the index should stand at one point on the scale when the tensions of the vapour have the same proportion to the maximum tension at their respective temperatures: this supposition is not quite correct; but it may be presumed that, in using Biot's table for temperatures differing from 50° (Fahr.), the error in the tensions will not be considerable.

Gay Lussac having proved that vapours, whether those of pure water or such as consist of different kinds intermixed, while they retain their character of elasticity, suffer the same variations of volume by variations of pressure as are suffered by permanently elastic fluids, determined, by subsequent experiments, the volumes of the vapour produced by a given weight of water at given temperatures and under given atmospherical pressures; and thus, consequently, obtained the quantity of moisture in a given volume of vapour. The results of his experiments were reduced to a formula by Biot; and subsequently, with certain modifications, to one in English weights and measures by Dr. Anderson, the writer of the article on Hygrometry in the 'Edinburgh Encyclopædia.' This formula is

$$G = \frac{10953\ B.F}{447{\cdot}4 + t};$$

in which G is, in grains, the quantity of moisture in a cubic inch of vapour at the temperature represented by t (Fahrenheit's scale), F is the elastic force of the vapour at the same temperature, and B is the height of the barometrical column in inches at the time of the experiment. It agrees nearly with that which was obtained by Dalton from experiments on the state of the thermometer at the dew-point [HYGROMETER, P. C.], the height of the mercurial column in that result being 30 inches. From this formula, the temperature t being 50° (Fahr.), $B = 30$ inches, and $F = 0{\cdot}375$ (from Dalton's table of the elastic force of vapour corresponding to that temperature and that density of the air), we have $G = {\cdot}002477$, the grains of moisture in a cubic inch of the vapour.

The value of G being thus found for any given states of the barometer and thermometer; the weight of moisture, in grains, in a cubic inch of air of the like density and temperature, and corresponding to any observed degree of Saussure's hygrometer may be obtained on multiplying that value by the number in Biot's table corresponding to the observed degree and dividing the product by 100; this division must be made because, in that table, 100 represents the elasticity of the vapour when in the state of complete saturation.

The extreme points on the scale of an hygrometer acting by the elongation of a material, like those of Saussure and De Luc, may be found in the following manner: the instrument is to be placed under a receiver in which is a certain quantity of dry caustic alkali; when, after a time, the material will contract in length as much as its nature will permit; the point on the scale at which the index stands is that of extreme dryness, and constitutes the zero point. The instrument may then be placed in water, or in a receiver filled with vapour completely saturated with moisture, when the material will expand to the greatest extent possible: the place of the index is then to be considered as the point of extreme humidity, and is usually indicated by 100.

Leslie's hygrometer consists of a glass tube bent so as to form two equal branches parallel to one another, and each terminating with a hollow ball in which is introduced sulphuric acid, coloured. One of the balls is covered with cambric, which is kept constantly moist by water from a neighbouring vessel; and the evaporation of the water, by cooling that ball, allows the air in the other, by its superior elasticity, to depress the acid in the tube below and force it to rise in the other. The degree of evaporation depends partly on the temperature, and partly on the state of the surrounding atmosphere with respect to humidity; and hence the depression of the acid in the tube, being measured by a convenient scale, affords an indication of the relative dryness of the air. In order to determine the absolute quantity of moisture in a given volume of the atmosphere by the state of his hygrometer, Leslie, having found from some experiments that the capacity of air for caloric was $\frac{8}{3}$ of that of water, and having ascertained that the quantity of caloric necessary to convert a given volume of water into vapour was expressed by 6000 degrees of his instrument; concluded that the same quantity of caloric would raise an equal volume of air to a temperature expressed by $\frac{8}{3} \times 6000$, or 16,000 degrees of the instrument; and consequently that, at the temperature of the wet ball, atmospheric air contains a quantity of moisture equal to $\frac{1}{16000}$ part of its weight for each degree; the scale between the points of extreme dryness and extreme moisture being divided into one thousand parts. (Treatise 'On the Relations of Air to Heat and Moisture.')

From the fact that the elastic forces of pure vapour and of vapours mixed with atmospheric air are equal to one another, the expansion which air undergoes in consequence of being saturated with moisture may be found. For if V represent a given volume of dry air, V′ the volume, when saturated, and B, in inches, the height of the barometrical column; then the elastic force of the air under the increased volume V′ is $\frac{V.B}{V'}$. Now F representing the elastic force of the vapour in inches of mercury, which, for the given temperature, may be found from Dalton's table; the sum of the elastic forces of the air and vapour will be expressed by $F + \frac{V.B}{V'}$; and this being made equal to B, the pressure of the atmosphere, the value of $V' - V$ may be found. Making $V = 1$, that value expresses the expansion in a fractional part of the volume of dry air.

At any place on the surface of the earth, the mean temperature at which moisture begins to form in the atmosphere may be found from Dalton's formula $E = \frac{1}{30} M (F - F')$, in which E is the number of grains evaporated in one minute from the surface of water in a cylindrical vessel 6 inches in diameter and one inch deep, F is the elastic force of vapour in the atmosphere at a given temperature, which may be the mean annual temperature at the place (50° Fahr., for Great Britain), and F′ the elastic force exerted at the time that the moisture begins to form: M is, in grains, the evaporating force in an atmosphere supposed to be perfectly dry; and Dalton has given a table of such forces for different temperatures, the atmosphere being at rest, in gentle, and in violent motion. In the table, the temperature being 212°, the height of the barometrical column 30 inches, and the wind blowing moderately, the value of M is 154; and substituting this value in the formula, we have $F' = F - \frac{1}{5} E$.

The mean annual evaporation in Great Britain is ·0000456 inches or ·01155 grains per minute: this last number being multiplied by the area of a circle 6 inches in diameter, gives 0·3236 grains per minute (= E) from a vessel of that magnitude; hence $F' = F - 0{\cdot}0647$. But, by Dalton's table, the elastic force (F) of vapour at a temperature equal to 50° is expressed by 0·375, in inches of mercury; hence $F' = {\cdot}3103$ inches. Substituting in the above formula for G this value of F′ in place of F, and 30 inches for B, we get ·00205 for the number of grains of moisture in a cubic inch of air corresponding to the elasticity F′. To this number corresponds the temperature 44° 16′; which may be found by inspection in a table formed to contain the values of G for different degrees of temperature.

HYMENÆA (from *Hymen*, in reference to its twin leaflets), a genus of plants belonging to the natural order Leguminosæ. It has a calyx furnished with two bracts at the base; the tube turbinate, coriaceous; the limb 4-5 parted, deciduous, with 2 lobes sometimes united into one; 5 petals nearly equal, glandular; 10 stamens distinct, inflated in the middle; the style filiform; the legume woody, oblong, many-seeded, containing fecula; the embryo straight. The species are trees, with bifoliate leaves, and corymbs of white or yellow flowers.

H. Courbaril, Locust-tree, or Gum-Anime Tree, has oblong ovate leaflets, unequal-sided, and unequal at the base, ending in a long point; with the legume oblong, compressed, yellowish, shining. It is a fine lofty spreading tree, and grows in the tropical parts of America and in Jamaica. The seeds are enveloped in a cellular mealy substance, which is sweet like honey, and is eaten by the Indians with great avidity. When fresh it is slightly purgative, but by keeping it loses this property. A decoction of this substance, when allowed to ferment, forms an intoxicating drink resembling beer. From between the principal roots of this tree there exudes a fine transparent resin, with a red or yellowish red colour, and which is collected in large lumps and sold under the name of *Gum Anime* or *Gum Animi*. This resin resembles amber, is very hard, and sometimes contains leaves, insects, or other objects imbedded in it, which remain in a perfect state of preservation. It burns readily, emitting a very fragrant smell. Dissolved in rectified spirits of wine it makes one of the finest kinds of varnish. According to Lindley, this resin is called *Jatahy*, *Jatchy*, or *Copal*, and in Minas Geraës *Jatoba*. *Courbaril* is the name of the tree in some parts of South America. In countries where this tree grows the resin is used medicinally, and has also been employed in that way in Europe. It acts as a stimulant when taken internally, and as an irritant when applied externally. In fumigation it has been employed for persons labouring under asthma and dyspnœa. Dissolved in spirits of wine or oil it is used as an embrocation in rheumatism. Internally, it has been recommended as a substitute for guaiacum, in venereal disease and chronic rheumatism. The inner bark, either in the form of tincture or decoction, is administered as a vermifuge. The curadores have a method of mixing it with sugar and rum, so as to make a very agreeable emulsion or syrup. The wild bees are fond of building their nests in the trunk of this tree. The timber of the old trees is very hard and tough, and is in great request for wheelwork, particularly for cogs. The wood is so heavy that a cubic foot is said to weigh a hundred pounds; it takes a fine polish.

Several other species of Hymenæa are described, but of these comparatively little is known.

(Don, *Gardener's Dictionary;* Lindley, *Flora Medica.*)

HYMENOMYCE'TES, the first suborder of the Fungi, a natural order of plants. [Fungi, P. C.] They are characterized by their reproductive organs, called the hymenium, being naked. This suborder is divided by Fries into four tribes [Fungi, P.C.]; by Berkeley into six tribes. Those of the latter are, Pileati, Clavati, Mitrati, Cupulati, Tremellini, and Sclerotiacei.

The tribe *Pileati* contain the following British genera:—

Agaricus, in which the hymenium consists of plates radiating from a common centre, with shorter ones in the interstices, composed of a double closely connected membrane, more or less distinct from the pileus: the veil is various or absent. [Agaricus, P. C.]

Cantharellus has the pileus furnished below with dichotomous, radiating, branched, subparallel folds, not separable from the flesh, sometimes anastomosing or obsolete.

Merulius has the hymenium veiny, or sinuoso-plicate; the folds not distinct from the flesh of the pileus, forming unequal angular or flexuous pores. [Merulius, P. C.]

Schizophyllum has the gills radiating from the base, composed of a folded membrane, which is ruptured along their edge; the two portions of the fold being revolute, bearing asci only on the outer surface.

Dædalea has the hymenium composed of anastomosing gills, or flexuous elongated pores formed out of the corky substance of the pileus.

Polyporus has the hymenium concrete, with the substance of the pileus consisting of subrotund pores with their simple dissepiments.

Boletus has the hymenium distinct from the substance of the pileus, consisting of cylindrical separable tubes, with oblong sporidia. [Boletus, P. C.]

Fistulina has the hymenium formed of a distinct substance but concrete with the fibres of the pileus; the tubes at first wart-like, somewhat remote, closed, radiate-fimbriate, at length approximated, elongated, open.

Hydnum has the hymenium of the same substance as the pileus, composed of free spine-like processes.

Sistotrema has the hymenium somewhat distinct from the pileus, composed of irregularly-disposed, curved, and gyrose lamellate teeth.

Irpex has the hymenium concrete with the substance of the pileus, torn into distinct spines, disposed in rows or in a reticulate manner, their bases connected together by lamellate, sinuous, or porous folds; the asci slender, situated only on the toothed processes.

Radulum has the hymenium tuberculated; the tubercles shapeless, resembling papillæ or rude somewhat angular spines, more or less obtuse, distant, distinct or irregularly fasciculate, the inner substance homogeneous with the receptacle; the asci occupying indifferently all parts of the hymenium.

Phlebia has the hymenium homogeneous and concrete, with the pileus smooth, venoso-rugose, wrinkles interrupted, disposed irregularly, straight or flexuous, bearing asci all over.

Thelephora has the hymenium homogeneous and concrete with the pileus, even or papillate, the whole surface bearing asci.

Of these genera Agaricus contains by far the greatest number of species. On this account it has been found necessary to class the species under various subgenera. The following table contains the subgenera of Fries arranged in eight series:—

AGARICUS. Lamellæ simple, unequal, juiceless, persistent, discrete from the pileus.	*Leucosporus.* Lamellæ unchangeable; veil variable or none; sporidia white.	Amanita. Lepiota. Limacium. Tricholoma. Clitocybe. Omphalia. Collybia. Mycena. Ompbalia. Pleurotus.
	Hyporhodius. Lamellæ changeable in hue; veil none; sporidia rose-coloured.	Cliptopilus. Eccilia. Leptonia. Nolanca.
	Inocybe. Lamellæ changeable; veil springing longitudinally from the innate fibres of the pilcus; sporidia tawny brown.	Inocybe.
	Derminus. Lamellæ discoloured; veil floccose; sporidia subferruginous.	Pholiota. Hebeloma. Flammula. Naucoria. Galera. Tapinia. Crepidutus.
	Phæotus. Lamellæ changeable, nebulous; veil various; sporidia dark brown.	Pratellarius.
	Pratellus. Lamellæ, changeable, lax, nebulous; veil floccose; sporidia brownish purple.	Volvaria. Psalliota. Gompbus. Hypholoma. Psilocybe. Psathyra.
	Coprinarius. Veil partial; lamellæ lax, nebulous; sporidia black.	Coprinarius.

Most of the species included under the series Leucosporus are eatable, and contain those species which are mentioned as edible in the article Agaricus, P. C. It also contains the various species of Amanita, which are among the largest and most remarkable forms of the fungi. *A. cæsarea* is remarkable for its beauty, but not so much so as for the traditional belief that it was in a dish of these mushrooms, which were regarded by the Romans as one of the greatest luxuries of the table, that Agrippina administered poison to her husband Claudius Cæsar, in order to hasten her son's accession to the Imperial power. *A. muscaria* possesses an intoxicating or narcotic property. It is used by the inhabitants of the north-eastern parts of Asia in the same manner as wine, brandy, arrack, spruce, &c. are by other nations. One large or two small fungi is a common dose to produce a pleasing intoxication for the whole of the day.

Upwards of 700 species of the genus Agaricus have been described; of these 333 are natives of the British Islands.

Eight species of the genus *Cantharellus* inhabit Great Britain. The *C. aurantiacus* is said to be a poisonous plant. It is common in fir-woods and pastures. It has a beautiful orange colour and a strong smell. *C. cibarius*, the common Chanterelle, is common in woods in the summer and autumn. The pileus is of a pale yellow colour, and the whole plant has an agreeable smell like that of apricots. On the continent of Europe this fungus is eaten, but is not often used in Great Britain. It is however dangerous when eaten raw, and should always be cooked. They form a delicious ingredient in rich gravies.

One of the species of *Merulius* has been supposed to be the cause of dry-rot. [Dry-Rot, P. C.; Merulius, P. C.] Berkeley describes five species of this genus as natives of Great Britain.

Of *Schizophyllum* but one species has been found in Great Britain, the *S. commune*. It is a very beautiful fungus, and has been found in almost every part of the world.

The genus *Dædalea* has been so named from the remarkable sinuosities and sculpture-like pores of its hymenium. *D. quercina* is found commonly on oak-trees or stumps and roots of that wood. It is an astringent and has been applied to wounds to arrest hæmorrhage. It is commonly called 'the lungs of the oak,' and was formerly on this account used as a remedy in phthisis. It is at the present day sold in Covent Garden market for that purpose. There are several other species of this genus which are indigenous in Great Britain

D. suaveolens is a northern plant. It yields an agreeable perfume.

Upwards of forty species of the genus *Polyporus* are found in Great Britain, and many more European species have been described. Many of the species are used in arts and medicine. *P. igniarius* has long been famed as a styptic. Amadou, or German tinder, is made from this plant by separating the porous hymenium from the harder parts and steeping it in a solution of nitre after it has been beaten into a soft spongy state. Many other species of Polyporus may be used for the same purpose. The Laplanders also use them for applying the actual cautery in the same way as the Japanese and Chinese use the moxa. When they suffer from pain in the limbs, they pull the fungus in pieces and placing it on the skin, set fire to it and allow it to burn away till it blisters the skin, when it acts as a counter-irritant. *P. officinalis* is a cathartic. *P. suaveolens* has a pleasant smell. Some of the species secrete acids, and boletic, fungic, and oxalic acids have been obtained from them. *P. squamosus* is one of the largest of British fungi, weighing sometimes as much as thirty pounds. *P. destructor* is one of the fungi found on decaying timber when it is attacked with what is called dry-rot.

Many of the plants formerly included under the genus *Boletus* are now referred to *Polyporus*. Berkeley enumerates sixteen species of the genus Boletus as natives of Great Britain. [Boletus, P. C.]

The genus *Hydnum*, although named after ὕδνον, the truffle, includes a different series of plants. The hymenium is formed of spinous bodies which give to the species of this genus a very formidable appearance. Hence they are called in the country spine-stools, prickle-stools, &c. Several species are natives of Great Britain. Some are eatable, but caution should be used in their selection. De Candolle says that those which have a dark colour are dangerous.

The genus *Fistulina* has one representative in Great Britain, *F. hepatica*, the pipe-stool. It grows upon the trunks of old oaks and other trees. It is eaten in France. When cut into it is beautifully marbled with red and white streaks resembling a fine piece of beef. It is called in France *Foie de Bœuf*, *Langue de Bœuf*, *Glue de Chêne*, &c. It has an acid taste, but is rather tough. It has been known sometimes to attain the weight of thirty pounds.

The genera *Sistotrema*, *Irpex*, *Radulum*, and *Phlebia* are small genera, and not used as food, or in any other way. *Thelephora* is an extensive genus, and forty-two species are indigenous in Great Britain. They are common on decaying branches of trees, &c., and exhibit a variety of colours.

The tribe *Clavati*, which are distinguished by a single or branched vertical receptacle, embrace the following British genera:—*Clavaria*, *Calocera*, *Geoglossum*, *Spathularia*, *Mitrula*, *Typhula*, and *Pistillaria*. These plants, in their branched and club-shaped forms, resemble the corals, and were actually placed by the older naturalists in the same class. Some of the species of the *Clavati* are edible. All the Clavaria are esteemed as food. *C. rugosa* has an agreeable flavour like that of the common mushroom. *C. flava* and *C. pyxidata* are prized on account of their taste. *C. cinerea* is the species most commonly eaten on the Continent.

The *Mitrati* have a bullate, fileiform, margined receptacle. They embrace five British genera: *Morchella*, *Helvella*, *Veapa*, *Leottia*, and *Vibrissea*.

The genus *Morchella* yields the esculent fungus morel. [Morel, P. C.] Three species are found in Great Britain. There are also three British species of Helvella as that genus is at present defined. The species of Helvella are edible. *H. crispa* is considered the best species for eating, but none of the species, foreign or British, are poisonous.

The tribe *Cupulati*, which has a patelliform margined receptacle with a superior hymenium, contains the following British genera:—*Peziza*, *Patellaria*, *Ascobolus*, *Bulgaria*, *Ditiola*, *Tympanis*, *Cenangium*, *Stictis*, *Cryptomyces*, *Cyphelia*. Of these *Peziza* is the most extensive genus, containing upwards of 300 species, of which 106 are natives of Great Britain. Some of these plants are very remarkable from the regular cup-like form and the deep colours they present. *P. coccinea* is perhaps the most elegant plant belonging to the natural order of Fungi. The outer surface of the cup which it forms is white and downy, whilst the inside is of the richest carmine. It frequently grows on sticks covered with moss, the green colour of which forms a beautiful contrast with the white and crimson of the Peziza. *P. æruginosa* has a deep green colour, and possesses the property of staining wood on which it grows of the same colour as itself. The Pezizæ are not generally eaten, but none of them are poisonous.

The fifth and sixth tribes of the Hymenomycetes are the *Tremellini* and *Sclerotiacei*. The Tremellini embrace six British genera. [Tremellini, P. C.] The British genera included under Sclerotiacei are *Pyrenium*, *Acrospermum*, *Sclerotina*, *Periola* and *Spermoedia*. These are amongst the lowest forms of the Hymenomycetous fungi, and include species which are found attacking the various Cerealia, producing the disease called ergot. [Ergot, P. C.; Spermoedia, P. C.] An account of the remaining forms of the Fungi is given under Gasteromycetes, P. C. S.

(Burnett, *Outlines of Botany*; Berkeley, *English Flora*, vol. v.; Fries, *Systema Mycologicum*.)

HYNDFORD, JOHN CARMICHAEL, third EARL OF, a Scottish nobleman of some diplomatic celebrity in the reign of George II., was born in 1701, and succeeded to the family honours in 1737. He represented, as one of the Sixteen Peers, the Scottish nobility in several parliaments, acted for two successive years (1739, 1740) as royal Commissioner to the General Assembly of the Church of Scotland, and held the dignity of lord lieutenant of the county of Lanark, in the upper district of which the family estates were situated. His diplomatic life began upon the occasion of the seizure of Silesia by Frederick the Great in 1741, when his lordship was deputed envoy extraordinary and plenipotentiary to the Prussian court. In this mission he succeeded in effecting an accommodation between that unscrupulous prince and the Empress-Queen Maria Theresa, by a treaty concluded the following year at Breslau. So sensible were the contracting parties of the value of his lordship's mediation and services, that by a grant from the King of Prussia, ratified subsequently at Vienna by the Empress-Queen, he was permitted to assume, in addition to the family armorial bearings, the Silesian eagle, with the motto 'ex bene merito,' and was moreover honoured by his own king with the national decoration of the order of the Thistle. At Berlin he became acquainted, through the introduction of Frederick, with the famous Baron Trenck, who gratefully acknowledges in his Memoirs, the 'parental trouble' which his lordship took in counselling him and promoting his interests when they met some years after at Moscow. In 1744 Lord Hyndford was sent ambassador to Russia, where he became a great favourite of the Empress Elizabeth, who took an active part in behalf of Maria Theresa; and he was highly instrumental in bringing about, in 1748, the peace of Aix-la-Chapelle, which terminated what is known in history as the war of the Austrian Succession. In this mission his lordship continued till the end of 1749, and on his return was constituted a privy councillor and lord of the bed-chamber. In 1752 he was sent to the Court of Vienna on his third embassy, with which, after a few months, his career as a diplomatist terminated, though he did not altogether withdraw from political life. In 1764 he received a further mark of the king's esteem in the appointment of lord vice-admiral of Scotland. After his return from Vienna, his time was divided between London and the family seat at Carmichael, in the vicinity of which the memory of the 'Ambassador' is still cherished with almost filial regard by the descendants of those who benefited by the munificence and public spirit which he never ceased to manifest in promoting the interests of his county. During his whole lifetime, and particularly his latter years, his attention was unremittingly devoted to his estates, which he enhanced in value by extensive improvements, and enlarged by judicious purchases and advantageous exchanges. He died in 1767, leaving no issue. His official correspondence, extending to twenty-three volumes in manuscript, is now deposited in the British Museum, to which it was secured by purchase in 1838.

HYPANTHO'CRINUS, a genus of fossil Crinoidea, from the Silurian strata.

HYPERBOLOID. The conditions under which the equation of the second degree belongs to an hyperboloid are given in Surfaces of the Second Degree, P. C. Of the two kinds of hyperboloids there mentioned, one, the *single* hyperboloid, has the remarkable property that straight lines can be drawn upon it. Through every point of the surface two straight lines can be drawn, which are entirely upon the surface, and which are also in its tangent plane. When the surface is one of revolution, that is, when it is formed by the revolution of an hyperbola about its minor axis, these straight lines are all divided into two sets, each set consisting of lines symmetrically disposed with respect to the axis, but never meeting it: so that if one of either set were to revolve about the axis, it would describe the surface. Consequently a straight line revolving about an axis which is not in its plane, describes a single hyperboloid of revolution. This surface is therefore easily turned: the outside of a dice-box is generally nearly a specimen of it.

HYPE'RICUM, a genus of plants belonging to the natural order Hypericineæ. The calyx is 5-parted, or it has 5 sepals; 5 petals; 3 styles, and a 3-celled capsule. The flowers of the species are mostly yellow. There are 13 British species of this genus, and 172 are enumerated by Don as growing in various parts of the world: St John's Wort is the common name of all the species.

H. maculatum has an erect quadrangular stem, elliptical ovate obtuse leaves with a few pellucid dots, reflexed ovate lanceolate sepals having pellucid streaks, obtuse petals with purple streaks and dots beneath. It is the *H. quadrangulum* of Fries, and is found in moist places by ditches and rivers.

H. perforatum has an erect 2-edged stem, ovate or elliptical leaves with numerous pellucid dots, anthers with black dots, the styles as long as the capsule. It is found in large quantities in Britain and throughout Europe; also in the north of Asia and Africa. The flowers are of a bright yellow colour, dotted and streaked with purple; when rubbed they emit a powerful lemon-like scent and stain the fingers with dark purple. The whole of the plant contains a powerful volatile oil, which is aromatic and possibly astringent, though as yet it has been but little used in medicine. Its sensible qualities however, and the few instances in which it has proved beneficial, entitle its virtues to a further trial. When boiled with alum this plant yields a yellow dye which is used for colouring wool. The common people of Germany and France gather this species of St. John's Wort with great ceremony on St. John's day, and hang it in the windows and about their houses as a charm against evil spirits, storms, thunder, and all other calamities, mistaking the meaning of some medical writers who fancifully called the plant Fuga Dæmonum, from a notion that it was a remedy in maniacal disorders. At one time the people of Scotland used to carry it about their persons as a protection against witchcraft and enchantment, and they fancy it prevents ropy milk by milking upon the fresh herb. Cows and goats will eat the plant, but horses and sheep refuse it. It is the ἄσκυρον of Dioscorides (iii. 162). It is found at the present day on the high hills of Attica.

H. laxiusculum has a smooth herbaceous stem, rather distant obtuse leaves, full of pellucid dots; the lower leaves narrow and lanceolate, segments of the calyx equal, nearly linear and acute. It is a native of Brazil, in the provinces of St. Paul and Minas Geraes, where a decoction of the leaves is used as a remedy against the bites of serpents.

H. crispum has a round branched stem, sessile lanceolate leaves sinuately waved at the base, full of dots, small blunt sepals. It is native in the regions of the Mediterranean, and is the ὑπέρικον of Hippocrates (*Morb. Mul.* i. 610); also of Dioscorides (iii. 161), and the Hypericon 'quod alii chamaepityn, alii corion appellant' of Pliny (xxvi. 8; xxvii. 4. 5). At the present day it grows near the sea in Attica.

H. perfoliatum, the ἀνδρόσαιμον of Dioscorides (iii. 163). It has a 2-edged stem; ovate, clasping, dotted leaves; fringed and dotted sepals and petals, and sessile flowers. It is a native of Italy.

H. Coris has a shrubby erect round stem, linear leaves in whorls with revolute margins, and a bluntish linear calyx. It is the κόρις of Dioscorides (iii. 174), and the Coris of Pliny (xxvi. 3). This species is a pretty little shrub, native of the Levant, and in dry places in the south of Europe.

H. origanifolium is distinguished by its ascending downy stem, ovate blunt and pubescent leaves full of pellucid dots, numerous stamens, and many black dots in the corolla. It is a native of the East, about Constantinople, Thrace, and Armenia, and is frequently found on high mountains in company with *H. perfoliatum*. It is probably the ἀγήρατον of Dioscorides (iv. 5), and undoubtedly the *Ageratum* of Pliny (xxvii. 4).

H. Olympicum has elliptical lanceolate leaves full of pellucid dots; a round stem, and withering corolla and stamens. It is a native of Mount Olympus and of China. Fraas thinks it probable that this is the πολεμώνιον of Dioscorides (iv. 8).

Most of the species of Hypericum are showy, and deserve cultivation. The hardy herbaceous kinds will thrive in any common garden soil, and are easily propagated by dividing the roots or by seeds. Those that require the greenhouse or frame will thrive best in a mixture of loam and peat and strike root readily in sand under a bell-glass.

(Don, *Gardener's Dictionary*; Babington, *Manual Brit. Bot.*; Fraas, *Synopsis Plantarum Floræ Classicæ*.)

HYPO'CHARIS, a genus of plants belonging to the natural order Compositæ, to the suborder Cichoraceæ, and to the section Hypochœrideæ, which has a scaly receptacle and a feathery pappus. The heads are many-flowered, the involucre is oblong and imbricated, the fruit glabrous, muricated, and beaked; the pappus in two rows, the outer short and setaceous, the inner long and feathery. There are two British species of this genus—*H. glabra*, with oblong dentate-sinuate leaves, and *H. radicata*, with runcinate obtuse leaves. They are found on dry and gravelly places and waste places.

(Babington, *Manual of British Botany*.)

HY'PODON. [FISHES, FOSSIL, P. C. S.]

HYPONITROUS ACID was discovered by Gay Lussac, who obtained it by adding nitric oxide gas in excess to oxygen gas, confined in a glass tube over mercury, containing a concentrated solution of potash; under these circumstances 50 volumes of oxygen gas unite with 200 volumes of nitric oxide gas, which forming hyponitrous acid unite with alkali. This acid may also be obtained by long exposure of nitric oxide gas to solution of potash, or by exposing to intense cold a mixture of 50 volumes of oxygen gas with 200 volumes of nitric oxide gas. By this operation the acid is obtained in a liquid state and possesses the following properties:

At common temperatures it is green, but at 0° it is colourless; it is very volatile, so that when exposed to the air, it is rapidly converted into an orange vapour, the density of which is stated to be 1·72, air being 1. When water is added, the acid is decomposed and converted into nitric acid and nitric oxide, the latter escaping with effervescence. It is composed of

Three equivalents of Oxygen	=	24
One equivalent of Azote	=	14
Equivalent . .		38

This acid does not combine directly with bases to form salts, being on their admixture converted into nitric acid and nitric oxide. Hyponitrites may however be formed by moderately heating certain nitrates, the acid of which losing two equivalents of oxygen, hyponitrous acid remains, and in combination with the base. Hyponitrite of lead may be formed by heating metallic lead in a solution of the nitrate of that metal.

HYPOTHEC (from the Greek ὑποθήκη, a security, literally the subjection of a thing to the authority of another person) is a term derived from the civil law, still in use in the law of Scotland, and in that of France with the lingual variation hypothèque; while, though in the law of England it is not a received technical expression, it is occasionally used for describing any species of security holding the character which the word was employed by the civilians to represent. Hypotheca in its proper acceptation signified a right of security over something which was not placed in the creditor's possession, in contradistinction to pignus, which applied to what is now termed a pledge. See the distinction pretty clearly drawn in book iv. c. 6 of the Institute, and in the Pandects, xiii., tit. 7, s. 9, *De Pignorat. Act. vel contra.* Propriè pignus dicimus, quod ad creditorem transit; hypothecam, cum non transit nec possessio ad creditorem. But the distinction is often lost sight of, even in the original authorities of the civil law. See Brissonius de Verborum Significatione, *voce* Hypotheca. Hypothecs were distinguished into those created by contract, and the tacit or prætorian, admitted in certain circumstances without stipulation. The law on the subject will be found in the Pandects, lib. xiii. tit. vii. De Pignoratitia Actione, &c. (above referred to), and in lib. xx. de Pignoribus et Hypothecis.

The several securities over real property in various parts of the empire, which can be completed without the absolute transfer of the property to the creditor, are so many illustrations of consensual hypothecs in that description of property. Consensual hypothecs in moveables are nearly unknown in the British Empire, as the law, studying the interests of commerce, has discouraged any latent right in favour of an individual over merchandise and other moveable goods while they are left apparently at the disposal of the original owner, and are liable to be viewed by all who transact with him as his property. Bottomry and Respondentia are perhaps the only instances in which it is countenanced. But there are still some tacit hypothecs created by the operation of law, affording a preference to particular creditors over the property of a person who cannot or will not pay all his debts. Used in this sense, hypothec is properly the counterpart of lien, the former being a tacit security over property which is in the debtor's hands, the latter over property in the creditor's hands. Those provisions in the excise laws which give the revenue a preference over exciseable commodities, and the instruments used in their manufacture, are strictly the creation of tacit hypothecs. The provisions in the bankrupt acts for paying servants' wages and other debts out of the readiest funds of the bankrupt are the establishment of a general hypothec over the estate.

In Scotland the landlord's privilege to seize the tenant's goods for arrears of rent is called a hypothec while it is unexercised—that is to say, before execution against them is commenced the landlord is said to have a hypothec over the goods. On an agricultural farm the crop stands hypothecated for the rent of the year of which it is the produce. The landlord's right exists so long as the crop is on the farm, and it extends to the revindication of it even from a bonâ fide purchaser within three months after the rent has fallen due, unless he have been a purchaser by bulk in open market. The hypothec for other effects—as the cattle on a farm, the tenant's furniture in a house—subsists over the whole for each term's rent, and gives a preference for three months after the rent is due. The landlord's hypothec is not affected by the bankrupt statutes. Another right of a different description is called a hypothec in Scotland—viz. the right of a law agent to take his client's decree for expenses, or judgment for costs, in his own name, in order that he may recover payment of his account as taxed by the auditor of court. This right cannot be defeated by a collusive settlement. In Scotland a law agent, whether employed to conduct a litigation or in other professional business, such as conveyancing, is entitled to retain his employer's title-deeds and papers until his just account is paid. This right has also been called a hypothec, but it is clearly a lien.

In France there is a distinction between privilèges and hypothèques. All tacit hypothecs, according to the division above kept in view, are included under the former, which are subdivided into a general preference over all the moveables or personal property in the debtor's possession, and limited preferences over particular articles of property for particular obligations. This last named, in so far as it affects moveable property, is the class of rights which has been spoken of above as tacit hypothec, and it includes the landlord's security for his rent. There is also a classification of privilèges sur les immeubles, consisting of tacit preferences over what is in England called real property, and of privileges which extend to both moveable and immoveable property. The term hypothèque is applied to conventional securities over immoveable or landed property, and is the object of much useful legislation, such securities being, from the efforts to give virtual effect to the law for partition of successions, without reducing them below the proper extent for agricultural operations, more common in France than perhaps in any other part of the world. See on the matter of the immediately preceding remarks, *Code Civil*, lib. iii. tit. 18.

HYPOTHECATION. [Mortgage, P C.]

INDEX TO THE LETTER H.

VOLUME II.

I

ICE-HOUSE, a building constructed for the purpose of keeping ice through the summer, by excluding, as perfectly as possible, the influence of changes in the temperature or humidity of the external atmosphere. Such structures are not only useful for preserving ice which is to be applied to the cooling of liquors, or to the preparation of articles of confectionary, but also as affording the most effectual means known for keeping meat, fish, game, vegetables, and fruit sweet and fresh in hot weather. In Loudon's 'Encyclopædia of Cottage, Farm, and Villa Architecture,' where (sec. 736-738) a detailed account is given of various modes of constructing ice-houses, it is observed that although these important conveniences are rarely to be found among the buildings of an English farm, they are frequent in those of North America, and might be advantageously introduced in this country, especially upon such farms as are connected with inns. To a gentleman's country residence an ice-house is always an important, and, in some cases, almost an indispensable appendage.

One of the simplest modes of preserving ice, alluded to in the work above mentioned, consists in enveloping the ice in a great quantity of straw, above the surface of the ground, in such a position that moisture, which is even more injurious than heat, may drain off freely. For this purpose the ground should be raised in the form of a flattened cone, upon which should be laid a stratum of faggots. Straw is laid upon the faggots to the thickness of a foot or more, and the ice is piled upon it in a compact conical mass, the larger the better. Over the ice is laid first about a foot thickness of straw, then faggot-wood to a further thickness of two feet, the interstices of which have the effect of keeping a stratum of confined air round about the pile of ice; and finally two or three feet of straw arranged as a thatch. The best situation for such an ice-stack or mound is stated by Loudon to be under the shade of trees, or, where such shelter cannot be obtained, under a kind of shed roof, with an opening to the north only. Some writers, however, among whom may be mentioned Cobbett, who notices the subject in his 'Cottage Economy,' considers that, in consequence of their tendency to increase the humidity of the air, the vicinity of trees is objectionable. On the same principle some recommend an eastern or south-eastern, in preference to a northern aspect, for the entrance to an ice-house, in order that the morning sun may dissipate the damp air from it.

An underground ice-house may, according to Loudon, be simply a large cellar, with hollow or double walls, floor, roof, and doors, and furnished with a trapped drain to allow the escape of such water as may be produced by a partial thaw, without admitting any air. Such ice-houses are usually formed in the shape of an inverted cone, which is considered the most advantageous because it keeps the ice more compactly together than any other form, and because, in case of any thaw taking place, the remaining ice will naturally slip down, so as to keep the mass solid. This advantage, however, Loudon does not conceive sufficient to compensate for the greatly increased expense of construction involved in the adoption of the conical form. 'A plain square room,' he observes, 'with double side walls, say a foot apart, a double arch over, and a double floor under, which can be built with the same ease as any common cellar, will, all other circumstances being alike favourable, keep the ice as long as any conical form whatever.' In all cases it is well to interpose a layer of straw, reeds, or chaff, which is preferred to straw in Italy, where it is used for packing ice for travelling, between the walls and the ice; and by the use of faggots as well as straw any perfectly dry cellar in a suitable situation may be used as an ice-house. In some situations a sufficient degree of hollowness in the walls may be produced by the adoption of the plan of building with bricks on edge (noticed under BUILDING, P. C. S., p. 250), or by some similar contrivance. One mode of building hollow walls which may be thus applied, consists in the use of half-bricks, divided longitudinally, as stretchers, leaving a space equal to the full width of a brick between them. Such half-bricks are easily produced by nearly cutting the brick in half with a wire before burning, when, after paying duty only as a single brick, it may, when burnt, be easily broken in two. Hollow floors for ice-houses may be constructed in various ways with bricks on edge and tiles or flags. Whatever be the construction of the ice-house itself, there should be no opening by which it can communicate with the external air excepting through the entrance passage, which is usually at least two or three yards long, and furnished with two, three, four, or more doors, of which not more than one must be opened at a time. Where a portion of the passage is fitted up with shelves to serve as a pantry, four doors are necessary, and the space between the first or outer and the second doors, and also, if possible, that between the second and third doors, should be filled up with straw, which, for convenience of removal, may be made up into great bags or cushions, and suspended from the ceiling. For this purpose barley-straw is, owing to its softer nature, preferable to that of wheat, rye, or oats. The space between the third and fourth doors then constitutes the pantry, the temperature of which may be reduced by occasionally opening the fourth or innermost door for a time. Sometimes pantry-shelves are placed in the body of the ice-house itself. Where the difficulty of excluding external temperature is very great, treble walls, roofs, and floors may be used, and the entrance-passage may be made crooked, with a door at every turn.

Loudon gives a ground-plan and section of a complete ice-house of approved construction, of the inverted conical shape, with an arched roof, which it is proposed to cover with two or three feet of earth, or more in hot climates, over which he suggests the propriety of training ivy, for the sake of excluding solar heat. In this design a small pump is shown communicating with a well in the drain of the ice-house, for the purpose of raising the thaw-water for drinking or other use. Dr. Ure, in his 'Dictionary of Arts,' &c., art. 'Ice-house,' gives a section of a similar structure, but with solid walls and a conical roof of timber, which may be simply thatched, or covered with brickwork and thatched, and which should have a gutter round it to collect and conduct to a distance all rain that falls upon it, that the circumjacent ground may be kept dry; and in Hebert's 'Engineer's and Mechanic's Encyclopædia,' under the same head, is an account of a plan proposed by Mr. David Gordon, for constructing an ice-house of similar form, principally of timber. In this plan the excavation is made considerably larger than the ice-house, which consists of a framework of strong timbers, roughly boarded outside, and lined with straw set on end and confined by laths nailed to the timbers. The conical roof is thatched with straw or heath, and the space between the outer boarding and the surface of the excavation is filled with heath, brushwood, or fir-tops, and neatly thatched or turfed over. In some situations simple excavations in calcareous soils, with a long circuitous passage by way of approach, are used instead of more regular ice-houses.

In filling an ice-house, the ice should be broken with mallets to a coarse powder, which, according to Loudon, should be 'composed of particles not larger than those of sand or salt,' and well rammed down as it is thrown into the ice-well, its upper surface being kept of a concave shape, and a little water being occasionally added to fill up all interstices, and to facilitate the congelation of the whole into a solid mass. A better method, according to the same authority, is to sprinkle the ice with water saturated with salt, by dissolving it at the rate of a pound of salt to a gallon of water. This salt and water may be applied by a common watering-pot upon the surface of the ice at intervals of two feet from bottom to top of the mass, an extra quantity being poured on when the filling is completed. By this means the ice becomes so firmly compacted as to need the force of a pickaxe to break it up, in the heat of summer. 'Thus prepared,' observes Loudon, quoting from the 'Gardener's Magazine,' 'it will be found to keep three times as long as by the common method in the house, and it will also keep three times as long when exposed to the air, from salt water, and consequently salted ice, having a less capacity for heat than fresh water or fresh ice.' Snow is occasionally preserved in a similar manner to ice, it being carefully compressed into a solid mass. Some curious particulars respecting the use of ice and snow for refrigerating liquids, in antient as well as modern times, are given in a long paper in the third volume of Beckmann's 'History of Inventions' (English edition of 1814, pp. 322-355), in which reference is made to antient writers who allude to the preservation of snow in pits or trenches; and it is stated that a similar method is pursued in Portugal, where, when the snow has been collected in a deep gulf, some grass or green sods, covered with dung from the sheep-pens, is thrown over it; and under this covering the snow is so well preserved that it may be taken up and transported to a considerable distance throughout the summer.

In connection with the subject of this article, Loudon describes a kind of pantry intended to serve some of the purposes of an ice-house, in which the evaporation of water, constantly trickling down the outside of a close conical chamber elevated above the ground, is employed as a means of refrigeration; and also, in section 2536 of his 'First Additional Supplement,' an ice-box which might almost be termed a portable ice-house. It consists of an inner and outer casing, six inches apart, the interval between which is filled with burnt cork reduced to powder, this being found to possess higher non-conducting properties than the charcoal of wood. The lid is double, and is filled with the same substance; and it is made perfectly air-tight by means of projecting ledges, which, when shut, dip into a gutter filled with water. Ice may be preserved for several weeks in such a box, in which also bottles, dishes, &c. may be placed. Similar to this contrivance is the American ice-safe lately introduced into this country.

ICE-PLANT. [MESEMBRYACEÆ, P. C.]

ICHNEUMON, a genus of insects belonging to the order *Hymenoptera*, section *Terebrantia*, and family *Pupivora*, in the arrangement of Latreille. The genus, as defined by Linnæus, included such pupivorous hymenoptera as are furnished with veined wings (the anterior pair presenting in their disk several complete or closed cells), filiform or setaceous vibratile antennæ composed of a great number of articulations, and an ovipositor of various length and complicated structure. The Linnæan genus now constitutes a group including a great many well marked genera and an immense assemblage of species. All these are remarkable for the habits of their larvæ, which are parasitic *in* the bodies of other insects. These bodies the perfect ichneumons perforate by means of their ovipositors, and there lay their eggs. This destructive habit gave rise to the name by which they are known; a comparison being drawn between them and the Egyptian ichneumon (*Viverra Ichneumon*), the quadruped celebrated as the destroyer of serpents and crocodiles.

The history of these insects has attracted much attention among naturalists, and many elaborate memoirs have been written upon them. The purpose they serve in the economy of nature has been well described by Kirby and Spence: 'The great body of the ichneumon tribe is principally employed in keeping within their proper limits the infinite host of lepidopterous larvæ, destroying, however, many insects of other orders. Such is the activity and address of the *Ichneumonidæ* that scarcely any concealment, except perhaps the waters, can secure their prey from them; and neither bulk, courage, nor ferocity avail to terrify them from effecting their purpose. They attack the ruthless spider in his toils; they discover the retreat of the little bee, that for safety bores into timber, and, though its enemy ichneumon cannot enter its cell, by means of her long ovipositor she reaches the helpless grub, which its parent vainly thought secured from every foe, and deposits in it an egg which produces a larva that destroys it. In vain does the destructive *Cecidomya* of the wheat conceal its larvæ within the glumes that so closely cover the grain; three species of these minute benefactors of our race, sent in mercy by Heaven, know how to introduce their eggs into them, thus preventing the mischief they would otherwise occasion, and saving mankind from the horrors of famine. In vain also the *Cynips*, by its magic touch, produces the curious excrescences on various trees and plants, called galls, for the nutriment and defence of its progeny; the parasite species attached to it discovers its secret chamber, pierces its wall, however thick, and commits the destroying egg to its offspring. Even the clover weevil is not safe within the legumen of that plant; nor the wireworm in the earth from their ichneumonidian foes.' (*Introduction to Entomology*, vol. i. p. 267.) In the third volume of the Transactions of the Linnæan Society, in a Memoir by Mr. Marsham, may be found a full account of the operations of one of these insects, the *Pimpla manifestator*, observed by him in Kensington Gardens. The details of its proceedings there given are exceedingly interesting, and present a remarkable picture of insect instinct. The larvæ of ichneumons are in some cases solitary, in others gregarious. Those of some species quit the bodies of their victims and spin a cocoon of silk before being transformed into the chrysalis state. Those of others, remain and use the skin of the caterpillar as a covering. By a wonderful instinct, when the grub leaves the egg, instead of attacking the vital organs of the caterpillar, within whose body it has been hatched, and thereby destroying its food, it confines itself to the fatty parts until it has nearly attained its full size.

ICHNOCARPUS (from ἴχνος, a 'footstep,' vestige, and κάρπος, a 'fruit,' in reference to the slender follicles), a genus of plants belonging to the natural order Apocynaceæ. It has a salver-shaped corolla, 5-cleft calyx, and inclosed stamens; sagittate anthers free from the stigma. The species are climbing shrubs with opposite leaves; the flowers in branched terminal panicles, white, and inodorous.

I. frutescens has a turning stem, oblong lanceolate leaves tapering to both ends, axillary peduncles very long and racemose. It is a native of Ceylon and Nepaul. The flowers are small and purple; the leaves deep green above and pale beneath. According to Professor Royle, it is sometimes used in India as a substitute for sarsaparilla, and it is also mentioned by Afzelius in his Remedia Guinensia as a medicinal plant.

I. fragrans has oblong lanceolate leaves tapering to both ends, and axillary trichotomous spreading peduncles. It is a native of Nepaul, and has large handsome flowers.

I. Afzelii is a glabrous shrub with turning stems, oval acute leaves at the base, oblong or lanceolate as they approach the top. The corollas are white and sweet-scented. It is a native of Sierra Leone, and about the river Bascha, in woods and among bushes.

I. Loureirii has a frutescent stem, ovate oblong leaves, lateral 3-flowered peduncles. It is a native of Zanzibar. All the species of Ichnocarpus grow well in a mixture of loam, peat, and sand, and cuttings strike readily in sand under a hand-glass.

(Don, *Gardener's Dict.*; Lindley, *Flora Medica.*)

ICHTHYOLOGY, RECENT ADDITIONS TO. The researches of naturalists in all parts of the world have of late years greatly added to our knowledge of fishes, and revived the interest attached to this important branch of vertebrate Zoology. The connection which the genius and labours of Agassiz have established between Ichthyology and Geology has not a little tended to promote research in this direction, and the results are beginning to hold no unimportant place in natural-history publications. Moreover, now that philosophic Zoology is fast gaining ground, and mastering the species-making and mere collecting, which had so long taken the name and usurped the place of the science, the study of a class of animals including the links between the vertebrata and invertebrata, is assuming a degree of importance to which it formerly could lay no claim. On the much-neglected subject of the classification and the distribution of fishes, some important researches have been recently made known, of which, as they will probably materially affect the future progress of Ichthyology, we shall here give a brief summary.

Classification of Fishes.—The natural arrangement of fishes has recently engaged the attention of two of the most eminent and philosophical naturalists of our time, W. S. Macleay and J. Muller. Mr. Macleay's views on this subject are made known in a letter to an eminent Indian naturalist, Mr. M'Clelland, and were published in the Calcutta Journal of Natural History for July, 1841. Throughout they are influenced by the quinarian hypothesis, of which he is the distinguished author. He bases his classification on three generally admitted facts, which he holds to be incontestable. The first is the near approach of fishes to Batrachian Amphibia, which, with Swainson, he considers to be made by means of *Lophius* and *Malthe*. 2nd. The near approach of fishes to the Cetaceous Mammalia, the viviparous sharks constituting the connecting link. 3rd. 'As the grand character of fishes as a class is their being the most imperfect of vertebrata, the most typical of fishes ought therefore to be the most imperfect of them, *i. e.* the furthest removed from the type of vertebrata;' a position which many naturalists will be inclined to combat. He regards as examples of such fishes the *Cyclostomi*. Bearing the above 'fundamental facts' in mind, he constitutes the following primary divisions:—

Aberrant group. CTENOBRANCHII. Gills pectinated.

1. *Plagiostomi.* Cartilaginous fishes with fixed branchiae, leading to *Mammalia.*
2. *Sturiones.* Cartilaginous fishes with free branchiae.
3. *Ostinopterygii.* Bony fishes with free branchiae, leading to *Amphibia.*

Normal group. ACTENOBRANCHII. Fish breathing with gills, not pectinated.

4. *Lophobranchii.* Bony fishes breathing by tufts arranged in pairs along the branchial arches.
5. *Cyclostomi.* Cartilaginous fishes breathing by a series of cells.

Mr. Macleay has not yet presented an analysis of the families and genera included under the above five orders, with the exception of those of the third, *Ostinopterygii*, a term by which he proposes to denominate the osseous fishes having pectinated gills. The following table of his subdivisions of this important order will convey to the naturalist a clear idea of his system.

OSTINOPTERYGII.

A.

Aberrant group. ACANTHOPTERYGII. Spines in the first dorsal fin hard.

Tribe 1. *Balistina.* Maxillary bones soldered to the intermaxillaries, and both to the palatine arch; opercula and gills concealed beneath the skin. Includes the families *Balistidae*, *Ostraciontidae*, *Cephalaspis*, *Orthagoriscidae*, *Diodontidae.*

Tribe 2. *Percina.* Bones of the jaws free and complete. Operculum distinct. Operculum or preoperculum generally with dentated edges, or with spines. Includes *Chaetidontidae*, *Percidae*, *Scorpoenidae*, *Cirrhitidae*, *Sparidae.*

Tribe 3. *Fistularina.* Bones of the jaws free and complete. Operculum distinct. Operculum and preoperculum generally with smooth edges. *Scombridae*, *Fistularidae*, *Gobioidae*, *Lophiidae*, *Labridae.*

B.

Normal group. MALACOPTERYGII. Spines in the dorsal fins soft.

Tribe 4. *Pleuronectina.* Ventral fins, when existing, inserted under the pectorals, and directly suspended to the bones of the shoulder. *Anguillidae*, *Echeneidae*, *Cycloptеridae*, *Pleuronectidae*, *Gadidae.*

Tribe 5. *Abdominales.* Ventrals suspended behind the pectorals, and not attached to the bones of the shoulders. *Siluridae*, *Cyprinidae*, *Esocidae*, *Clupeidae*, *Salmonidae.*

Geographical Distribution of Fishes.—This branch of ichthyology is beginning to attract the attention and research which the interest of the subject demands. Within the last five years the example of Yarrell has been followed in many countries, and valuable local monographs published, with excellent illustrations. In the north of Europe, besides the writings of Nilson and Eckstrom, the fishes of Denmark are in progress of illustration by Henrik Kroyer. Those of Belgium have been carefully examined by M. de Selys Longchamps. In that naturalist's *Faune Belge* fifty-three fresh-water fishes and forty-one species inhabiting the sea are enumerated. Of the former, forty-three live only in fresh water; six in fresh water, but go to the mouths of rivers in winter; and four live in the sea, but migrate to the rivers in spring or summer. Of the sea-fishes thirty pass up the Scheldt as far as Antwerp. The fresh-water fishes of central Europe are engaging the attention of Agassiz, and his work on them is in progress of publication. Freyer has published an account of those inhabiting Carniola, amounting to thirty-two species. Italian ichthyology has been admirably illustrated by Charles Bonaparte, the Prince of Canino. In Asia the fishes of the Caspian have been described by Eichwald in his 'Fauna Caspio-Caucasica,' published in 1841. Those inhabiting the rivers of Syria have been enumerated by Heckel (1843) from the collections of Kotschy. Fifty-seven species inhabit the rivers Orontes and Euphrates, of which no fewer than forty-five are Cyprinidae. Indian ichthyology has received valuable contributions from M'Clelland, whose papers have been chiefly published in the Calcutta Journal. In Siebold's 'Fauna Japonica' (1842) are accounts and figures of Japanese fishes by Temminck and Schlegel. The most valuable contribution ever made to our knowledge of the ichthyology of Eastern Asia was communicated to the British Association at Cambridge in 1845, in the form of a report on the 'Ichthyology of China,' by Dr. Richardson. From his researches it would appear that the fishes of that region are not only very numerous as regards species, but also very valuable on account of the extensive fisheries there carried on. His remarks on their distribution are highly interesting. It would appear that chains of islands or coasts having an east and west extension determine the extent of the range of species and groups of species. For example, to take the intertropical zone of the ocean, we find a great number of fishes common to the Red Sea, the coasts of Madagascar, the Mauritius, the Indian Ocean, the south of China, the Philippines, the Malay Archipelago, the northern coast of Australia, and the whole extent of Polynesia, including the Sandwich Islands. As regards the generic forms of the fresh-water fishes, China agrees with the peninsula of India. Were the vast zone in question, embracing more than two-thirds of the circumference of the globe, to be suddenly elevated, we should find the remains of fishes similar everywhere throughout, the species which have a local distribution being few and unimportant. This result of Dr. Richardson's researches is of the highest importance when brought to bear on geological considerations. Dr. Richardson has also been engaged in the special investigation of the ichthyology of Australia, and his many valuable memoirs on that subject may be consulted in the 'Transactions of the Zoological Society,' and in the 'Annals of Natural History.' In Dieffenbach's 'Travels in New Zealand' (1843), the same indefatigable and philosophic zoologist has published, in conjunction with Mr. Gray, a list of the fishes of New Zealand. Ninety-two species are there enumerated. In Smith's 'Illustrations of the Zoology of South Africa,' figures and descriptions are given of the fishes of the Cape of Good Hope. The researches of Dr. Peters on the eastern coast of Africa, at present in progress, promise to make us well acquainted with the ichthyology of that interesting region. With those of the northern part of Western Africa we have had ample information in the valuable memoirs of Lowe on the fishes of Madeira (*Zoological Transactions and Proceedings*).

The labours of Jenyns on the fishes collected during Captain Fitzroy's voyages have contributed materially to our knowledge of the ichthyology of the southern extremity of South America, whilst that of Guiana has been illustrated by Sir Robert Schomburgk, in the 'Naturalist's Library.' De Kay's 'Zoology of New York' (1842) has made us acquainted in detail with the fishes of the United States. They amount, so far as known, to 440 species, distributed through 156 genera and 32 families. In the State of New York there are 126 *Acanthopterygii*, 115 *Malacopterygii*, 3 *Lophobranchii*, 18 *Plectognathi*, 3 species of sturgeon, and 27 cartilaginous fishes. It is to be regretted that the researches of Dr. Parnell on the West Indian fishes are still unpublished, since they would go a long way towards enabling us to gain a connected view of the ichthyology of the new world.

As far as we can judge from the materials as yet collected, the distribution of fishes appears to be determined by the same laws which regulate that of other aquatic animals. Climate, composition of the element in which they live (whether salt, brackish, or fresh), and conformation of the sea or river bed, on which the depth of water depends, are the great regulating influences. The great distinctions of form and colour between fishes of tropical and those of temperate regions, evince the influence of climate; the fact of the fisheries for certain species commonly used for food being invariably conducted in deep water, whilst others can only be maintained among shallows, shows the influence of depth; the fact pointed out by Dr. Richardson that the seas, by ranges of land or reefs extending for great distances under the same climatal parallel, are peopled by the same species of fishes, is an instance of the action of the combined influences of climate and depth. The distinctness as to genera and species of the greater number of river and lake fish from those inhabiting the sea depends on the second of the three great influences enumerated—that of the composition of the element in which they live. Great depths cut off the range of species even when climatal conditions are similar. Hence the fishes of the coast of the United States are for the most part distinct from those on our own side of the Atlantic. Some fishes have very limited ranges in depth compared with others, and, generally speaking, it may be assumed that those having the greatest vertical range (*i. e.* range in depth) have also the widest horizontal extension, a fact depending on the capacity of such species for living under a greater variety of conditions. Barriers of land, as chains of mountains, determining the courses of rivers, are often the boundaries between two distinct specific assemblages of fresh-water fish, and in like manner a very narrow strip of land may divide two very distinct marine faunas. The distribution of marine vegetables, affecting the distribution of numerous marine invertebrata which feed on those vegetables, and in their turn serve to furnish food for fishes, will materially affect the distribution of many species of the latter. So also will the presence of currents, and even the agency of man, assisting often unintentionally in the conveyance of ova from one country to another. Distant regions, presenting similar conditions, such as the Arctic and Antarctic Seas, are inhabited hy species representative hut not identical, and presenting a general aspect very similar, depending on characters of form and colour, &c. It is probable also that the fishes inhabiting the greater depths of tropical seas resemble those of temperate climes, and that those of the latter in like manner approach Arctic forms.

A brief glance at the range and distribution of the principal genera will best serve to illustrate the above positions.

The lowest and most anomalous of all the species of fishes, the *Branchiostoma*, is generally distributed through the seas of Europe. Only one species is known, yet we cannot but hope that the researches of the many active naturalists now occupied with the study of marine zoology will bring to light forms connecting the Lancelet with other genera. The *Myxine*, or glutinous hag, almost equally strange in form and structure, is confined to the most northern and most southern seas, and is replaced in the higher parts of the southern hemisphere by the equally curious and nearly allied genus *Heptatrema*. The Lampreys inhabit the fresh waters of Europe and North America, but the species in each are quite distinct. *Lepidosiren*, the connecting link between fishes and reptiles, so dubious in organization that its position is still disputed, is an inhabitant of the west of Africa, and a genus closely allied has just (1845) been discovered hy Dr. Peters on the eastern coast of the same continent.

The rays and sharks are universally distributed, but many of the genera and species are very local and apparently regulated in their range hy climatal zones. The seas of Europe can boast of the greater number, though fortunately the most formidable of the species are exotics. The largest species, as the great *Silachus maximus*, the basking shark, are harmless, and have their favourite habitats in the temperate zone. Size among fishes does not appear to hear any relation to latitude. *Chimaera* is northern and southern, extending from the frigid zone. The *Sclerodermi* are for the most part southern and tropical, especially the curious forms of *Cestracion* and *Astracion*. *Monacanthus* inhabits the American and Chinese seas; *Triodon*, the Indian ocean; *Tetrodon*, *Diodon*, and *Balistes* have wider ranges. The typical genus of pipe-fishes, *Syngnathus*, is cosmopolitan, and has a very wide geographical distribution. Six species are found in the British seas, two on the coast of the United States, and Mr. Jenyns has described new forms from Valparaiso, Tahiti, and Patagonia. *Hippocampus* is of the temperate zones of both hemispheres, and in the tropical seas is replaced by *Solenostoma* and *Pegasus*. The sturgeons inhabit the Western European seas, the Caspian, the Black Sea, and the Mediterranean. Three species are North American.

Of the eels, *Anguilla*, *Conger*, and *Muræna* are typical and cosmopolitan. *Gymnarchus* is Egyptian, *Gymnotus* (the electrical eel) South American, both inhabitants of fresh water. The osseous flat fishes are very generally distributed; the largest species are inhabitants of northern seas. The Mediterranean boasts of many species of *Pleuronectes*. Species of sole are found in both northern and southern hemispheres. The *Gadidæ* are inhabitants of northern and temperate seas, and certain species, as the Tusk, do not range farther southwards than Norway and Scotland. *Lepisosteus*, one of the few remaining genera of Sauroid fishes, which appear to have played a most important part in the waters of antient geological epochs, is confined to the rivers of America, and some allied forms to northern Africa. The herring tribe, *Clupeidae*, has a wide distribution, and forms of the typical genus *Clupea* are found in the southern as well as in the northern hemisphere. The species however are locally distributed; thus the true herring is unknown in the Mediterranean, where its place is taken by the Sardine, and the herrings of the South American coasts are quite distinct from those of the north. Even within very limited areas, as in that of the British seas, the species have peculiarities of distribution, as we see in the prevalence of the herring, properly so called, on the coasts of Scotland and in the Irish sea, while it is replaced by the Pilchard on the south-west coasts of England and south of Ireland: the white-bait is also a remarkable instance of local distribution. *Mormyra*, *Exocætus*, and *Esox* are the typical forms of pikes; the first is North African; the flying fishes are oceanic and Mediterranean, and the pikes proper are inhabitants of the temperate zones. The restricted genus *Esox* is confined to fresh water.

The important family of *Salmonidae* has its most valuable members in northern regions, some with a wide range, the same species of trout occurring in Lapland and in Switzerland. In North America the trouts are represented by very similar hut distinct species. M'Clelland has described a true salmon from India inhabiting the tributaries of the Oxus. This instance, however, does not affect the essentially temperate and subarctic character of the distribution of the *Salmonidae*, for this Indian species was found at an elevation of 11,000 feet, where we must expect to find temperate forms prevail. Jenyns has made known a peculiar genus of *Salmonidae*, which he has named *Aplochiton*, inhabiting the seas of the Falkland Islands and Tierra del Fuego. *Bajore* is a genus constituted by De Kay, and confined to the United States. The *Argentines* are Mediterranean, and *Sternoptyx* is oceanic.

Among the most characteristic fishes of the fresh waters of tropical countries are the *Siluridae*, which abound in the regions of Central Asia, where almost all the species of the typical genus *Silurus* occur. A single offset finds its way to Europe. *Pimelodus* and *Callichthys* are American genera of this family; the electrical *Malapterurus*, North African; *Loricaria*, South American. Equally interesting and well marked in distribution is the fresh-water family *Cyprinidae*. The true carps are characteristic of the old world; *Catastoma* and *Anableps* of the new.

Of the Acanthopterygious fishes the genera *Centriscus* and *Fistularia* are, with the exception of a single Mediterranean species, tropical. The genera of *Labridae* have well-marked provinces. Thus the numerous species of *Scarus* are grouped together in tropical seas, being replaced in temperate regions by *Labrus* and *Crenilabrus*. There are offsets, however, of each. The frog-fishes *Lophius* and *Chironectes* are chiefly represented in Africa and South America. A single *Lophius* is a native of European seas. De Kay enumerates seven Lophiadae as inhabitants of the United States, and Richardson has described some Australian species. The Goby tribe prevails in Europe and Asia. Some of the species of *Gobius* are remarkable for the depth at which they live. The Blennies are truly European, with very few exceptions. The Gunnels are mostly of northern seas. Some species of the Goby tribe inhabit fresh water, as the genus *Tuenioides*, which is found in marshes in India. *Comepturus* lives in Lake Baikal, and one or two species of *Gobius* proper live in rivers.

The *Mugiloidae* are very generally extended. They have been said to be absent from North America, hut this is incorrect, four species of *Mugil* inhabiting the United States. *Atherina* is also a cosmopolitan genus.

The Labyrinthiform Pharyngeans are essentially tropical, being all natives of the eastern regions of Asia. Their organization is peculiarly adapted to their climatal range. The *Teuthyes* are fishes of warm climates, and many species inhabit the Australasian seas. The Mackerel tribe includes a number of genera, which have very various areas of distribution. Among them the Dolphins (*Coryphaena*) are Mediterranean and Oceanic; the Dories (*Zeus*) mostly European; *Vomer*, exotic; *Notacanthus*, arctic; *Lichia*, Mediterranean. *Scomber* and the allied typical genera of the tribe are mostly cosmopolitan. The *Chetodans* are essentially equatorial.

The family of *Sparoideae* gives the most prominent feature to the ichthyology of the Mediterranean and seas of Southern Europe. *Pagrus* has a wide range, hut chiefly through warm regions. The *Scienoideae*, very numerous in species, are mostly equatorial. The important family of *Triglidae*, of which the Gurnard is the type, has a very extensive distribution. The true gurnards are mostly European; *Scorpaena* ranges from Europe to Australia. *Platycephalus* is peculiarly Indian. *Sebastes* is a genus of the old world, with one or two exceptions.

The *Percoideae*, chief of the Acanthopterygious families, is partly composed of marine and partly of fresh-water genera. The genus *Perca* is characteristic of the northern temperate zone. *Mesoprion*, *Diacope*, *Plectropomus*, and *Serranus* are cosmopolitan. *Mullus* and *Paralepis* are European genera. *Holocentris*, *Myripristis*, *Priacanthus*, and *Dules* are represented in both hemispheres. *Ambassis* is an Indian fresh-water genus. *Percophis*, *Pinguipes*, *Centrarchus*, and *Pomotis* are American. *Beryx*, *Trachichtes*, *Helotes*, *Pelotes*, and *Chironema* are Australian

I'CICA, a genus of plants belonging to the natural order Burseraceæ. It has a small obtusely 5-toothed calyx; 5 petals inserted under the disk, recurved, sessile, valvate; 10 stamens shorter than the petals inserted with them; a cup-shaped disk with 10 crenatures at the margin; a sessile 5-celled ovary with two collateral pendulous ovules in each cell; a very short style; a 5-angled stigma; a globose obtuse 1-3-celled drupe with thick and fleshy dissepiments; resinous seeds without albumen. The species are shrubs or trees with unequally pinnate leaves, and white flowers seated on panicled racemes which are terminal or axillary.

I. heterophylla has ternate or pinnate leaves, with stalked ovate, acuminated, entire, simply-veined leaflets; the racemes simple, rather shorter than the leaves. This plant is the *I. Aracouchini* of Aublet. It is a tree 50 feet in height, growing in Guyana, on the banks of the river Couron, where it is called by the natives Aracouchini. When an incision is made in the bark of this tree, a yellow balsamic aromatic fluid exudes, which retains its fluidity a long time after exposure to the air. This fluid is used by the Guyanese as an application to wounds. A resin is found also in the seeds, and the natives of Guyana carry the nuts about with them on account of the scent they give out. These nuts they often send as presents to their friends. The Caribs also use the exudation for mixing with oil with which they anoint their bodies.

I. heptaphylla has 5-7 stalked oblong acuminated leaflets, with the racemes few-flowered, somewhat corymbose, and 6 times shorter than the petiole. It is a small tree, a native of the woods of Guyana, where it is called *Arbre d'Encens.* The whole plant is sweet-scented, and like the last species yields a clear balsamic fluid when it is wounded. It is burned as a perfume, and used as a remedy in dysentery. The seeds are contained in a viscid pulp which hardens into a grey resin, and is used by the natives for burning as a perfume. The Carib name of this tree is *Arouaou.*

There are several species of Icica, all of which yield the same transparent fluid, resembling turpentine in many of its properties.

I. Icicariba, a native of Brazil, yields a resin, which is brought into the market under the name of gum elemi, but it is not the true gum of that name. *I. decandra* is found in the woods of Guyana, where it is called *Chipa.* The fluid which exudes from it yields on evaporation a resin. *I. altissima* grows in Guyana. There are two varieties of this tree, known by the name of white cedar and red cedar. The latter is a very durable wood, and is used for making household furniture, boats, canoes, &c.

(Don, *Gardener's Dict.*; Burnett, *Outlines of Botany*; Lindley, *Flora Medica*)

IDENTITY. [SAMENESS, P. C. S.]

IDIOT. [LUNACY, P. C.]

IGNATIUS, Patriarch of Constantinople. The schism of the Greek and Roman churches, which began under Photius, who persecuted this prelate, and usurped his see [PHOTIUS, P. C.], gives importance to the life of Ignatius. He was born in 799, and was the son of the Emperor Michael Curopalates, and his mother Procopia was the daughter of the Emperor Nicephorus. On the revolt of Leo the Armenian, Michael surrendered to him the throne, which he had occupied during only a year and nine months, and embraced the monastic life. His sons followed the example of their father, and the youngest, Nicetas, then aged fourteen, changed his name into that of Ignatius. The new emperor, in order not to be disturbed in the possession of power, separated the several members of the family of Michael, and caused his two sons Eustratius and Nicetas to be made eunuchs.

During the reign of the three emperors Leo, Michael II., and Theophilus, they were allowed to enjoy in tranquillity the monastic life to which they had devoted themselves. Ignatius was admitted into the order of priesthood by Basil, Bishop of Paros in the Hellespont, a prelate who had suffered much persecution in opposing the Iconoclasts, and to whom Ignatius was much attached.

On the death of Theophilus, the Empress Theodora was declared regent in the name of her son Michael III. Being opposed to the Iconoclasts, she banished John, the Patriarch of Constantinople, and caused Methodius to be elected in his place. Four years after, on the death of Methodius, the patriarchal dignity was bestowed upon Ignatius, who was compelled to leave his monastery, where he had acquired a high reputation for piety and talent, and to accept this perilous honour.

He had not long enjoyed this see when the possession of it was troubled by his contest with Bardas, the brother of the empress, whom he had excommunicated on account of his scandalous excesses. Bardas having obtained considerable influence over the mind of the young Emperor Michael, whose vices he flattered and encouraged, induced him to take the reins of government, and to compel his mother to withdraw to a convent, and to accept the vows. Ignatius, when summoned to lend his authority to this unfilial act, did not content himself with remonstrating against it, but gave them a stern refusal. He was in consequence banished to the isle of Terebinthos, and deprived of his see, which he had held for eleven years; every means were afterwards employed, but without effect, to induce him to resign. Photius, a eunuch related to Bardas, and a person of considerable learning, who favoured the Iconoclasts, was by the will of the emperor, but without the consent of the church, appointed to the Patriarchate of Constantinople. The controversy of Photius with the Church of Rome, and its issue, are fully detailed in the article PHOTIUS, P. C.

In the year 866 Bardas was put to death; and Basil, the Macedonian, became possessed of the supreme power. One of the first acts of his reign was to banish Photius and to recall Ignatius, who was triumphantly reinstated in his patriarchal dignity on the 3rd of November, 867. At his suggestion a Council was assembled at Constantinople, which ranks in the Roman Church as the eighth Oecumenical. It was presided over by the legate of Pope Adrian II., and in it Photius and his partisans were excommunicated, and their opinions condemned.

From this time Ignatius was allowed to rule the Greek Church without opposition, and his episcopacy was adorned by many Christian virtues, and by a piety which long and severe persecution had chastened. He died on the 23rd of October, 878, on which day the Greek and Roman Churches still celebrate his memory. He was buried in the Church of St. Sophia; but his remains were afterwards transferred to that of St. Michael, near the Bosporus. The details of his life are chiefly drawn from Nicetas David, who had known him personally. It has been published by Rader, Ingolstadt, 1604.

(Le Beau, *Histoire du Bas Empire*, liv. lxvi.—lxx.; Fleury, *Hist. Eccles.*, vol. x.; Alban Butler, *Lives of the Saints.*)

IGNIS FA'TUUS, a meteor resembling a flame, which floats in the atmosphere at a few feet above the surface of the ground. It is generally observed by night, either stationary or in motion, over marshes or burial grounds; but in the 'Philosophical Transactions,' for 1694, there is an account of some ricks of hay being burnt at Dolgelly, in the preceding year, by a vapour like a weak blue flame which came from the sea: Derham (*Phil. Trans.* 1729) relates that he observed about a decayed thistle a flame in motion, which receded from him as he advanced towards it; and Beccaria states that he saw one which seemed fixed to a spot about two feet above some stones near a river: this philosopher observes that such meteors are most usually witnessed during a fall of rain or snow; he adds that they often appear on clayey soils, and that they have been seen to give out sparks. Trebra (*Deutscher Merkur*, Oct. 1783) mentions that he saw at Zellerfeld a meteor which at first approached him and afterwards receded from him to a distance of 500 paces; he adds that it then disappeared, and at the end of half an hour it again became visible.

Occasionally such meteors have been observed to follow or advance towards a spectator; but in general they appear to recede on being approached, and it has happened that from their resemblance to the flame of a distant lamp, they have led the unwary traveller into dangerous swamps. Little confidence can be placed in the descriptions given of them, as few persons have been able to examine them with due attention; and commonly they have been observed under the influence of an ill regulated imagination rather than a philosophical spirit.

A plausible hypothesis which has been proposed in order to account for this phenomenon is that a phosphuretted or a carburetted hydrogen gas, produced by the decomposition of animal or vegetable substances, rises from the ground or from stagnant water, either small in quantity and occupying a single spot, or in great abundance and then becoming a train or a horizontal column of vapour of variable dimensions: such gas may take fire by electricity or spontaneously, at a spot where the atmosphere is particularly free from moisture; and the flame communicating itself successively to other parts of a line or column, the latter being in a state of undulation from the agitations of the atmosphere, will give rise to the appearance of a motion from place to place. The brightness of the meteor will change with the varying quantity or purity of the gas; and its temporary disappearance may be caused by the quantity being in some places too small to render the flame visible. Spontaneous ignition is well known to take place occasionally in a number of vegetable and animal substances while undergoing decomposition, in consequence of the inflammable matter coming in contact with common air or with oxygen gas.

ILFORD. There are two places of this name in Essex, both in the hundred of Becontree. Great Ilford is a village included for civil purposes in the ward and former chapelry of Ilford in the parish of Barking; it forms a respectable street along the road from London to Chelmsford and Colchester, about 8½ miles from the General Post Office. It is on the left or east bank of the river Roding, which is here crossed by a bridge. The river is navigable for small craft up to the bridge, under the name of Barking creek. The name Ilford is derived by Morant from the *ill ford* that must have been here before the causeway and bridge were erected; and by Mrs. Ogbourne from 'a ford at the hill, written *Hyle-ford*.' Great Ilford has a new church, erected in 1831 by the aid of a grant from the commissioners for building new churches. The chapelry was then constituted a distinct parish for ecclesiastical purposes. The church is in the 'gothic style, with tower and spire,' and is capable of accommodating about 850 persons. Mr. Wright describes it as a handsome building. There is also a small chapel (St. Mary's) belonging to an antient hospital, of later (or perpendicular) English architecture; and a new church or chapel (Trinity Chapel) has been erected at Barking-side in the parish of Ilford, capable of accommodating 466 persons, to which a district chapelry has since been assigned. The chapel is in the Anglo-Norman style, with a small belfry. There are also in the village two dissenting chapels. Ilford ward contained in 1831, 725 houses, namely, 668 inhabited by 701 families, 4 houses building, and 53 uninhabited; with a population of 3512: in 1841 it contained 771 houses, namely, 721 inhabited, 32 uninhabited, and 18 building; with a population of 3742, showing an increase in ten years of 230. The living of great Ilford is a vicarage of the clear yearly value of 430*l*., in the rural deanery of Barking, the archdeaconry of Essex, and the diocese of London. The educational returns for 1833 do not distinguish the ward of Great Ilford from the other divisions of Barking parish.

Little Ilford is a parish separated from that of Barking by the river Roding. The parish has an area of 750 acres, and contained in 1831, 22 houses inhabited by 23 families, and 1 house building: the population was 115: in 1841 it contained 23 inhabited houses, with a population of 189; of whom 36 were prisoners or officers in Ilford gaol, which is a house of correction for the county, erected in 1831. The church is dedicated to St. Mary the Virgin. It contains a monument to Smart Lethieullier, Esq., the antiquary. The living is a rectory of the clear yearly value of 408*l*., with a glebe house in the same ecclesiastical divisions as Great Ilford. There was no school in the parish in 1833, but the children 'were taught to read every Sunday morning and afternoon in the church.'

(Morant, *History of Essex*; Mrs. Ogbourne, *History of Essex*; Wright, *History of Essex*; *Reports of Commissioners for Building New Churches*; *Population Returns, and other Parliamentary Papers*.)

ILICINEÆ. [AQUIFOLIACEÆ, P. C. S.]

ILLEGAL CONTRACT. [PUBLIC POLICY, P. C. S.]

ILLICE'BRUM, a genus of plants the type of the natural order Illicebraceæ. It has five sepals slightly cohering at the base and horned at the back. Petals absent or five subulate inserted with the five stamens on a perigynous ring; a one-celled one-seeded furrowed capsule bursting along the furrows. The only species is a small trailing shrub with opposite leaves having scarious stipules at the base.

I. verticillatum, Whorled Rush-grass. It has a trailing glabrous stem, roundish leaves, verticillate whorled white minute flowers. It is found in bogs and wet marshy places, chiefly in Cornwall and Devonshire. The seeds of this shrub should be planted in a moist situation, and, if allowed to sow themselves, will spring up regularly every season. It is worth cultivation on account of the delicacy and beauty of its blossoms.

(Babington, *Manual of British Botany*; Don, *Gardener's Dictionary*.)

ILLICIEÆ. [WINTERACEÆ, P. C.]

ILMEN, LAKE. [RUSSIA, P. C.]

I'MOLA, INNOCE'NZIO DA, a pupil of Francia, and a distinguished painter, of the early half of the sixteenth century. His family name was Francucci; he was born in the latter part of the fifteenth century, at Imola, whence his surname, but he lived chiefly at Bologna. He painted from 1506 until 1549: Vasari says he died aged fifty-six, but this is apparently an error, or he must have commenced to paint when only thirteen years of age. However, about 1506 he was placed with Francia, and, according to Vasari, he studied also with Albertinelli at Florence. In 1517 he produced what is now considered his masterpiece. It is a large picture, now in the Academy at Bologna, but formerly over the great altar of San Michele in Bosco, representing, in the lower part, the Archangel Michael vanquishing Satan, Saints Peter and Benedict at the sides, and above in the clouds the Madonna and Child surrounded by angels; the whole is treated much in the second manner of Raphael. It has been engraved by A. Marchi for the 'Pinacoteca di Bologna.' There is also a very superior work by him in the cathedral of Faenza. Da Imola's style is termed by Lanzi *Raffaellesco*, and it appears that several of his works have passed for the works of Raphael, that is, for works of his second style. He was also a good fresco painter.

(Vasari, *Vite de' Pittori*, &c.; Lanzi, *Storia Pittorica*, &c.: Giordani, *Pinacoteca di Bologna*.)

IMPEACHMENT. [PARLIAMENT, P. C., p. 279.]

IMPERATO'RIA (so named from its supposed imperial virtues in medicine), a genus of plants belonging to the natural order Umbelliferæ. It has no calyx; obovate petals contracted into an inflexed segment. The fruit flattened at the back with a dilated flat border. The species are glabrous perennial herbs with erect hollow terete striated stems. The umbels are large and compound, and the flowers white.

I. Ostruthium has a tuberous fleshy and somewhat creeping root of an aromatic and acrid nature. The lower leaves biternate, the upper ones less compound. The flowers are small and of a white or pale flesh-coloured hue. It is a native of Europe and Newfoundland in damp meadows and woods. This species is the Masterwort of old English herbalists, and the root has been much celebrated as an antidote against poisons, a diuretic, and sudorific; and Lerango affirms that an infusion of it in wine has cured agues which have resisted quinine. When chewed, it excites a copious flow of saliva, and acts as an agreeable stimulant to the gums. It is recommended in cases of rheumatic toothache, and is cultivated in many places for the London market.

I. angustifolia, the Narrow-leaved Masterwort, has biternate leaves, oblong leaflets attenuated at the base and deeply serrated. It is a native of the Alps and Piedmont. The blossoms appear in June and July, and are of a white colour. The species of this genus are of easy culture, and may be propagated either by dividing the roots or from seed.

(Don, *Gardener's Dic.*; Lindley, *Flora Medica*; Burnett, *Outlines of Botany*.)

IMPRESSMENT. [SEAMEN, P. C. S.]

IMPRISONMENT, FALSE. [FALSE IMPRISONMENT, P. C. S.]

INCENDIARY. [ARSON, P. C.; LAW, CRIMINAL, P. C. S.]

INCEST. During the Protectorate in the year 1650, incest and adultery were made capital offences, but at the Restoration this law was not confirmed. Incest in England is now only punishable by the ecclesiastical courts, according to the rules of the canon law. This law also determines what kind of sexual connection is incest. Incest may be committed either by married persons or persons unmarried. If adultery is committed, it may also be incest; and if fornication is committed, it may also be incest. The notion of incest is founded upon the degree of consanguinity or affinity between the parties who have had the sexual connection.

The term Incest is from the Roman term Incestum, which is the same as Non Castum, 'not pure,' and in its most general sense signified any offence against positive morality, or religion. Persons within certain degrees of consanguinity could not contract a marriage; and if they did contract a marriage or live together as man and wife, such a marriage was called incestuous (Incestae Nuptiae). The affecting to marry was not necessary to constitute Incestum. It would be Incestum whenever there was sexual connection between a man and woman, whether married or not, who were incapable of contracting a lawful marriage by reason of consanguinity. If the parties were capable of contracting such marriage, the connection would be Stuprum, which, in its limited sense, partly corresponds to fornication.

The Roman notion of Incestum was not confined to the case of blood relationship. Persons who stood in the relation of parent and child by adoption could not contract a marriage, even after the adopted child was emancipated.

The Romans do not appear to have had any direct legislation on this subject till the Imperial period, and the rules of law that were in force were founded upon positive morality and usage. The Lex Julia which was enacted in the time of Augustus treated of incest only indirectly, and so far as it concerned the object of that law, which was the punishment of adultery.

In some cases of incest at Rome, there was capital punishment. (Dion Cassius, lviii. c. 22; Tacitus, *Annal.*, vi. 19.)

The subject of the Roman Incestum is treated copiously by Rein, *Criminalrecht der Römer*, and with a reference to the numerous authorities.

INCH OF CANDLE. [Auction, P. C.]

INCHBALD, MRS. ELIZABETH, whose maiden name was Simpson, was the daughter of a Suffolk farmer residing near Bury St. Edmunds. She was born in 1753. Prone to romantic notions, and losing her father in youth, she ran away at the age of sixteen to seek her fortune, and endeavoured to procure an engagement as an actress in London. After several adventures, she obtained a place in a country theatre, and soon married Mr. Inchbald, a respectable actor, much older than herself, with whom she lived for some years in mutual regard and comfort. Mr. and Mrs. Inchbald performed for four seasons in Edinburgh, and, after an engagement at York, went to France for a time. In 1779 Mr. Inchbald died at Leeds; and in the winter of 1780-81 Mrs. Inchbald began to play secondary parts at Covent-Garden. She continued on the stage till 1789, but always owed her favour with the public less to her merits as an actress than to the sweetness of her face and manner, and to the blameless character which she was known to maintain in private life. She had begun to write dramatic pieces several years before her retirement from the stage: the first of these, a slight afterpiece, was acted and printed in 1784; and from that time till 1805 she wrote plays in rapid succession, producing nineteen in all, one of which, 'Lovers' Vows,' is an adaptation from Kotzebue. Her dramatic genius was not of a very high class: but several of her comedies had much success, and one or two of them still keep their place on the stage. They gained for her the means not only of supporting herself with honourable economy, but of making a handsome allowance to an invalid sister, and of saving a considerable sum. Her melo-dramatic comedy of 'Such Things Are' gained for her more than four hundred pounds: as much was produced by 'Wives as they Were and Maids as they Are;' and for 'Every One has His Fault,' the most strongly characterised of her plays, she received seven hundred pounds. She edited, with biographical and critical remarks, 'The British Theatre,' a collection of acting plays, 25 vols., 1806-1809; 'The Modern Theatre,' 10 vols., 1809; and a collection of 'Farces,' 7 vols. Mrs. Inchbald's literary talents are best exhibited by her two novels, 'A Simple Story,' first published in 1791, and 'Nature and Art,' in 1796. Both became extremely popular, and deservedly so, and have been reprinted in our time in collections of standard novels. She died on the 1st of August, 1821, in a boarding-house at Kensington, leaving nearly 6000*l.* in legacies to her relatives and friends, to the Roman Catholic poor, to the Covent-Garden Theatrical Fund, and small sums to her laundress and hairdresser, 'provided they should inquire of her executors concerning her decease.' She had written an account of her own life, but had refused an offer of a thousand pounds for it; and, in obedience to her will, it was destroyed after her death. But her journal, kept regularly for many years, was preserved; and from it and her letters were written Mr. Boaden's 'Memoirs of Mrs. Inchbald,' 1833.

INCLOSURE. The term Inclosure is applied to the inclosing and partitioning of lands in England and Wales, which are comprehended under the general name of Commons or Common Lands. A knowledge of the present condition of the lands comprehended under this term enables us to form a better estimate of the state of agriculture in England and its capabilities of improvement. We thus learn also what was the general condition of the lands in England before inclosures were made.

It is necessary to define the terms Commons, and Commonable and Intermixed Lands. Commons or Common Lands are lands in a state of nature or waste, of which individuals have not the severalty. Commonable Lands are those lands which during a part of the year are in severalty, that is, occupied severally by individuals as their own, to the exclusion for the time of other people. The amount of common land in England is not known, but it is conjectured that it may be about 8,000,000 of acres: the total area of England and Wales is supposed to be about 37,000,000 acres.

The amount of commonable and intermixed lands is not known. The nature of these commonable and intermixed lands may be collected from the following instances. 'There are many parishes in the kingdom that consist altogether of intermixed or commonable lands; there are others in which there is a great intermixture of common land with the commonable and intermixed land. The township of Barmby on the Marsh in Yorkshire contains 1692 acres. There are 1152 pieces of open land, which contain 1015 acres, giving an average size of 3 roods and 23 perches, and there are 352 old inclosures containing 677 acres. In the parish of Cholsey in Berkshire, the total contents of which are 2381 acres, there are 2315 pieces of open land, which contain 2327 acres, giving an average size of one acre.' This open land generally consists of long strips, which are so narrow that it is impossible to plough them across. Yet much of this land is the best in the kingdom for natural fertility, and is the oldest cultivated land.

There is a great variety in these commonable lands; but they may be divided into three classes, exclusive of woodlands. First, there is open arable and meadow land, which is held and occupied by individuals severally until the crop has been got in. After the crop has been removed, that is, during the autumn and winter, it becomes commonable to persons who have severalty rights in it, and they turn on to it their cattle without any limit, or without stint, as it is termed. Thus there is a divided use in these open lands: individuals have the exclusive right to the enjoyment of one or more of these strips of open land for a part of the year; and during another part of the year all these individuals enjoy this open land in common. Second, there is open arable and meadow land that is held in severalty during one part of the year, like the first class; but after the crop is removed, it is commonable not only to parties who have severalty rights, but to other classes of individuals: these lands are generally called Lammas Lands.

These commonable rights may belong to a particular class, as a body of freemen, or to all landholders. There is great variety in these two classes as to the severalty holdings also. 'There are many cases in which the severalty holding varies year by year. There are in these open lands what is called a pane of land, in which there may be 40 or 60 different lots. It is reported to be a remnant of an old military custom, when on a certain day the best man of the parish appeared to take possession of any lot that he thought fit; if his right was called in question, he had to fight for it, and the survivor took the first lot, and so they went on through the parish. It often happens that in these shifting severalties the occupier of lot one this year goes round the whole of the several lots in rotation; the owner of lot one this year has lot two the next, and so on. When these lands are arable lands, they do not change annually, but periodically, according to the rotation of the crops. Then there is the old lot meadow, in which the owners draw lots for the choice. There are a great variety of circumstances under which the severalty ownership of these lands shifts from time to time; but after the severalty ownership has ceased, and after the crop has been removed, they all become commonable.'

This is one among many instances of the existence of antient usages in England, which are the same or nearly the same as the usages of nations that we call barbarous. Tacitus (*Germania*, c. 26) says of the antient German mode of agriculture, 'The lands, in proportion to the number of cultivators, are occupied by all in turns, which presently they divide among themselves according to their rank (merit). The extensive plains offer facility for division. They change the cultivated fields yearly; and there is still a superfluity of land.' The meaning of Tacitus is not clear. The following passage in Cæsar's account of the Gauls (vi. 22) is more distinct: 'They pay no attention to agriculture, nor has any man a fixed quantity of land and boundaries of property: but the magistrates annually assign to the clans and tribes who have come together as much land as they please, and where they please, and in the next year they compel them to move to another spot.' Herodotus (ii. 168) says that each member of the military caste in Egypt had a certain portion of land assigned to him; but they enjoyed the lands in a rotation, and the same persons did not continue in the enjoyment of the same lands. Strabo (p. 315) mentions a custom amongst the Dalmatians of making a division of their lands every eight years.

'The third class is that of grazing lands, where the rights of parties are settled and defined, the ordinary stinted pasture. The commonable lands are subject to very great variety and peculiarity; for instance, in some of these lands the right of grazing sheep at all belongs to a man called a flock-master, and he has the power, during certain months of the year, of turning his own sheep exclusively on all the lands of the parish; or, according to particular circumstances, his right is limited and restricted to turning sheep upon a certain portion of it, with a view to giving parties an opportunity of putting in a wheat crop. In those parishes where there is a flock-master who has a right of depasturing his sheep during a certain portion of the year over all the land of the parish, it is clear that no one can sow any wheat without having made a bargain with him for shutting up his own particular fields, or some proportion of them.'

'There is a very large extent of wood-land in this kingdom that is commonable, strange to say, where certain individuals have a right during the whole year to turn on stock, the owner of the wood having no means of preserving his property except by shutting out other commoners' stock by custom for some two or three years after felling. There is that right, as also the old right of estover, which is a very great inconvenience, viz. where parties have the right of cutting house-bote, and plough-bote, and fire-bote, and so on in woods belonging, *quâ* wood, to another party. There is a great deal of land subject to that ruinous custom. There are many varieties of these commonable lands, but these are the most prominent and remarkable of them.'

Under such a system as this, it is obvious that these common fields must be ill cultivated. The intermixed lands cannot be treated according to the improved rules of good husbandry. It is stated that the simple re-distribution of intermixed lands, now held in parcels so inconvenient in form and size as to be incapable of good husbandry, would in many instances raise the fee-simple value of the lands from 15*s*. or 17*s*. an acre to 30*s*.

It is the opinion of witnesses examined before the parliamentary committee of 1844, on Commons' Inclosures, that judicious inclosure would make a large portion of common lands much more productive. At present open arable lands are so intermixed that effectual drainage is nearly impossible. One witness says: 'I have had occasion to go over two small properties, about 150 acres each; one I found in 301 different pieces, and the other in a little more than a hundred. I mention this to show how the lands are frequently intermixed; they are therefore farmed at much greater expense; and it is impossible to drain them on the present improved mode of drainage, inasmuch as other parties are occupying the furrow by which the water should pass off.' In the Midland counties, where there are these open arable fields, the course is two crops and a fallow, and every third year the flocks run over the whole field. The same witness considers that a fourth of all the open arable land is at present totally unproductive. In cases where common arable fields have been subdivided and allotted, 'the great improvement is, that in the first place every man has his allotment, and he deals with it as he pleases; he drains it, and crops it upon a proper course of cropping; he puts it in seed and keeps sheep upon it: he grows turnips and clover, or whatever he thinks proper.' The same witness is of opinion that the average improvement in the value of common fields which have been inclosed is not less than 25 per cent. Indeed the evidence that was produced before the committee establishes to a degree beyond what otherwise would be credible, the immense inconvenience and loss which arise from the system of intermixed lands, and their being also subject to commonage.

As to Common Rights, that is, rights of pasture and so forth on commons or waste lands, they are described generally under COMMON, RIGHTS OF, P. C. As to the common pasture lands, they also require an improved management. It is stated that commons are generally overstocked, partly in consequence of persons turning out more stock than they have a right to do, and partly by persons putting their stock on the common who have no right. In consequence of commons being overstocked, they are profitable to nobody; and a rule for regulating the quantity of stock would therefore be beneficial to all persons who are entitled to this right of common. Violent disputes also frequently arise in consequence of the rights of parties to commonage not being well defined. It is the opinion of competent judges that very great advantage would result from stinting those parts of commons that are not worth inclosure; and that 'it would be in many instances highly desirable to inclose portions of a common for the purpose of cultivation, and to allot such portions of it, whilst it would be impolitic to do more than stint other portions of it.' A *stint* may be defined to be 'the right of pasturage for one animal, or for a certain number of animals, according to age, size, and capability of eating.' The commons in fact are not now stinted by the levant and couchant right, a right which cannot be brought into practical operation; and besides this there are many commons in gross. [COMMON, RIGHTS OF, P. C.]

Inclosures of land have now been going on for many years. It is stated that since 1800 about 2000 inclosure acts have passed; and prior to that time about 1600 or 1700. It seems doubtful from the evidence whether the 1600 or 1700 comprehend all inclosure acts passed before 1800. These inclosure acts (with the exceptions which will presently be mentioned) are private acts, and the expense of obtaining them and the trouble attendant on the carrying their provisions into effect have often prevented the inclosure of commons.

In 1836 an act (6 & 7 Wm. IV. c. 115) was passed for facilitating the inclosure of open and arable fields in England and Wales. The preamble to the act is as follows:—'Whereas there are in many parishes, townships, and places in England and Wales, divers open and common arable, meadow, and pasture lands and fields, and the lands of the several proprietors of the same are frequently very much intermixed and dispersed, and it would tend to the improved cultivation and occupation of all the aforesaid lands, &c., and be otherwise advantageous to the proprietors thereof, and persons interested therein, if they were enabled by a general law to divide and inclose the same,' &c. Inclosures have been made under the provisions of this act, but the powers which it gives are limited, for the 'act applies solely to lands held in severalty during some proportion of the year, with this exception, that slips and balks intervening between the cultivated lands may be inclosed.' The lands which cannot be inclosed under the provisions of this act are 'the uncultivated lands, the lands in a state of nature, intervening between these cultivated lands, beyond those that are fairly to be considered as slips and balks.' However, it was stated in evidence before the committee of the House of Commons in 1844, that a large extent of common and waste land has been illegally inclosed under the provisions of the act, and the persons who hold such lands have no legal title, and can only obtain one by lapse of time. The chief motive to this dealing with commons appears to have been, that they thus got the inclosure done cheaper than by applying to parliament for a private act.

In 1844 a select committee of the House of Commons was appointed 'to inquire into the expediency of facilitating the inclosure and improvement of commons and lands held in common, the exchange of lands, and the division of intermixed lands, and into the best means of providing for the same, and to report their opinion to the House.' The committee made their report in favour of a general inclosure act, after receiving a large amount of evidence from persons who are well acquainted with the subject. The extracts that have been given in this article are from the printed evidence that was taken before the select committee.

In pursuance of the recommendation of the committee, an act of parliament was passed in 1845 (8 & 9 Vict. c. 118), the object of which is thus stated in the preamble:—'Whereas it is expedient to facilitate the inclosure and improvement of commons and other lands now subject to the rights of property which obstruct cultivation and the productive employment of labour, and to facilitate such exchanges of lands, and such divisions of lands intermixed or divided into inconvenient parcels, as may be beneficial to the respective owners; and it is also expedient to provide remedies for the defective or incomplete execution, and for the non-execution of powers created by general and local acts of inclosure, and to authorize the renewal of such powers in certain cases,' &c.

It is not within the scope of this article to attempt to give any account of the provisions contained in the 160 sections of this act; but a few provisions will be noticed that are important in an economical and political point of view.

The 11th section contains a comprehensive description of lands which may be inclosed under the act; but the New Forest and the Forest of Dean are entirely excepted. The 14th section provides that no lands situated within fifteen miles of the city of London, or within certain distances of other towns, which distances vary according to the population, shall be subject to be inclosed under the provisions of this act without the previous authority of parliament in each particular case. The 15th section provides against inclosing town-greens or village-greens, and contains other regulations as to them. The 30th section provides that an allotment for the purposes of exercise and recreation for the inhabitants of a neighbourhood may be required by the commissioners under the act, as one of the terms and conditions of an inclosure of such lands as are mentioned in section 30.

The 108th section makes regulations as to 'the allotment which, upon any inclosure under this act, shall be made for the labouring poor;' and (section 109) 'the allotment wardens (appointed by section 108) shall from time to time let the allotments under their management in gardens not exceeding a quarter of an acre each, to such poor inhabitants of the parish for one year, or from year to year, at such rents, payable at such times and on such terms and conditions not inconsistent with the provisions of this act, as they shall think fit.' Section 112 provides for the application of the rents of allotments; the residue of which, if any, after the payments mentioned in this section have been defrayed, is to be paid to the overseers of the poor in aid of the poor-rates of the parish.

Sections (147, 148) provide for the exchanges of lands not subject to be included under this act, or subject to be inclosed, as to which no proceedings for an inclosure shall be pending, and for the division of intermixed lands under the same circumstances.

Under section 152 the commissioners are empowered to remedy defects and omissions in awards under any local act of inclosure, or under the 6 & 7 Wm. IV. c. 115; and under section 157 the commissioners may confirm awards or agreements made under the supposed authority of 6 & 7 Wm. IV. c. 115, if the lands which have been illegally inclosed or apportioned or allotted, shall be within the definition of lands subject to be inclosed under this act.

The provisions of this act seem to be well adapted to remedy the evils that are stated in the evidence before the select committee; and there can be no doubt that agriculture will be greatly improved, the productiveness of the land increased, and employment given to labour by this judicious and important act of legislation. The 'London Gazette' of August 22nd, 1845, notified the appointment by the Secretary of State of two Commissioners of Inclosures.

(*Report from the Select Committee on Commons' Inclosure, together with the Minutes of Evidence and Index.* The Report is accompanied with maps which explain various parts of the evidence. A complete digest of these Minutes of Evidence would form a very instructive article on the state of agriculture in England. The little that has been here attempted is of necessity very incomplete. The witnesses appear to agree in the main, but there are some differences of opinion which a reader of the Minutes will not fail to see.)

INCOME TAX. [TAXATION, P. C.]

INCUBATION, ARTIFICIAL. [POULTRY, P. C., pp. 477, 478.]

INCUMBENT. [BENEFICE, P. C.]

INDIA. It was intended to give, under this head, a general view of all the territories of Hindustan, their areas, population, revenue, by whom held, names of the great divisions, and other details political and statistical. It will be convenient, for the sake of bringing down the information to the latest date, to postpone the article by referring it to TERRITORIES OF INDIA, P. C. S.

INDIA LAW COMMISSION. The act of the 3 & 4 Wm. IV. c. 85, by which the privileges of the East India Company are regulated, provides for the establishment of a Law Commission in India. The 53rd section recites that it is expedient, subject to such special arrangement as local circumstances may require, that a general system of judicial establishments and police, to which all persons whatever, as well Europeans as natives, may be subject, should be established in the East Indies, and that such laws as may be applicable in common to all classes of the inhabitants, having a due regard to the rights, feelings, and peculiar usages of the people, should be enacted, and that the laws, and customs having the force of laws, should be ascertained and consolidated. For this purpose the appointment of a commission of five members was authorized, to be called 'The Indian Law Commissioners.' They were to report from time to time, and to suggest such alterations as they should consider could be beneficially made in the courts of justice and police establishments, in the forms of judicial procedure and laws, due regard being had to the distinction of castes, difference of religion, and manners and opinions prevailing among different races, and in different parts of India. By subjecting the European population of India to the same system of laws as the native population, the influence of the opinion of the former in the administration of justice will prevent abuses to which the latter might be exposed without having the opportunity of urging their complaints in this country. Mr. T. B. Macaulay was the chief member of the first commission. The report of a penal code was presented to the Governor-General on the 15th of June, 1835. The groundwork of it is not taken from any system of law in force in India, though compared with and corrected by the practices of the country. The principles of the British law, the French code, and the code drawn up by Mr. Livingston for the State of Louisiana, are the foundations of it. Most of the articles which it contains are accompanied with illustrations to facilitate the application of the law, and it is thus a statute-book and a collection of decided cases. This report was signed by Messrs. Macaulay, J. M. Macleod, G. W. Anderson, and F. Millett. The progress of the present commissioners in dealing with the general law of India has not been published. (*Penal Code, Parliamentary Paper*, 1838, No. 673.)

INDUCEMENT. [PLEADING, P. C.]

INFAMY (from the Roman Infamia) in English law is not easily defined. Certain offences were formerly considered such that conviction and judgment for such offences rendered a man infamous and incompetent to be a witness. But the endurance of the punishment, or reversal of the judgment, restored a man's competency as a witness. The 9 Geo. IV. c. 23, § 3, enacts, that when a man convicted of a felony shall have undergone the legal punishment for it, the effect shall be the same as a pardon under the Great Seal; and (§ 4) no misdemeanour, except perjury or subornation of perjury, shall render a man an incompetent witness after he has undergone his punishment. The 6 & 7 Vict. c. 85, enacts, that no man shall be excluded from giving evidence, though he may have been convicted of any crime or offence. [EVIDENCE, P.C.S.]

Certain offences enumerated in the 7 & 8 Geo. IV. c. 29, § 9, are infamous crimes, with reference to the provisions of that act. Though infamy does not disqualify a man from being a witness, it may be urged as an argument against his credibility.

The only satisfactory definition of infamy would be a permanent legal incapacity to which a man is subjected in consequence of a conviction and judgment for an offence, and which is not removed by suffering the punishment for the offence. By 2 Geo. II. c. 24, § 6, persons who are legally convicted of perjury or subornation of perjury, or of taking and asking any bribe, are for ever incapacitated from voting at the election of members of parliament. They are therefore infamous: they labour under infamy: and have lost part of their political rights.

The Roman term Infamia is the origin of our term infamy. Infamia followed in some cases upon condemnation for certain offences in a judicium publicum; and in other cases it was a direct consequence of an act, as soon as such act became notorious. Among the cases in which Infamia followed upon condemnation, were, insolvency, when a man's goods were taken possession of by his creditors in legal form and sold; the actio furti, and vi bonorum raptorum; actio fiduciae, pro socio, tutelae, &c. In all these cases a judicial sentence, or something analogous to it, was necessary, before Infamia could attach to a person. Among the cases in which Infamia followed as an immediate consequence of acts which were notorious are the following: the case of a woman caught in adultery, of a man being at the same time in a relation of a double marriage, of prostitution in the case of a woman, or when a man or woman gained a living by aiding in prostitution. The consequence of Infamia was incapacity to obtain the honours of the state, and probably the loss of the suffrage also; and it was perpetual. The Infamis was still a citizen (civis), but he had lost his political rights. The infamous man was also under some disabilities as to his so-called private rights. He was limited by the Prætor's edict in his capacity to postulate (that is, take the initial measures for asserting or defending his rights in legal form), to act as the attorney of another in such cases, to be a witness, and to contract marriage.

The rules of the Roman law as to Infamia are chiefly contained in the *Digest*, iii. tit. 1 and 2.

(See Savigny, *System des heut. Röm. Rechts*, ii. § 76-83; Becker, *Handbuch der Röm. Alterthümer*, ii. 121; Puchta, *Institutionem*, ii. 441.)

INFANT HEIR. [HEIR, P. C.]

INFANT TRUSTEE. [TRUSTEE, P. C.]

INFANT WITNESSES. [AGE, P. C.]

INFEFTMENT, in the law of Scotland, from the same origin as the English term feoffment, expresses the ceremony by which a person succeeding to another by descent, settlement, or conveyance, is invested in any heritable or real property. Down to the year 1845 this ceremony was as pure a feudal usage as it ever had been in the days when the almost universal inability to write suggested symbolical modes of changing possession. Suppose a very ordinary case—that a person purchases a piece of ground from one who holds it of a superior. According to the system of sub-infeudation preserved in Scotland, he may either be put in tho seller's place and hold of the same superior, or be may hold a sub-feu under the seller. Whoever is to be the superior, the title deed contains an authority from him to invest the vassal. Until the late change, a number of persons had to proceed to the ground, consisting generally of the attorney who prepared the titles, and his clerks, who had the following parts to act. One was the bailiff of the superior, and a commission authorizing him to act in that capacity was read over. Another party acted as the procurator or representative of the vassal or purchaser. The bailiff lifted some fragments of earth and stone from the soil and handed them to the procurator, as symbols by which, according to the authority given to him, he made over possession of the lands to the new owner. The receiver of the symbols then placed a coin of the realm in the hands of another party, who must have been a notary public—this being the form in which a protest is taken in the hands of a notary in Scotland. Two other parties acted as witnesses. The ceremony, with the authority on which it proceeded, was narrated in a deed called an instrument of sasine, in which the notary publicly attested tho transaction. The preservation of this cumbrous ceremony down to so late a period was owing to its connection with the admirable system of registration which has kept the commerce in real property in Scotland on so clear and secure a position. The whole ceremony went for nothing unless the instrument narrating it were recorded in the Register of Sasines within sixty days after the ceremony. The registration was and is the criterion of preference. If land should be sold or mortgaged to any number of different people, the person whose sasine is first registered has the absolute title, and all questions as to the fairness of the transaction, are pecuniary questions to be settled apart from the titlo to the lands. The cumbrous ceremony mentioned above was rendered no longer necessary by the 8 and 9 Vict. c. 35, passed 21st of July, 1845, and called 'An Act to simplify the form and diminish the expense of obtaining infeftment in heritable property in Scotland.' It simply provides that 'it shall not bo necessary to proceed to the lands in which sasine is to be given, or to perform any act of infeftment thereon; but sasine shall be effectually given therein and infeftment obtained, by producing to a notary-public the warrant of sasino and relative writs, as now in use to be produced at taking infeftment, and by expeding and recording * * * an instrument of sasine, setting forth that sasine had been given in the said lands, and subscribed by the said notary-public and witnesses.' There has been little opportunity of observing the working of this act, but it is expected that it will materially reduce the expense of transferring interests in landed property in Scotland. A costly ceremony and a long deed, essential to the durability of every title of a new holder, are abolished by it. The act at the same time contains some methods of remedying mistakes and omissions which under the old law were fatal flaws.

INFORMER. An informer is a man who lays an information or prosecutes any person in the King's courts for some offence against the law or a penal statute. Such a person is generally called a common informer, because he makes a business of laying informations for the purpose of obtaining his share of the penalty. [INFORMATION, P. C.] Persons are induced to take the trouble of discovering offences, for which a pecuniary penalty is inflicted on the offender, by the promise of the reward; and if the penalty is imposed for the public interest, he who makes the offender known does the public a service. But still the business of a common informer is looked on with dislike, and he who follows it is generally despised; and perhaps tho character of common informers is generally such that they deserve all the odium they receive. They stand in a like situation to the common hangman. This dislike of informers, simply as such, is one of the anomalies of society, who hate their benefactor. The real foundation of the dislike however among those who can form a just judgment of things is, not the act of information, but the devices, tricks, and meannesses to which a man must often resort in order to know the facts on which his information must be founded. It is the same principle which often leads us to condemn a man for making certain statements in public, not because of the statements, but because of the means by which he may have obtained his knowledge. When a penalty is too heavy, or when the law that imposes it is generally disliked by the people for any reason, good or bad the popular dislike finds a definite object in the informer who gives effect to the law. The legislature that made the penal law is overlooked, because the legislature is a number of persons; the informer is one, and his agency is seen and felt.

In absolute governments there are spies and political informers, who are the tools of a government which has no rule but its own pleasure. Some peoplo have been dull enough to confound all informers in one class; not seeing that there is a difference between an informer who helps to give effect to the law, and an informer who helps a tyrannical government to entrap and punish persons suspected of disaffection to the government or of designs against it.

INFUSO'RIA, FOSSIL. The *geographical distribution* of living infusoria corresponds in extent with the abundance of reproduction, and the facility of diffusion through water and air, which belong to these microscopic creatures. Frequent in all the varieties of water which have been exposed to air and light, and in all the conditions of this element between the extremes of terrestrial temperatures, not absent even from snow, ice-covered streams, or the ejections of volcanoes, they have been recognised in all the regions of the globe. Lakes, rivers, and the sea are in places richly replenished by them, and their siliceous integuments falling through the water accumulate into extensive deposits. In regard to such accumulations in the sea, we have the evidence of soundings by Captain Sir J. Ross in the course of the antarctic voyage (*Annals of Nat. History, Oct.*, 1845) and Ehrenberg's examination of the deposits at Cuxhaven; and their abundance in fresh waters is matter of universal occurrence. These deposits consist of the siliceous integuments of the infusoria, and as only a small proportion of the families are protected with siliceous coverings, and as the waters which nourished them contain but little silica, while the deposits are very extensive, we naturally associate with these facts the idea of long-elapsed time.

But on turning to the marine and fresh-water deposits of earlier date, this impression of the long duration of natural agencies becomes much heightened. When, conducted by Ehrenberg, we find beneath the Bohemian mountains, and in the plains of North Germany, pleiocene deposits many feet in thickness, composed of little else than the thin flinty loricæ of microzoaria, and, following Professor Rogers and Mr. Bailey, who dug up myriads of other forms from the meiocene strata of Virginia, while Mantell and Reade exhibit to us infusoria from the chalk and the Kimmeridge clay of England, we must add to the historic time during which it can be proved these animalcula have lived the large indefinite geological periods of Cainozoic and Mesozoic formations.

The *source* of the siliceous matter, which enters the organization of the infusorial races, is not difficult of discovery. Most of our fresh waters contain silica, though not in abundance, derived, it is probable, from the decomposition of felspar and other mineral silicates. Silicate of soda and silicate of potash, thus occasioned, may by intermediate vegetative processes yield the silica in a state suitable for being organically solidified. Experiments on this subject, which may be easily made, are quite satisfactory in showing that myriads of silicated infusoria (Brachioni) may be generated in a few days in a sandstone trough, supplied with water and decaying vegetation. The animalcula being dried on the field-glass of the microscope, their beautiful transparent siliceous loricæ remain in abundance. In the hot waters of volcanic foci, silica is dissolved abundantly, and it is necessary to keep this fact in view while considering the extensive flint beds in chalk, the thick Polierschiefer beds of Bilin, and other siliceous masses, the result of organization. The distinction of *marine and fresh-water races*, which runs through all the larger animals and plants with such regularity as to be termed a law of nature, obtains also, but less absolutely, in the infusoria. Some species live both in fresh and salt water, and many at the junction of rivers with the sea. By comparing the living oceanic and lacustrine races on a large scale, enough of difference appears in their siliceous shields to authorize conclusions more or less positive as to the marine or fresh-water origin of infusorial deposits, which contain identical or analogous forms belonging to earlier periods. Thus the rich deposits of Richmond in Virginia appear to have been formed beneath the sea; the famous deposits of Bohemia, Berlin, and Santa Fiora contain *admixtures* of marine and fresh-water tribes; while those of Bann, in the county of Down, and Gainsborough and Bridlington, contain a more considerable proportion of fresh-water species.

Infusoria of marine or estuary origin have been found in a fossil state very extensively in Europe, Asia, Africa, and America. Ehrenberg has described many species from Greece (Zante and Egina), Italy (Caltasinetta and Cattolica), and Africa (Oran), which occur in calcareous marls, referred by Ehrenberg to the age of the true chalk deposits. These deposits are very extensive in Africa, occupying the whole coast of Oran and large tracts in Egypt and Arabia. (Portions of this tract have, however, been described by M. Rozet as tertiary.) In the undoubted white chalk of Denmark (Rügen), of France (Meudon), of England (Gravesend and Brighton), infusoria also occur, but less abundantly. North America has yielded a great variety of marine or partly marine infusoria, especially at Richmond and Petersburg in Virginia, at West Point, in Connecticut, Rhode Island, Massachusetts, and Maine. Brazil has also yielded similar deposits.

Infusoria partly of marine and partly of fresh-water origin have become familiar to us in the Polierschiefer (polishing slate) of Bilin and Planitz in Bohemia, and of the Habichtwald near Cassel, the Bergmehl of Santa Fiora in Tuscany, the white marls in the peat of Franzenbad near Egra in Bohemia, the peat deposits of Gainsborough in Lincolnshire, and at the base of the Mourne Mountains in Ireland. We find them to occur also in considerable plenty, but in limited distribution, in the lacustrine deposits of the East coast of Yorkshire. The Isle of France is added to these localities by Ehrenberg, and New Zealand by Mantell, all the occurrences belonging to supra-tertiary æras.

Infusorial remains are very unequally congregated. The siliceous marl (Kieselguhr) of Franzenbad consists mainly of Navicula viridis (fig. 6) (now recent); that of the Isle of France, of Bacillaria vulgaris (fig. 7); that of San Fiora, of Synedra capitata (fig. 9); while that of Bilin is composed of Gaillonella distans (fig. 8) almost exclusively. (Ehrenberg.)

Infusoria are mentioned in the moya (volcanic mud) of Mexico, and in the edible clay of the Amazons River, by Ehrenberg; in the rock salt and the marl which accompany it at Cardona in Spain, by Marcel de Serres; they are assumed by Ehrenberg to enter largely into the composition of flint, which indeed readily shows Xanthidia and Pyxidiculæ. The bog-iron ore (Raseneisenstein) common near Berlin is composed chiefly of Gaillonella ferruginea. A kind of semiopal lying in nodules in the Polierschiefer of Bilin is composed of the same siliceous reliquiæ (Gaillonellæ), as the true polishing slate, but they are cemented together and filled by infiltrated siliceous paste. With the Gaillonellæ Ehrenberg finds spicula of sponges. The precious porphyry opal of Kaschau, and the serpentine opal of Kosernitz in Silesia, has appeared to Ehrenberg of analogous composition. The following tabular view given by Ehrenberg of some of these facts will be useful:—

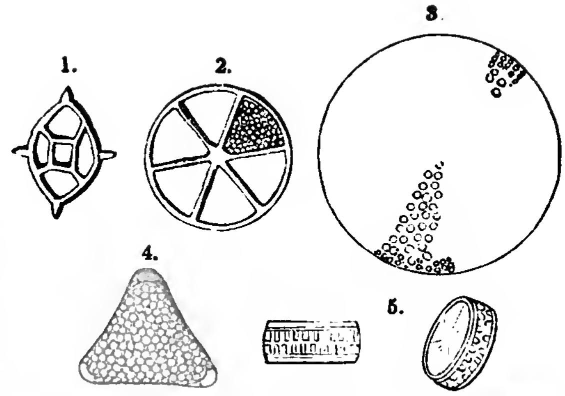
1. Bergmehl	Newest formation.
2. Kieselguhr	
3. Polierschiefer	Tertiary formation.
4. Saugschiefer	
5. Semiopal of Polierschiefer	

The above consist entirely or partly of the shells of Shield-Infusoria.

6. Semiopal of the Dolerite	Pyrogenous rock.
7. Precious opal of the porphyry	
8. Flint of the chalk	Secondary strata.
9. Gelberde (yellow earth)	Newest formation.
10. Raseneisenstein	
11. Certain kinds of Steinmark, investing the opal of Kaschau	

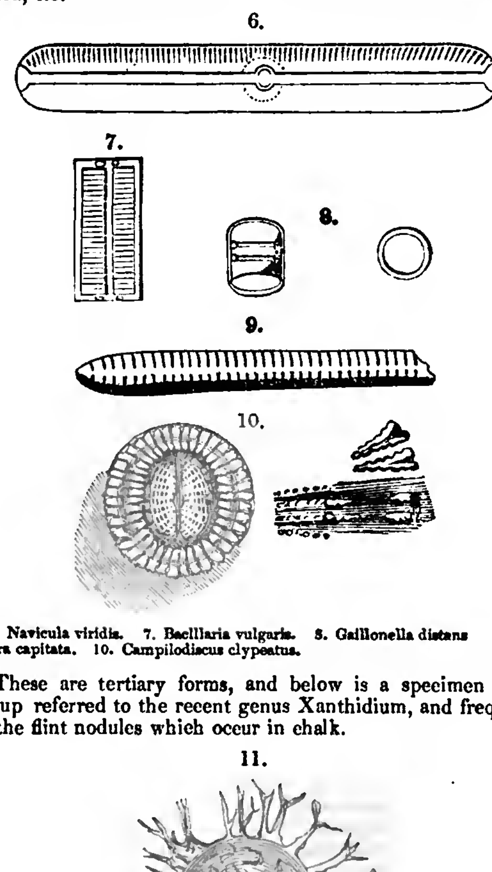
The above are *probably* of the same nature.

As examples of undoubted marine infusorial fossils we give below figures of some of the forms most frequent in a white deposit from Richmond.



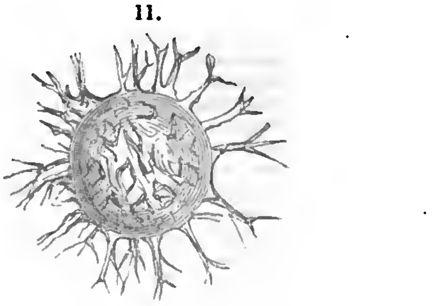
1. Dictyocha fibula. 2. Actinocyclus senarius. 3. Coscinodiscus radiatus. 4. Triceratium favus. 5. Gaillonella sulcata.

And for comparison the following outlines of mixed marine and fresh water species common in the Polierschiefer of Bilin and the Peat and Kieselguhr of Franzenbad, Egra, San Fiora, &c.



6. Navicula viridis. 7. Bacillaria vulgaris. 8. Gaillonella distans 9. Synedra capitata. 10. Campilodiscus clypeatus.

These are tertiary forms, and below is a specimen of a group referred to the recent genus Xanthidium, and frequen in the flint nodules which occur in chalk.



11. Xanthidium ramosum.

List of species of infusoria from the Kieselguhr of Franzenbad.—Navicula viridis (plentiful), N. gibba, N. fulva, N. librile, Gomphonema paradoxum, Gomphonema clavatum (fresh water species now living near Berlin); N. viridula, N. striatula (now living in the sea, the second also lives in the Carls bad water); Gaillonella varians?

Species of infusoria in the peat bog of Franzenbad,—Eunotia granulata (plentiful), Navicula viridis (rare), Bacillaria vulgaris, Cocconeis undulata, Gomphonema paradoxum.

Species which occur in the Kieselguhr of the Isle of France,—Bacillaria vulgaris? (plentiful), B. major, Navicula fulva? N. gibba, N. bifrons (living near Berlin).

In the Bergmehl of Santa Fiora:—

Synedra capitata (plentiful); with this are S. ulna (living both in fresh water and the sea); Navicula inæqualis, N. capitata, N. viridis, N. gibba (fresh water species); N. viridula (living in Baltic); Eunotia granulata, Navicula follis (extinct); Cocconeis undulata (marine); Gomphonema paradoxum, G. clavatum, G. acuminatum (living near Berlin); Cocconema cymbiforme (fresh water); Gaillonella italica; Spicula of spongiæ or spongillæ.

In the Polierschiefer of Bilin:—

Podosphenia nana (plentiful), Gaillonella distans, Navicula scalprum, Bacillaria vulgaris? (probably all marine!).

In the Leaf Tripoli:—

Gaillonella distans (plentiful), Podosphenia nana, Bacillaria vulgaris? (probably marine).

At Bann, in the county of Down, Captain Portlock found under peat, Naviculæ, Bacillariæ, Eunotiæ, with fragments of achnanthes and confervæ. (*Microscopical Journal*, 1841.) At Gainsborough, Mr. Binney found under peat, abundance of Gaillonella. At Bridlington, we have observed in white and brown marls, Eunotia serra? Bacillaria vulgaris, Navicula inæqualis, N. viridis, N. phœnicenteron, Cocconema lanceolata, a new and beautiful Campilodiscus (C. zonalis), &c.

The North American localities have yielded to Bailey and Ehrenberg a large catalogue of infusoria. Ehrenberg enumerates:—

Amphiphora—one species.
Cocconema—two species.
Eunotia—seven species.
Fragillaria—three species.
Gomphonema—four species.
Himantidium—one species.
Navicula—eighteen species.
Staurosira—two species.
Tabellaria—three species.

With these are three forms of spongoid spicula, and two species of Thylacium.

These are mostly derived from beds lying under peat,—.

The Richmond earth (of miocene date) yields—

Coscinodiscus radiatus and other species (*fig.* 3) . . Actinocyclus senarius and others (*fig.* 2) . . . . Naviculæ, several species . Gaillonellæ . . . . . Dictyocha fibula (*fig.* 1) .	M. Queckett has found several of these recent in the North Sea. Mr. Lee has discovered Coscinodisci and Dictyochæ in the barnacle and scallop.

In the chalky marls of Oran, Sicily, Greece, &c. occur many living forms, as—

Actinocylus—ten species.
Amphitetra—two species.
Biddulphia—one species.
Cocconema—one species.
Coscinodiscus—seven species.
Dictyocha—four species.
Eunotia—two species.
Gaillonella—one species.
Grammatophora—four species.
Haliomma—one species.
Navicula—six species.
Striatella—one species.
Synedra—one species.
Tessella catena—one species.
Triceratium—one species.

In the white chalk and flint of Europe, and also living,—

Fragillaria rhabdosoma—Gravesend.
striolata—Gravesend.
Gaillonella aurichalcea—Rügen.
Peridinium pyrophorum—Gravesend.
Xanthidium furcatum—Gravesend.
hirsutum—Gravesend.

Dr. Mantell has been unable to discover Fragillaria in the chalk of Gravesend, but Xanthidia occur in the chalk of Dover. (*Ann. Nat. Hist., Aug.* 1845.) Gaillonella aurichalcea has been regarded as an Oscillatoria; and it appears doubtful whether the so-called Xanthidia of the flints and chalk are really to be referred to that fresh-water genus.

From the preceding notices we may gather as general facts the occurrence of infusorial remains in the following stratifications:—

Cainozoic period	Recent Fluviatile and other sediments. Lacustrine deposits of the Elk period. Deposits of the 'Lehm' period. Miocene Tertiaries Eocene Tertiaries.
Mesozoic period	Chalk deposits. Oolitic deposits.

The relative abundance of the Infusoria in these several deposits is inversely as their antiquity; they are rare in the oolitic and cretaceous rocks, and abundant in the upper tertiaries. It is true that Ehrenberg, by assigning to the cretaceous æra the calcareous marls of Oran, Sicily, and Greece, gives a large catalogue of Mesozoic infusoria, and that in favour of such reference of those marls are the Rotaliæ, Textilinæ, &c. which occur both in the true chalk and in such marls. But on the other hand, remembering the long scale of geological time through which these genera of Polythalamiæ extend, and taking into consideration the fact that some species which occur in the chalk of Europe are quoted by Ehrenberg from unquestionably miocene strata in America, we shall hesitate to admit those richly infusorial marls as truly coeval with the white chalk in which comparatively very few remains of the group occur, and these not of the same species as those which abound in the other deposits.

Another point on which the authority of Ehrenberg has not been received without hesitation, is the *absolute specific identity* of a large proportion of the fossil and recent infusoria. The previous discoveries of geology had prepared an easy admission for the opinion that many of the tertiary forms of infusoria were undistinguishable from living races; such is the fact in regard to all the invertebral races; but with very few, and those not always allowed, exceptions, the secondary strata had been found to contain only extinct forms of life, till Ehrenberg examined the minute Polythalamiæ and found many of them similar to living types, and confirmed this inference by independent researches among the infusoria. Supposing these opinions of the Prussian microscopist to be confirmed by future inquirers, we shall find that they involve no infraction of the relations of zoological forms to geological time, which have been established from examinations of the other classes of the animal kingdom. The systems of life in each successive system of strata *are not separate and distinct creations*, but successive terms of a *creative series;* each of these terms is compound, and (to speak exactly), its constituent quantities (the several *classes, orders, families, genera, or species*) have their own coefficients and exponents; that is to say, *have their own times of duration, their own periods of abundance, their own peculiar relations to earlier and later organizations.*

A rule drawn from Fishes cannot be applied to Mollusca, a law based on Crustacea cannot be received for Microzoaria, without scrupulous examination; and Palæontology is full of examples of the unequal periods of duration which belong to the different organizations, and the unequal degree of development, and unequal geographical diffusion, which characterize these organizations at the same epochs and during the same periods.

Admitting the authority of Ehrenberg's determination of species, we find another curious and unexpected result—the frequent, if not general, admixture of marine and fresh-water tribes—in the comparatively level regions of Europe. In the plains of North Germany, round the Bohemian and Harz mountains, in Tuscany, and Yorkshire, we find this admixture of supposed marine and supposed fresh-water races, in the supra-tertiary deposits. Is this to be explained by supposing those deposits to have happened while the relative level of land and sea was different from what it is at present, and the sea was *near* to the place of deposition, so that by some of the many natural modes of diffusion which are effective in this class of life, the organisms of the sea might be carried into lakes, as well as mixed in estuaries, and along the course of languid rivers? Probably so. The deposits of infusoria which now happen so abundantly at the mouth of the Elbe are mostly derived from the sea; and it has been found in the River Hudson that species once imagined to be truly marine live in juxtaposition with the species of fresh waters. There may probably be, in a class of beings associated with silicated waters, a greater independence of the saline qualities of water than in other races which have little need of silica, and which require the extrication of lime from a state of solution in the waters which they inhabit. In confirmation of this view, we find the spongiæ of the sea matched by the spongillæ of fresh water, each extracting silica from the liquid, but the calciferous Polypean races of the ocean are almost unrepresented in our inland lakes and streams.

(Ehrenberg, *Die Infusionthierchen; Memoirs of the Berlin Academy*, and Translations in Taylor's *Scientific Memoirs*; Reade, Queckett, &c., *in the Microscopic Journal;* Mantell, *Medals of Creation and Annals of Natural History;* Prichard, *Infusorial Animalcula*, &c.)

INGEN-HOUSZ, JOHAN, a distinguished natural philosopher, was born at Breda in 1730: for some years he practised medicine in that city, and employed his leisure in the performance of experiments in chemistry and electricity; but, at length, quitting his native country he came to London, where his discoveries in those branches of science soon attracted the notice of the English philosophers, and led in 1769 to his being elected a Fellow of the Royal Society. He had the good fortune to obtain an introduction to Sir John Pringle; and this celebrated physician, immediately appreciating his merits, warmly encouraged him in the prosecution of his researches, and honoured him with his esteem and friendship: he appears also occasionally to have corresponded with Franklin on the subject of electricity, which was, at that time, rapidly rising in importance.

The reputation of Ingen-housz as a physician must have been great, for the Empress Maria Theresa, who had lost two of her children by the small-pox, having directed her ambassador in London to consult Sir John Pringle respecting the choice of a physician whom she might invite to her court for the purpose of inoculating the young princes and princesses of the imperial family, Sir John, then president of the Royal Society, without hesitation recommended Dr. Ingen-housz: the latter, accepting the invitation, set out, in 1772, for Vienna, where he performed the operations with complete success. The example of the sovereign was followed by the nobility of Austria, and the children of the highest families of the country were inoculated by Ingen-housz or under his immediate inspection. The empress, in testimony of her sense of his merit and attention, gave him the titles of aulic councillor and imperial physician; and accompanied these honours with the grant of a pension, which he enjoyed during the rest of his life.

During his residence on the continent, Ingen-housz visited Italy, France, and various parts of Germany; and, at intervals, continued to prosecute his researches in electricity and magnetism, and on the air produced by plants. While at Vienna, the emperor Joseph II. honoured him with especial notice, inviting him frequently to the palace, and occasionally visiting him at his own house, in order to witness the performance of his philosophical experiments. During a visit to Italy in 1773, Dr. Ingen-housz had an opportunity (at Leghorn) of making some experiments on the torpedo: he found that the animal gave the shocks most frequently when he attempted to bend its body; these shocks were sometimes so strong that he was almost obliged to quit his hold, and he remarks that they resemble the discharge of a number of small Leyden jars through the hands.

After an absence of several years, Dr. Ingen-housz returned to England, where he continued to prosecute his experiments; and an account of an electrophorus, which he had invented, is described in the 'Philosophical Transactions' for 1778. About the same time he made the discovery that plants exposed to the light while growing, discharge oxygen gas from their leaves into the atmosphere; and an account of his researches relating to this subject was published in London in 1779, under the title of 'Experiments upon Vegetables, discovering the power of purifying the Air in the Sunshine and of injuring it in the Shade,' &c. The work was translated into French by the author, and published in Paris in 1780.

In the 'Philosophical Transactions' for 1779, there is an account of an electrical machine which, about that time, Dr. Ingen-housz had constructed; this consisted of several pasteboard disks, about four feet in diameter, which being covered with varnish were fixed upon an axis; between every two of them was a board covered on both sides with flannel and then with hare's skin; and the friction produced when the disks were made to revolve enabled the operator to obtain from the machine sparks above a foot in length. This probably led to the invention of the plate electrical machine, which is generally ascribed to Ingen-housz: it consists of a circular disk of glass, which, being made to turn on its axis between two cushions, forms a very elegant and, if made of considerable magnitude, a very powerful apparatus.

Dr. Ingen-housz published in English a work entitled 'New Experiments and Observations concerning various physical Subjects,' which was translated into French and published in Paris. He also published, in French, a work entitled, 'Essai sur la Nourriture des Plantes,' which was translated into English and published in London in 1798.

Dr. Ingen-housz died Sept. 7, 1799, at his country-house, near London, in the sixty-ninth year of his age.

(*Biographie Universelle; Philosophical Transactions.*)

INHIBITION, in the law of Scotland, is a writ by which a creditor may prevent his debtor from alienating property either to favoured creditors or to other persons. Nominally it affects all property, but it is only in the case of heritable or real property that, from its standing on the register, it is efficacious. The debt on which inhibition may proceed must be founded on some obligatory written document, or established by the decree of a court. It may be recalled if improperly awarded. It conveys no specific security to the person who holds it, but it gives him a right to impugn every act which the debtor does to his prejudice regarding his real estate. It does not affect the validity of a sale for a fair price, but it gives the inhibiter a right to draw the price so far as his debt extends. If the inhibition be followed by proceedings to attach the estate at the instance of the other creditors, the inhibiter has a preference over them if the debts have been incurred subsequently to the inhibition, but not otherwise. The mixed rights thus occasioned are often productive of very intricate questions.

INJURY, INJURIES. As these words are vaguely used, it is as well to explain them.

Blackstone, after treating of Rights, proceeds in his Third Book (c. 1) to 'consider the wrongs that are forbidden and redressed by the laws of England.' He then divides Wrongs into two sorts or species:—Private wrongs and Public wrongs. To Private wrongs he also gives the name of Civil Injuries, as being 'the infringement or violation of the private or civil rights belonging to individuals considered as individuals.' Public wrongs are 'a breach and violation of public rights and duties,' and 'are distinguished by the harsher appellation of Crimes and Misdemeanours.'

This is a confused statement. The true nature of Injuria is however contained by implication in another expression in Blackstone:—'the contemplation of what is Jus is necessarily prior to what may be termed Injuria.'

The English law has in fact adopted many terms of the Roman law; and if Blackstone had always traced their meaning correctly, he would have written less confusedly. As Jus is law, so Injuria is something that is not Jus, or is forbidden by Jus. An Injury then, in the English law, is some illegal act; but the word is commonly used to express an illegal act done to a man or his property, for which he may by legal process get compensation. The English legal maxim that a man cannot recover damages or compensation when there is a 'damnum absque injuria,' contains in it the true meaning of injuria or injury. The act must be an illegal act in order to entitle a man to compensation. If a man's acts damage the property of another, without being such acts as are forbidden, the person who is damaged can get no compensation. For instance, a man may set up a grocer's shop next door to another shop, and get all his neighbour's custom, which is a grievous 'damnum,' but no 'injuria.' It is true that the nature of the damage may in some cases help to determine whether it is a legal injury or not; but the true question always must be whether the act complained of is either at common law or by statute an injuria, an unlawful act.

The Roman word Injuria, as already observed, signifies generally anything which is done contrary to law (quod non jure factum est, hoc est contra jus). In its narrow sense, Injuria was limited to unlawful acts that affected a man's person, not his property, at least not directly. It comprehended personal violence, such as beating a man, and using abusive words to him, and libelling him. Injuria might be done to a man either in his own person or in the person of those who were in his power, as his children and slaves, or in his hand (manu), as his wife. The mode of proceeding was by the Actio Injuriarum. (Gaius, iii. 220-225.)

The nature of Roman Injuria in its limited sense is, therefore, it appears, different from that of Injury in English law, as properly understood. For Injuries in English Law, or Civil Injuries, or Private Wrongs, as Blackstone calls them, comprehend all the wrongs that are treated of in his Third Book, that is, all wrongs except Crimes and Misdemeanours. The Roman Injuria belongs both to the head of Law Criminal and Non-Criminal. In some cases damages were got: in others the offender was punished in his person: in some cases he might be punished by a pecuniary penalty and in his person also.

The common, the non-legal, use of the words Injury and Injuries is as vague as people's notions of Right and Wrong generally. But people have often a clear perception that a damage is done for which no compensation can be got by legal means, though compensation is due according to those universal principles on which the common notions of right and wrong are based. The popular judgment here is often right, and is a foundation on which good and efficient legislation can be securely based.

INN. The responsibility of innkeepers for the safe custody of the goods and chattels of their guests is one out of the numerous classes of cases that arise upon the law of bailments, and is placed by Sir W. Jones, in his Treatise, under the second subdivision, *Locatio Operis*, of the general head *Locatum*. The law makes the innkeeper responsible for the safety of the goods of persons coming to his house, in the language of the antient writ, *causâ hospitandi;* but he may be released from his liability either by inattention on the part of the guest to such reasonable rules as the innkeeper may think proper to lay down for the protection of the property of his guests; by any act of negligence on the part of the guest himself, or by his making use of the house not, as it is before said, *causâ hospitandi*. Thus, if an innkeeper requires his guest to put his goods under lock and key, and the guest leaves them in a passage, whereby they are lost; or the goods are stolen by the guest's own servant; or the guest uses his room in the inn as a show-room, into which a number of people are allowed to have access, and not as a lodging-room, the responsibility of the innkeeper ceases. The general interest seems to require that the law should be made still more strict as against innkeepers, as the good faith and responsibility of the innkeeper form the only security of the traveller. The Roman law on this subject is contained in the Digest iv., tit. 9.

(Smith's *Leading Cases*, 'Calye's Case;' *Treatise on the Law of Bailments*, by Sir W. Jones.)

INSANITY. [LUNACY, P. C. S.]

INSCRIPTIONS (*Inscriptiones*), that is, records of public or private occurrences, of laws, decrees, and the like, engraved on stone, metal, and other hard substances, exhibited for public inspection. The custom of making inscriptions was infinitely more general in the states of antiquity than in any modern country, as we see from the innumerable inscribed monuments which still exist in Persia, Egypt, Greece, Italy, and other countries subject to or colonized by the Greeks and Romans. A great number of inscriptions, especially those recording great events, laws, or decrees of the government, which it was important for every citizen to know, supplied to some extent the want of the art of printing. When, for example, the laws of the twelve tables at Rome were set up in public, this public exhibition was equivalent to their publication by means of the art of printing, for every Roman might go and read them, and, if he liked, take a copy of them for his private use. Previous to the invention of the art of printing, inscriptions set up in a public place were the most convenient means of giving publicity to that which it was necessary or useful for every citizen of the state to know. Inscriptions therefore are, next to the literature of the antients, the most important sources from which we derive our knowledge of their public, religious, social, and private life, and their study is indispensable for every one who desires to become intimately acquainted with the history of antiquity. For the history of the languages they are of paramount importance, since in most cases they show us the different modes of writing in the different periods, and exhibit to us the languages in their gradual progress and development; though it is manifest that the antients did not bestow that care upon the accuracy of the language and orthography which we might expect, and in many cases they seem to have left these things to the artisan who executed the inscription. After the overthrow of the Roman empire in the west, inscriptions still continued to be made very frequently; but as the ignorance of the middle ages increased, and as all knowledge became more and more confined to the priesthood, the custom of making certain things known by means of inscriptions gradually fell into disuse, until the art of printing did away with it almost entirely.

In order to render inscriptions as permanent as possible, the antients chose such materials as were least subject to destruction, viz. stone or metal. The stone most commonly used was marble cut in slabs, but sometimes inscriptions were engraved upon a flat surface of the unhewn rock. The most common metal was brass or bronze, though we have instances also of lead, tin, and gold being used. If we believe the accounts of the antients, inscriptions were made even in the mythical ages (Herod., v. 59, &c.; Pausan., viii. 14, 4; ix. 11, 1); but such inscriptions, existing in later times, were probably forgeries, and we cannot suppose that inscriptions were made until the art of writing was pretty generally known.

We shall here pass over the arrow-headed inscriptions of Persia [ARROW-HEADED CHARACTERS, P. C.], the hieroglyphics of Egypt, and the now unintelligible inscriptions of Etruria, Lycia, and other countries, and confine ourselves to those written in Greek and Latin.

Greek Inscriptions.—The earliest Greek inscriptions which we may safely take to have been genuine, but all of which have perished, were the lists of the victors in the Olympian games (Paus., iii. 21, 1; v. 4, 6, &c.), the records of the musical contests at Sicyon (Plutarch, *De Mus.*, 3, 8), and the chronicle of the priestesses of Hera (Juno) at Argos. The earliest among the extant inscriptions do not seem to have been made much before the year B.C. 580.

All inscriptions are composed either in prose or verse, but the former compose by far the greater number. The prose of the public documents is usually stiff, and their style is not unlike that of official documents of our own time. All Greek inscriptions are written in capital letters, and without any punctuation or separation of the several words, which often renders it difficult to read and understand them properly. Some of the earliest inscriptions are written, like the Hebrew, from the right to the left; others varied their lines, the first being written from the left to the right, and the next from the right to the left. In this manner, which is called βουστροφηδὸν, the laws of Solon were written, and some specimens are still extant. [ALPHABET, P.C.] The method of later times was to write, like ourselves, from the left to the right. But besides these general distinctions, there occur a great variety, and some modifications of writing which are the result of mere fancy. Another important point which it is necessary to know before attempting to read Greek and more especially Roman inscriptions are the abbreviations of names and words (sigla), which have been described and explained in several works, such as Nicolai, 'De Siglis Veterum,' Lugdun. 1703, 4to.; Maffei, 'De Graecorum Siglis Lapidariis,' Verona, 1746; E. Corsini, 'Notae Graecorum,' Florence, 1749, fol.; Placentinus, 'De Siglis Veterum Graecorum,' Rome, 1757, 4to.; but the best work on this subject is Franz, 'Elementa Epigraphices Graecae, Berlin, 1840, 4to., which is at the same time the most complete introduction to the study of Greek inscriptions.

Public or state documents were exhibited in Greece in certain places of great publicity, as the Acropolis at Athens, and sometimes whole walls were set apart for the purpose of receiving marble or metal slabs with inscriptions. Market-places and temples likewise served as repositories for inscriptions. When it was intended that an inscription should be understood by two different nations, it was written in the languages of both (*inscriptiones bilingues*), as in Greek and Assyrian (Herod., iv. 87), Greek and Phoenician (Gesenius, *Monum. Phoenic.*, i. p. 93, &c.), Greek and Latin, Greek and Lycian (Grotefend in the *Transactions of the Royal Society*, iii. 2, p. 317, &c.), and Greek and Egyptian, as on the Rosetta stone in the British Museum, of which another copy has recently been discovered by Lepsius.

The necessity of making collections of the most important inscriptions, such as contained public decrees, or interesting epigrammatic poems (of which many have found their way into the Greek Anthology), was felt by the Greeks themselves. The earliest collection we know of is that of Philochorus, under the title of Ἐπιγράμματα Ἀττικά; his example was followed by Polemon in a work Περὶ τῶν κατὰ Πόλεις Ἐπιγραμμάτων, and especially by Craterus in the important collection entitled Συναγωγὴ Ψηφισμάτων. Although public inscriptions were under the protection of the state, and although their violation was severely punished, we nevertheless know of several instances in which they were maliciously or frivolously destroyed or mutilated. In certain cases the state itself ordered the destruction of public documents, as when decrees were annulled or abolished. In times of war and in the destruction of towns, innumerable inscriptions must have perished. Athens, as early as the time of the Persian wars, gives us an example of the destruction of public monuments, as pillars, and tombstones with inscriptions, for the purpose of building walls for the protection of the city. In the fourth century of our æra religious fanaticism caused still greater havoc among the antient monuments, which were frequently used as building materials for all kinds of edifices; and if, in addition to all this, we consider the ravages of time and the destructive influence of rain and air, it is astonishing to see the immense number of inscriptions that have been preserved down to our own time.

The first modern writer who conceived the idea of making a collection of ancient inscriptions was Cyriacus of Ancona, who undertook, in A.D. 1435, a journey through Italy, Greece, and Asia Minor, and brought back a great number of inscriptions, which he collected in 3 vols. MS., which are still extant in the Barberini Library at Rome, and have often been used by subsequent collectors. After Cyriacus a long time elapsed, during which the attention of the learned was chiefly directed towards Roman inscriptions. Scipio Maffei, and after him J. Carcagni and T. M. Raponi, formed the plan of a complete collection of all inscriptions, but none of them were able to carry it into effect, and people were satisfied with books containing such inscriptions as their authors happened to meet with, or thought of particular interest. Works of this kind are:—Janus Gruter, 'Inscriptiones Antiquae totius Orbis Romani,' Heidelberg, 1602, 2 vols. fol.; 'Marmora Arundeliana' (also called 'Oxoniensia,' containing twenty-nine Greek and ten Latin inscriptions), edited by J. Selden, London, 1628, 4to., by Prideaux, Oxford, 1676, by Maittaire, London, 1732, and by Chandler, Oxford, 1763; Oct. Falconerius, 'Inscriptiones Athleticae Graecae et Latinae,' Rome, 1668, 4to., is the first attempt at a systematic collection; J. Spon, 'Itinerarium in Italiam, Illyricum, Graeciam, et Orientem,' Lugdun., 1678, 3 vols. 8vo.; Thom. Reinesius, 'Syntagma Inscriptionum Antiquarum,' Lipsiae, 1682, fol.; W. Fleetwood, 'Inscriptionum Antiquarum Sylloge,' London, 1691, 8vo.; R. Fabretti, 'Inscriptiones Antiquae,' Rome, 1699; A. van Dale, 'Dissertationes Antiquariae et Marmoribus cum Romanis tum Graecis illustrandis inservientes,' Amsterdam, 1702, 8vo.; A. F. Gori, 'Inscriptiones Antiquae Graecae et Romanae quae extant in Etruriae Urbibus,' Florence, 1727, 3 vols. fol.; L. A. Muratori, 'Novus Thesaurus Veterum Inscriptionum,' 1739, &c., 4 vols. fol., with a Supplement by S. Donatus, Lucca, 1765, &c., 2 vols. fol.; E. Corsini, 'Inscriptiones Atticae nunc primum e Maffei Schedis editae,' Florence, 1752, 4to. The material collected in these works was greatly enriched by the collections of inscriptions made by travellers, as Pococke, P. M. Paciaudi, Torremuzza, Passionei, Walpole, C. Vidua, and others. With the assistance of these further accessions, F. Osann began, in 1822, his 'Sylloge Inscriptionum Antiquarum Graecarum et Latinarum,' of which eight fasciculi in fol. appeared; and F. G. Welcker published a smaller collection of metrical inscriptions, 'Sylloge Epigrammatum Graecorum ex Marmoribus et Libris collecta,' Bonn, 1828, 8vo.

But in the meantime the Berlin Academy had formed the plan of publishing a complete collection of all the known Greek inscriptions, of which A. Boeckh undertook the editorship. It bears the title, 'Corpus Inscriptionum Graecarum.' Vol. i. appeared in 1828, and besides the most antient inscriptions, it contains those of Attica, Megaris, Peloponnesus, Boeotia, Locris, Phocis, and Thessaly; the second volume, which appeared in 1843, contains the inscriptions of Acarnania, Epirus, Illyricum, the islands of the Ionian Sea, of Macedonia, Thrace, Sarmatia, the islands of the Aegean, Rhodes, Crete, Cyprus, Caria, Lycia, Mysia, and Bithynia. This great work, in two huge folios, is now the most complete collection of Greek inscriptions. They are arranged, as appears from the above enumeration, according to the countries and localities in which they were found; and in each particular where it is feasible, as in those of Athens, Boeckh has judiciously classified them into ten sections:—1, Acta senatus et populi, universitatum et collegiorum; 2, Tabulae Magistratuum; 3, Tituli Militares; 4, Magistratuum Catalogi; 5, Agonistica et Gymnastica; 6, Honores Imperatorum et aliorum ex domo Augusta et decreta imperatoria; 7, Tituli Honorarii; 8, Donariorum Tituli et Operum Publicorum; 9, Ordo Sacrorum, Termini, Defixiones Magicae, Supellex varia; 10, Monumenta privata, maxime sepulchralia. It is partly owing to the influence which Boeckh's 'Corpus Inscriptionum' exercised upon the scholars of our time, and partly to the political condition of Greece, that since the publication of the first volume of Boeckh's work a prodigious number of inscriptions have been brought to light by travellers, which were before unknown. Some of them have been incorporated in the second volume of the 'Corpus Inscriptionum,' but others were published too late for insertion, and will be published in a supplementary volume. The principal among these subsequent works are:—Ph. Lebas, 'Inscriptions Grecques et Latines recueillies en Grèce,' Paris, 1835, &c.; Janssen, 'Musei Lugduno-Batavi Inscriptiones Graecae et Latinae,' Lugdun. Bat., 1842, 4to.; L. Ross, 'Inscriptiones Graecae ineditae,' Naupliae, 1834, 4to.; H. N. Ulrichs, 'Reisen und Forschungen in Griechenland,' vol. i., Bremen, 1840, 8vo.; L. Stephani, 'Reisen durch einige Gegenden des nördlichen Griechenlands,' Leipzig, 1843, 8vo.; E. Curtius, 'Anecdota Delphica,' Berlin, 1843, 4to.; the same, 'Inscriptiones Atticae nuper repertae duodecim,' Berlin, 1843, 8vo.; the travels of Colonel Leake, Fellowes, and Hamilton; the work of Mr. Hamilton contains a large number of inscriptions from Asia Minor; and lastly Letronne, 'Recueil des Inscriptions Grecques et Latines de l'Egypte,' vol. i., Paris, 1842, 4to.; and the Philological Journals of Germany, France, and England.

Latin Inscriptions.—These are not less numerous than those of Greece, and are found in great numbers at Rome, in Italy, and all the countries which were once subject to Rome. They embraced the same variety of subjects as the inscriptions in Greece, and if only the principal ones had been preserved the early constitution of Rome would be comparatively clear, whereas now there are a vast number of questions to which we can only answer by conjectures. Some of the Roman writers have, it is true, made use of the most important inscriptions for the early history of Rome, but not by any means to that extent which we could wish. The attention of Roman writers does not appear to have been so much directed towards this source of information as that of the Greeks, for there is no instance of any collection having ever been made by the Romans themselves, although some of them were of the very highest importance in a constitutional as well as legal point of view. At the time of the overthrow of the Western Empire thousands of inscriptions must have perished, especially those engraved on metal, as the material attracted the avarice of the barbarians. But a great number was still preserved in Rome and Italy, which attracted the attention of the learned even in the early part of the middle ages.

The oldest collection of inscriptions found at Rome, exists in the monastery of Einsiedeln; it is written on parchment, and probably belongs to the tenth or eleventh century. It is printed in Mabillon (*Veterum Annal.*, p. 358, &c.). At the time of the revival of letters, the attention of the learned was chiefly directed towards the authors of antiquity, but ever since the fifteenth century attention has also been bestowed upon inscriptions. The man who first formed the idea of a comprehensive collection was the above-mentioned Cyriacus of Ancona, who undertook his travels at the request and the expense of Pope Nicolas I. The first printed collection of Latin inscriptions is that of Peutinger, who collected and published those which were found at Augsburg and in its neighbourhood on seven folio leaves, under the title of 'Romanae Vetustatis Fragmenta in Augusta Vindelicorum et ejus Dioecesi,' Augsburg, 1505. Another collection, which is now extremely rare, was published by Laurentius Ahstemius, at Fani in 1515, of which a second edition by F. Polyardu appeared in the same year. The collection published by the bookseller Mazocchi, at Rome, in 1520, in folio, under the title 'Epigrammata Antiqua Urbis Romae,' contains scarcely any other than sepulchral inscriptions.

After these collections of local inscriptions, B. Amantius and P. Appianus, supported by the liberal merchant Raimund von Fugger, published a general collection under the title of 'Inscriptiones Sacrosanctae Vetustatis,' Ingolstadt, 1534, fol. Soon after, the learned George Fabricius published a considerable collection of Latin inscriptions which he had made in his travels, and which had been communicated to him by his friends, in the second volume of his 'Roma,' Basle, 1550, reprinted in 1587, and at Helmstädt, 1660, fol. Martin Smetius of Bruges, during a stay of six years in Italy, made a very careful collection of inscriptions, which however were not published till after his death by Janus Douza, and with an auctarium by J. Lipsius, Lugdun.-Bat. 1588, fol. The work of Laurentius Schrader, 'Monumenta Italiae,' has one volume which contains only inscriptions which he had collected during his visits in Italy; they are arranged according to the towns in which they were found, but he does not distinguish between the earlier and later inscriptions, and he has some which are evidently not genuine. After that of Schrader followed that of Thom. Reinesius, which was mentioned above. A somewhat more complete and accurate collection of 4688 inscriptions was published by Fabretti under the title 'Inscriptionum Antiquarum, quae in Aedibus Paternis asservantur Explicatio et Additamentum,' Rome, 1699, fol. (some copies bear date of 1702, but this is only a bookseller's imposition).

But all the works here mentioned are eclipsed by the undertaking of Janus Gruterus, which was to contain all the inscriptions that had until then been made known. He took the work of Smetius as his foundation, and was actively assisted by Joseph Scaliger. The collection appeared under the title 'Inscriptiones Antiquae totius Orbis Romani,' Heidelberg, 1603 and 1663, fol. J. G. Graevius afterwards undertook to edit a still more complete and corrected edition, but he did not live to complete his task, which fell into the hands of P. Burmann, who, assisted by many other scholars, published the new edition of Gruter, under the title 'Inscriptiones Antiquae totius Orbis Romani, in absolutissimum Corpus redactae, olim auspiciis J. Scaligeri et M. Velseri, industria autem Jani Gruteri, nunc notis Marquardi Gudii emendatae, cura J. G. Graevii,' Amsterdam, 1707, fol. Marquard Gude, who had travelled in Italy, likewise prepared a collection of inscriptions for publication, which however was edited after his death by F. Hessel, Leovardiae, 1731, fol. This collection however contains many forgeries made by the notorious Ligorius. A collection of 2000 inscriptions which had been gathered by Doni, was published by Gori, 'T. B. Donii Inscriptiones Antiquae,' Florence, 1731, fol. In 1739, L. A. Muratori published his 'Novus Thesaurus Veterum Inscriptionum,' Milan, 1739, 4 vols. 4to., with a supplement by S. Donatus in 2 vols., Lucca, 1765, &c. Among the collections of inscriptions published at a later time, few are of great importance, with the exception of the selection from all the known inscriptions which was published by J. C. Orelli, under the title 'Inscriptionum Latinarum selectarum amplissima Collectio ad illustrandam Romanae Antiquitatis Disciplinam accommodata, &c.; cum ineditis Hagenbuchii suisque Annotationibus,' Zürich, 1828, 2 vols. 8vo. This collection is extremely useful, but it is to be regretted that the editor has not always published the incriptions with that accuracy and exactness which are required in works of this kind.

In modern times the number of Latin inscriptions found in the various parts of the world which once were subject to Rome, has been increased enormously, and will increase every year, as archaeological societies are formed in all parts of Europe, with the express object of searching after, preserving, and publishing the Roman monuments existing in the particular districts in which those societies are formed. The number of Latin inscriptions now known amounts to about 60,000, and the want of a new and complete collection has long been felt. The Danish scholar Olaus Kellermann, who lived in Italy for some time, formed the plan of publishing a collection of Latin inscriptions similar to the 'Corpus Inscriptionum Graecarum' of Boeckh, but his untimely death in 1837 prevented the carrying out of his plan. O. Jahn honoured his memory by the publication of his 'Specimen Epigraphicum in Memoriam Olai Kellermann,' Kiel, 1841, 8vo. But a fair prospect of the publication of a complete collection of all the known Latin inscriptions has recently been held out. On the 6th of July, 1843, Villemain, the French minister of public instruction, requested the Academy of Inscriptions at Paris to prepare such a collection, and a commission of French savans has been appointed to conduct and superintend the work. Several pamphlets have since appeared both in France and Germany, containing suggestions respecting the principles which should be followed in the arrangements of the inscriptions.

Among the works to be consulted by those who wish to acquire a facility in reading and understanding Latin inscriptions, the following are of importance: Zaccaria, 'Instituzione Lapidaria,' Rome, 1770, and Venice, 1792; Morcelli, 'De Stilo Inscriptionum Latinarum Libri Tres,' Rome, 1781, and reprinted in his 'Opera Epigraphica,' Patavii, 1819, 5 vols. 8vo.; Kopp, 'Palaeographia Critica,' Mannheim, 1829, &c. 4 vols. 4to.; and Orelli's Introduction to his Collection.

INSECTA, FOSSIL. Until within a few years the occurrence of insects in a fossil state could only be substantiated by reference to a small number of localities, situated (as at Aix in Provence) among lacustrine tertiary strata, or (as at Stonesfield in Oxfordshire and Solenhofen in Franconia) among marine oolitic beds. But Mr. Prestwich has added traces of coleoptera from the coal formation of Coalbrook Dale, and Mr. Strickland parts of neuroptera from the lias of Warwickshire; Dr. Buckland obtains neuroptera from the oolite of Stonesfield, and Mr. Brodie portions of insects belonging to various natural orders from the lias of Somersetshire, Gloucestershire, and in the Wealden deposits of the Vale of Wardour in Wilts, and the Vale of Aylesbury.

Still the number of fossil insects, whether we estimate individuals or species, is very small compared to the probable number of anciently existing races; a circumstance quite explicable by reference to the phenomena which are now taking place in nature; for of upwards of 12,000 British species of insects there is reason to believe that but a very minute proportion is buried and preserved in lacustrine, estuary, or marine deposits now in progress. Only one elytron of a small beetle was observed in a deposit of the Elephantoidal æra in Yorkshire, and one seed of some umbellate plant, along with hundreds of shells which inhabited the lake.

No doubt vast numbers of insects, wandering by caprice or drifted by winds, pass from the shore and fall in the sea—as we learn from the first voyage of Cook, who sailed through myriads of insects, some on the wing and others in the water, even thirty leagues from land off the coast of South America; but few of these escape the watchful finny races, or ever reach the bottom of the sea.

In like manner we find land insects heaped in profusion by winds on certain tracts of fresh water, and borne down the course of rivers by inundations; and these cases, by the aid of particular suppositions, such as evaporation or slow draining off of the water, may offer the nearest analogy to the facts actually observed in the greater number of insect deposits.

The occurrence of fossil insects, especially in marine strata, is therefore to be regarded as an exceptional case, and this makes the circumstances brought to light concerning them remarkable and difficult of interpretation. We find however from Mr. Brodie that the insects lie in a certain bed or mass of thin beds in the lias; similarly they occupy particular layers in the oolite, the Wealden deposits, and in the tertiary accumulations of Aix, Oeningen, and Auvergne. In the latter region the calcareous incrustations gathering on the indusiæ or larva-cases of Phryganidæ have caused the formation of a peculiar limestone ('Indusial Limestone').

In the following summary of the groups of fossil insects in Britain, the most recent stratifications come first. The catalogue commences with the Elephantoidal era. The authorities and localities are given for each case. (See Morris's *Catalogue of Fossils;* Brodie's *Fossil Insects;* Lyell, in *Geol. Pro.;* Phillips, *Geol. Yorkshire;* Strickland, in *Mag. of Nat. Hist.;* Buckland, in *Bridgwater Treatise;* and *Geol. Proceed.*)

1. *Ossiferous fresh-water deposits* (Pleistocene).

Elytron of a Chrysomela. Bielbecks, in Yorkshire. (Phillips.)
Remains of Copris lunaris. Mundesley, Norfolk. (Lyell.)
" Donacia. " " "
" Harpalus. " " "
" Coleoptera. Southwold, Suffolk. (Alexander.)

(No truly aquatic beetle is mentioned among these. Donacia haunts aquatic plants. The others are strictly terrestrial. They must have been drifted into the lakes in which the Planorbes, &c. lived.)

2. In the Cretaceous System, no insects yet found.

3. In the Wealden strata of the Vale of Wardour (found by Mr. Brodie and examined by Mr. Westwood)—

Land Coleoptera, of the families—Carabidæ? Harpalidæ? Staphylinidæ? Buprestidæ? Tenebrionidæ? Elateridæ? Curculionidæ? Cantharidæ? Helophoridæ.

Aquatic Coleoptera of the families—Hydrophilidæ? Dyticidæ? (Colymbetes.)

Orthoptera, of the genera Acheta and Blatta.

Hemiptera and Homoptera, including land tribes, as—Cimicidæ, Cicada, Cercopis (Larva), Aphides, &c., and the aquatic races of Velia and Hydrometra.

Neuroptera. In this water-haunting order occur Libellula and Æshna, Corydalis, Libellulidæ, Termes? and Leptoceridæ. Trichoptera? Phryganidæ?

Diptera. Simulium? Platyura? Tanypus? Chironomus? Culex? Tipulidæ, &c. (Aquatic larva) Empidæ?

4. In the *oolitic strata*, insects occur in the laminated probably littoral beds of Stonesfield and some other localities in Gloucestershire and near Bath. Dr. Buckland has described several species in the Geological Proceedings and in his Bridgwater Treatise on Geology, and Mr. Brodie has added others. The remains are chiefly Elytra of Coleoptera

and wings of Neuroptera. The following is abstracted from Mr. Brodie's list.

Coleoptera, of the families Prionidæ, Buprestidæ, Pimelidæ? Chrysomelidæ? Coccinellidæ.

Neuroptera. Hemerobioides giganteus. (Buckland.)

5. *In the Upper Lias* at Dumhleton and Churchdown. (Brodie.)

In the Lower Lias—above the bone-bed of Aust Cliff, Wainlode Cliff, &c. on the Severn; Coombe Hill, Cracombe; Hasfield, Corsewood Hill, &c. in Gloucestershire. (Brodie.)

(Mr. Westwood has examined 300 specimens of insects from the Lias beds.)

Coleoptera, of the families Buprestidæ? Elateridæ; Curculionidæ or Chrysomelidæ; Carabidæ; Telephoridæ; Melolonthidæ, &c.; a species of Gyrinus?

Orthoptera, including Gryllidæ and Blattidæ.

Hemiptera and Homoptera. Cicada? Cimicidæ?

Neuroptera. These are the best determined of the fossil groups, owing to the structures of the wings being clear and characteristic:

Libellula, Brodiæi (Br.): in upper Lias.	Dumhleton, Glouc. (Brodie.)
Hopei (Brodie).	Strensham, Worcestershire. (Brodie.)
Agrion, Buckmanni (Br.), in upper Lias.	Dumhleton. (Brodie.)
Aeshna, liassina (Strickland).	Bidford, Warwickshire.
Orthophlebia communis (Westwood).	Wainlode, Forthampton, Strensham, Cracombe, Bidford.
Hemerobius Higginsii (Br.).	
Chauliodes	Hasfield, Strensham, Bidford.
Ephemera	Strensham.
Diptera	
Asilus? ignotus (Brodie).	Forthampton.

It is in the lower lias beds that the insects are most abundant. They occur in this part (between the ordinary lias limestones and the bone bed) so extensively as to justify the application to this genus of the term 'insect limestone' used by Mr. Brodie. As a whole the lias insects appear to contain larger proportions of aquatic tribes than the Wealden. There is no decided evidence amongst them of the prevalence of a warm climate at the time and in the place of their existence. They are usually of small size, not so entire as to forbid the supposition of having been *drifted* (the Neuroptera may have been less drifted than the Coleoptera); and if there were islands or high coasts adjacent, these might nourish, and in time of floods send down the small coleopterous insects to be imbedded with the fucoids, oysters, and modiolæ of the coasts, and ferns and other plants of the land and streams.

6. In the ironstone nodules lying in the carboniferous deposits of Coalbrook Dale, Mr. Prestwick has discovered Coleoptera, Curculioides Ansticii (Buckl.), C. Prestvicii (Buckl.); and Mr. Murchison, Sil. Syst. p. 105, mentions an insect to which the name of Corydalis Brongniarti is assigned. It is very possible that the laminated limestone deposits of Burdie House near Edinburgh and Ashford in Derbyshire may yield insect remains older than any yet mentioned. And seeing the frequent connexion or proximity of fossil insects to fossil fishes, it may be worth while to search the lower beds of the mountain limestone where the rich fish-beds occur in it, on the Avon, in Caldy Island, and in Fermanagh. The fish-beds of the magnesian limestone (marl slate) may also be indicated for further research. A very interesting addition to the fossil insects of Aix has been made known by M. Coquand. It is a butterfly, and has been carefully examined by M. Boisduval, who has been able to recognise perfectly its generic and specific characters. It belongs to one of those genera the species of which are not numerous, and are at present confined to the islands of the Indian Archipelago, or the warmest countries of the Asiatic continent. It belongs to the genus Cyllo—it is an extinct species—and is named C. sepulta. M. Boisduval has examined the other fossil insects of Aix, and differing both from Curtis and Marcel de Serres, refers them to the extra-European genera, and to extinct species.

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INSECTS, GEOGRAPHICAL DISTRIBUTION OF. The various kinds of insects, even when furnished, as the greater number of them are, with powerful organs for flight, are each and all distributed within as certain bounds as the most stationary animals or plants. Independent, then, of its great interest as a part of philosophical zoology, the study of the range and specific centres of the forms of insect life becomes of great importance as an aid in the definition of tribes, genera, and species. As yet, however, entomologists have done comparatively little in this department of their science, and have rather occupied themselves in recording the distribution of specimens in cabinets than of species on the earth's surface.

Climate and the extension or form of land are the chief influences regulating the distribution of insect life. The constitution of the soil affects it also, but in a secondary manner, through its influence on the vegetation, on which many insects feed. When from the intervention of tracts of water, of mountain barriers, or other causes depending on antient geological events anterior to the origin of the existing fauna of the earth, tracts of land presenting exactly similar conditions of climate and soil are placed far apart, we then have, not a repetition of the same forms among their insect population, but a representation by similar forms. This we see also in the fauna of the several zones of climate belting mountains at different heights. Man's agency and the transporting power of currents of wind modify the distribution of many species of insects. In the following brief glance at the distribution of the principal genera of insects, examples of all these influences will be met with.

Coleoptera.—From the facility with which insects of this division may be preserved and transported from place to place, we have more detailed accounts of their distribution than of any of the species of other orders. The *Cincindelidæ* are dispersed over most parts of the globe, the typical genus being cosmopolitan, whilst other groups are more limited. Among the *Carabidæ* are many genera peculiar to Europe. *Chlænius*, *Agonum*, and *Amara*, are common to both hemispheres. *Harpalus* and *Brachinus* are cosmopolitan. *Cnemacanthus* occurs in Africa and Chili. The *Carabidæ* of Western Asia agree remarkably with those of Europe. Erichson has remarked that *Carabi* are very constant to certain soils: the vertical distribution of the species is also very constant. The water-beetles allied to *Dytiscus*, itself universal in the old world, are mostly European: several of the species live in salt or brackish waters. *Gyrinus* ranges from Northern Europe to New Holland. The *Brachelytra* have their chief centre in Europe. The typical genus *Staphylinus* appears however to be represented everywhere: many species occur in South America. A species of *Aleochara* is found in Van Diemen's Land. *Elater* and *Buprestis*, types of families, are both cosmopolitan: the species are often local, and their distribution depends, in many cases, on that of certain plants on which the larvæ prey. Among the fire-flies (*Lampyridæ*) the genus *Lampyris*, which is European, is represented in the tropics by *Photinus*, and in the New World by *Aspisoma*. The *Malachii* are found everywhere, except in South America. *Ptinus*, a genus chiefly European, has a single representative in Australasia. Of the *Necrophagi*, the genera *Cryptophagus*, *Strongylus*, and *Silpha* are found everywhere, ranging from Britain to China, and from Brazil to Lapland. *Hister*, the type of a family, is also a cosmopolitan genus. *Byrrhus* belongs to the northern hemisphere, and has its chief centre in Europe. Among the *Coprophagous Lamellicornes*, the genus *Aphodius*, though represented in most countries, is chiefly developed in temperate regions; whilst *Ateuchus*, on the other hand, is mainly tropical. *Geotrupes* is cosmopolitan. *Copris* ranges to New Holland, where however it is confined to the north coast. *Scarabæus* is subtropical. *Pelidnota* is American. The beautiful *Cetoniae* appear to be of universal distribution. The strange forms of *Goliathus* are South African. Of the cockchafers, *Melolontha* is cosmopolitan; *Macrotops* and *Anoplognathus*, confined to Australia; *Hoplia*, with one exception, European; *Amphicoma* is Mediterranean; *Anisoplea* and *Serica* natives of the warm and temperate regions of both hemispheres; whilst *Euchlorus*, occupying the same range, extends beyond in a northern direction. Of the *Melasomæ*, *Blaps*, and *Pimelia*, both extensive genera, have their chief development in the warmer regions of the Old World. Of the *Stenilytra*, *Helops* is cosmopolitan, *Œdemera* European. Of the *Anthicidæ* the numerous species of *Anthicus* are chiefly inhabitants of temperate regions. The blistering beetles of the genus *Meloë* are very generally distributed.

Of the ten thousand species of weevils the great genera *Ceutorhyncus*, *Cryptorhyncus*, *Calandra*, *Otiorhyncus*, and *Clionus* are all cosmopolitan. *Platysomis* and *Cyphus* are South American; *Brachycerus*, South African and Mediterranean, *Brentus*, mainly confined to the tropical regions of both hemispheres; *Apion* and *Rhynchites*, chiefly European. The distribution of the species of weevils depends in a great measure on that of plants.

The most beautiful and vividly coloured forms of Longicorn beetles are mostly tropical. The presence of forests determines that of many of the genera. Of the seventy genera of *Cerambycidæ*, the typical one, *Cerambyx*, is cosmopolitan. Others have defined centres, as *Clytus* in Europe, *Trachyderes* in South America.

Of the *Chrysomelinæ*, the typical genus *Chrysomela* is cosmopolitan. The presence of certain plants determines the distribution of the species. From this cause, species of limited distribution are sometimes multiplied far from their aboriginal centres. Thus *Galeruca calmariensis*, introduced from Europe into America, multiplied so at Baltimore in the years 1838 and 1839, that the elm trees of the district were eaten bare by their larvæ, and probably they will henceforth become a constant annoyance in the New World. *Lema* and *Donacia* are instances of cosmopolitan genera having distinct centres in temperate climates. *Cassida*, on the other hand, has its centre in the tropics.

Of the *Trimera*, *Coccinellæ* are found everywhere. *Eumorphus* is Indian and Polynesian.

Orthoptera.—Though by no means an extensive order either as to genus or species, the *Orthoptera* are of very general distribution. Representatives of the genera *Gryllus* and *Acheta*, the grasshoppers and crickets, are found in most countries. The *Locusts* are mostly exotic. The strange *Phasmæ* are mostly tropical, as are also the greater number of *Mantidæ*, known popularly as 'walking leaves.' The cockroaches, *Blattæ*, are very general, and have been greatly diffused from their original centres by unintentional human agency. The earwig tribes, *Forficulidæ*, including more than fifty species, are in great part European, but range even to Van Diemen's Land.

Erichson notices the curious fact respecting the Orthoptera of Van Diemen's Land, that only one fourth of the species are completely winged and capable of flying.

Neuroptera.—The number of known species in this order is short of one thousand. The section of *Plicipennes* is almost entirely European; the genus *Macronoma*, including species from Madagascar and Brazil, is an exception. The *Planipennes*, a great part of the genera of which division are now considered by many naturalists *Orthopterous*, have a much more varied distribution. Thus the *Myrmelionidæ* are cosmopolitan, the *Perlæ* and *Nemouræ* chiefly European, the *Panorpæ* characteristic of the temperate regions of both the old and new world, the *Termites* of the tropics. In the section of *Subulicornes*, the *Ephemeridæ* are European; the *Aeshnidæ*, cosmopolitan; as also the true dragon-flies, *Libellulæ*, of which near two hundred species are known. Other allied genera are more limited.

Hymenoptera.—Among the sting-bearing species, the true bees are characteristic of the antient continent, those now dispersed in America having been transported from Europe. The genera *Centris* and *Euglossa* are exclusively American. *Nomia* is Asiatic. *Allodape* is south African. *Andrena*, *Xylocopa*, and several other extensive genera, are cosmopolitan. A great many genera of wasps are peculiar to South America. The ants are most developed in Europe. *Bembex* is a tropical genus. The terebrating Hymenoptera are both very numerous and widely distributed, especially the great genus *Ichneumon*. Certain genera forming the family *Oxyuræ* are exclusively European, as are also a great part of the numerous family of *Chalcididæ*. *Cynips* is European, and the greater number of *Tenthredinidæ*.

The distribution of the *Strepsiptera* depends on that of the insects on which they are parasitic.

Lepidoptera.—When the distribution of the butterflies shall have been worked out, it will doubtless prove very interesting. At present our knowledge of this subject is imperfect. The *Papilionidæ* are very numerous specifically, and for the most part tropical. Some of them possess great ranges. Thus certain species of *Pieris* are found over all Europe, and great part of Asia and Africa. Other forms are constant to mountainous regions. Of the *Nymphalidæ* the greater number and more gorgeous forms are tropical. In this family there are some remarkable instances of extensive distribution of species. Thus *Vanessa Cardui* (a common British butterfly) is found in every part of the world, and *Vanessa Atalanta* ranges over all Europe, part of Asia and Africa, and to North America. In the remaining tribes the typical genera are almost always cosmopolitan, whilst others have more limited areas.

The *Sphingidæ* and *Zygenidæ* are in great part European; the *Castnidæ* mostly tropical.

Among the moths, the *Phalenidæ* are chiefly European, and the species are usually widely distributed. This appears to be the case also with the other families of Nocturnal Lepidoptera, probably rather in consequence of our imperfect knowledge of exotic forms, than because it is really so, for we find types and species in distant regions wherever they have been even casually explored, as in the instance of Asiatic Russia, where the researches of Eversmann among these insects have brought many new forms to light.

Diptera.—One-half of the described species of two-winged flies (about eight thousand) belong to Europe. This disproportion arises from our comparative ignorance of the exotic forms. The small group of *Ornithomyzidæ*, parasites on quadrupeds and birds, has representatives of all its genera in Europe, the few remaining species being natives of eastern Asia, Western Africa, Australia, or Brazil. The flies forming the family of *Muscidæ* include a great number of genera, both European and exotic, the former being most prolific in species, some of which have wide ranges. The *Syrphidæ* are in the same category. The genus *Chrysops*, equally developed in Europe and America, and represented in a less degree in Africa and Asia, does not appear in Australia nor in the islands of the Pacific. *Tabanus* is more widely distributed. *Ommatius*, a genius of *Asilidæ*, has its members in all parts of the world. A great many genera are peculiar to South America, and several to Africa, hot, woody, and moist regions favouring their diffusion. *Tipula*, presenting numerous and varied forms in most parts of the world, is excluded from Australia and the Pacific, which region seems to be the least prolific in *Diptera*. *Culex* is very generally distributed.

Hemiptera.—Of the two great divisions of this order, the *Hemoptera* and the *Heteroptera*, the first is the smallest and also the most tropical. The distribution of the insects comprising them depends mainly on the fauna and flora of the countries they inhabit. Thus each species of *Coccus aphis* has a range correspondent to that of the plant upon which it feeds; and of the *Coræidæ* and *Lygæidæ* with the presence of their favourite animal food. Among the most interesting of the families of *Hemiptera* are the *Cicadeidæ*, of which the genus *Tettigonia* includes 200 species, centred in America, but having members also in the Old World; the *Fulgoridæ*, or Lantern-flies, very generally distributed through warm climates; *Scutelleridæ*, remarkable for brilliancy, and mostly equatorial; and *Cimex*, of which the only true species is the common bed-bug, a pest spread over all Europe. Of the Aquatic *Hemiptera* *Gerris* and *Nepa* are cosmopolitan; *Pelognus* and the *Nectonectidæ*, mostly European; *Galgulus* and *Mononyx*, American; and *Halobates*, equatorial.

Thysanura.—As yet the distribution of these minute insects has been scarcely attended to. The species of *Lepisma* range from Europe to China. *Padura* and *Smynthura* are European; a single species of the last-named genus occurs in North America.

Anoplura.—These disagreeable parasites have lately been honoured by the attention of some excellent naturalists, especially Denny and Gwilt. Their distibution corresponds with that of the animals upon which they are found. Of the equally annoying order *Aphaniptera* three-fourths of the known species are European. The common flea is a cosmopolite, and the Chigo is confined to South America.

INSOLVENCY. From August, 1842, to August, 1845, three acts have been passed relating to insolvent debtors; these are 5 & 6 Vict. c. 116; 7 & 8 Vict. c. 96; and 8 & 9 Vict. c. 127.

The act 5 & 6 Vict. c. 116, which came into operation 1st November, 1842, enabled a person who was not a trader within the meaning of the bankrupt laws, or a trader who owed debts which amounted in the whole to less than 300*l.*, to obtain by petition a protection from the Court of Bankruptcy in London or the Commissioners of the District Courts of Bankruptcy in the country, from all process whatever (except under a judge's order), either against his person or property until the case was adjudicated by the court. In the interim the insolvent's property was vested in an official assignee appointed by the court. If, on the hearing of the petition, the commissioner were satisfied with the allegations which it contained, and that the debts were not contracted by fraud, breach of trust, or by any proceedings for breach of the laws, he was empowered to make a final order for the protection of the petitioner from all process, and to cause his estate and effects to be vested in an official assignee, together with an assignee chosen by the creditors.

The act 7 & 8 Vict. c. 96, passed 9th August 1844, is entitled 'An act to amend the law of Insolvency, Bankruptcy, and Execution.' It enacted that any prisoner in execution upon judgment in an action for debt, who was not a trader, or whose debts, if a trader, were under 300*l.*, may, without any previous notice, by petition to any court of bankruptcy, be protected from process and from being detained in prison for any debt mentioned in his schedule; and if so detained, the commissioners of any bankruptcy court may order his discharge.

The property of the insolvent may be seized for the benefit of his creditors with the exception of the wearing apparel, bedding, and other necessaries of the petitioner (the insolvent under 7 & 8 Vict. c. 96) and his family, and the working tools and implements of the petitioner not exceeding in the whole the value of 20*l.* Under the 7 & 8 Vict. c. 96 (§ 39) if a petitioner for protection from process (pursuant to the provisions of that act) shall wrongfully and fraudulently omit in the schedule, which schedule he is required to make (5 & 6 Vict. c. 116), any property whatsoever, or retain or exempt out of such schedule any wearing apparel, bedding, or other necessaries, property of greater value than 20*l.*, he shall, upon conviction, be liable to be imprisoned and kept to hard labour for any period not exceeding three years.

The 7 & 8 Vict. c. 96, made a great alteration as to debts under 20*l.* The 57th section is as follows: 'Whereas it is expedient to limit the present power of arrest upon final process, be it enacted, That from and after the passing of this act, no person shall be taken or charged in execution upon any judgment obtained in any of her Majesty's superior courts, or in any county court, court of requests, or other inferior court, in any action for the recovery of any debt wherein the sum recovered shall not exceed the sum of 20*l.* exclusive of the costs recovered by such judgment.' The 58th section provided that upon application to a judge of one of the superior courts of law at Westminster, or to the court in which such judgment as is mentioned in section 57, shall have been obtained, all persons in execution at the time of passing this act be discharged, when the debt, exclusive of costs, did not exceed what is specified in the 57th section. Accordingly, such persons, on making application pursuant to the 58th section of this act, were discharged from prison in England and Wales.

The consequences of the legislation contained in the 57th and 58th sections of 7 and 8 Vict. c. 96, were these. All persons who were in confinement for debts under 20*l.*, exclusive of costs, might get their liberty; but the judgment upon which the debtor was taken in execution remained in force (§ 58), and the judgment creditor or creditors had their remedy and execution upon every such judgment against the property of the debtor, just as they might have had if he had never been taken in execution upon such judgment. The 59th section gave to the judge who should try such cause (§ 58), being either a judge of one of the superior courts or a barrister or attorney at law, power to imprison the defendant (debtor) for such times as are mentioned in § 58, if he should appear to have been guilty of fraud in contracting the debt, or had contracted it under the other circumstances mentioned in the 59th section.

The amount of debts in England and Wales under 20*l.* must always form a very considerable proportion of all the debts that are at any time due in England and Wales. Such debts comprehend a large part of the dealings of shopkeepers and petty tradesmen; probably in a very large number of cases debts under 20*l.* may comprehend every debt that is due to a large body of petty tradesmen. The tradesmen no doubt do in many cases give credit to persons who have no reasonable means of payment, and with whose character and condition they are very imperfectly acquainted. Many persons are always willing to contract a debt, but never intend to pay if they can help it. Another class of debtors consists of those whose morality is not so well fixed as to make them good and willing payers, but who will pay and do pay under the combined influence of some feeling of honesty and some fear of the consequences of non-payment. A third class, which we hope may be the most numerous of all, is willing to pay, but often requires time, and must be deprived of many comforts if they cannot command the credit which their character and earnings fairly entitle them to. [CREDIT, P. C. S.]

The 57th and 58th sections of the 7 & 8 Vict. c. 96, deprived creditors of their hold upon their debtors for sums under 20*l.*, and left to all persons who had claims upon persons in prison for sums above 20*l.*, the power of still keeping their debtors there. As to debts under 20*l.* existing before the act, and for which the debtor was not in execution, it left the creditor no remedy except against his property. And here we may remark that the question as to the imprisonment of debtors seems reducible within narrow limits, if we view it merely as it affects the interests of the community. The object in allowing a debtor to be seized is not to punish him as a debtor, but that he may be subjected to a complete examination for the purpose of discovering what his property is, that he has not parted with it to defraud his creditors, and that there was no fraud in the contracting of the debt. The simple fact of being indebted and unable to pay should not be punished. The contracting debts under such circumstances as amount to fraud ought to be punished. The principle then which should guide a legislator should be, not to punish a man simply because he is indebted and cannot pay his debts, but to punish him for any fraud that is committed either in contracting the debt or in attempting to evade the payment of it. Now in the case of a debtor, fraud, both in contracting a debt and in attempting to evade payment, is known by experience to be a thing of frequent occurrence; and it is therefore just and reasonable that judgment creditors should have the power to secure the person of their debtor until he has paid his debts or made a full and honest statement of his means of payment.

The effect of the last-mentioned act was of course to diminish the credit given by small dealers to all persons. The act also relieved many dishonest debtors from the payment of their past debts, for it deprived the creditor of his most efficient remedy; and as to all future dealings, it rendered the small tradesman less willing to give credit to those who, under the old system, had it. But the act did more: it encouraged fraud and a fraudulent system of trade. Persons who were refused credit by respectable tradesmen, who honestly paid for their goods, could still obtain credit of tradesmen whose practices were not so honest. The amount of mischief, both pecuniary and moral, caused by this unwise measure, may be estimated from the loud complaints against it from all parts of the kingdom, from a great variety of tradespeople, especially tailors, shoemakers, butchers, bakers, grocers, three-fourths of whose debts, and of retail tradesmen generally, are ordinarily in sums under 20*l.* In some wholesale trades three-fourths of the debts are also in sums under 20*l.* Their debtors set them at defiance, as, except in cases of fraud, there was no power of obtaining payment except by an action in one of the superior courts, in which case the creditor would have to pay the costs out of his own pocket, and in the end might be unable to obtain satisfaction for the debt. Many tradesmen had debts in sums of less than 20*l.* which in the aggregate amounted to a large sum, perhaps in some cases to 2000*l.* or 3000*l.* In some of the provincial towns it was stated that the aggregate amount owing in sums under 20*l.* was not less than 100,000*l.*

The legislature have now remedied the mischief which they did by a new act, 8 & 9 Vict. c. 127, which is intituled very significantly 'An Act for the better securing the Payment of Small Debts;' and it begins by declaring, which every thinking man will allow to be true, that 'it is expedient and just to give creditors a further remedy for the recovery of debts due to them.' The sums to which the act applies are debts under 20*l.*, exclusive of costs. The powers of 7 & 8 Vict. c. 96, and of the several acts relating to insolvency, are applicable to 8 & 9 Vict. c. 127.

The act (8 & 9 Vict. c. 127) gives to creditors the means of obtaining payment of sums under 20*l.*, besides the costs of suit, by the following process:—A creditor who has obtained judgment, or order for payment of a debt not exceeding 20*l.* (exclusive of costs), may summon his debtor before a commissioner of bankruptcy; or he may summon his debtor before any court of requests or conscience, or inferior court of record for the recovery of small debts, if the judge of such court is a barrister-at-law, a special pleader, or an attorney of ten years' standing. It may here be remarked that this part of the act which takes the jurisdiction of the courts of request out of the hands of non-professional commissioners is a new provision. The judges of these courts are made removeable for misbehaviour or misconduct, and the courts will be assimilated in some degree to the bankruptcy and insolvency courts.

On the appearance of the debtor before the commissioner or court upon summons, he will be examined by the court, or by the creditor if he think fit, 'touching the manner and time of his contracting the debt, the means or prospect of payment he then had, the property or means of payment he still hath or may have, the disposal he may have made of any property since contracting such debt.' The commissioner is empowered to make an order on the debtor 'for the payment of his debt by instalment or otherwise;' and if the debtor fails to attend or to make satisfactory answer, or shall appear to have been guilty of fraud in contracting the debt, or to have wilfully contracted it without reasonable prospect of being able to pay it, or to have concealed or made away with his property in order to defeat his creditors, the commissioner or judge of the court may commit him for any time not exceeding forty days; but such imprisonment will not operate in satisfaction of the debt. Wearing apparel and bedding of a judgment debtor, and the implements of his trade, amounting in the whole to a sum not exceeding 5*l.* in value, are exempted from seizure. The powers of all inferior courts under this act are assimilated; and a suit commenced in one small debt court cannot be removed to another similar court in the same town. When a debt exceeds 10*l.* the suit may be removed by certiorari to the superior courts. Any of her Majesty's secretaries of state are empowered to alter or enlarge the jurisdiction of all small debts and inferior courts. The act itself enlarges the jurisdiction of courts of request, where sums not exceeding 2*l.* could heretofore only be recovered, and now sums not exceeding 20*l.* may be recovered in them. It is provided by the act that all suitors' money paid into court and not claimed for six years is to go into a fund for the payment of the necessary expenses of carrying on the business of the court.

The act 7 & 8 Vict. c. 70, which came into operation 1st September, 1844, and is entitled 'An Act for facilitating Arrangements between Debtors and Creditors,' is of the nature of an insolvent act. Under this act a debtor who is not subject to the bankrupt laws may apply by petition to a court of bankruptcy and obtain protection from arrest, provided his petition be signed by one-third in number and value of his creditors. The debtor's petition must set forth the cause of inability to meet his creditors, and contain a proposition for the future payment or the compromise of his debts, and a statement of his assets and debts. Any one of the commissioners of bankruptcy may examine the petitioning debtor, or any creditor who may join in the petition, or any witness produced by the debtor, in private; and if he be satisfied with the statements made, he may convene a general meeting of all the petitioner's creditors, and appoint an official assignee, registrar, or a creditor to report the proceedings. If at the first meeting the major part of the creditors in number and value, or nine-tenths in value, or nine-tenths in number of those whose debts exceed 20*l.*, shall assent to the proposition of the debtor, a second meeting is to be appointed. If at the second meeting three-fifths of the creditors present in number and value, or nine-tenths in value, or nine-tenths in number of those whose debts exceed 20*l.*, shall agree to the arrangement made at the first meeting and reduce the terms to writing, such resolution shall be binding, provided one full third of the creditors in number and value be present. Under this arrangement the affairs of the debtor may be settled. When this has been effected, a meeting of the creditors is to be held before the commissioner, who is to give the debtor a certificate, which shall operate as a certificate under the statute relating to bankrupts.

The regulations of the 7 & 8 Vict. c. 96, as to debts under 20*l.*, caused universal dissatisfaction among creditors in England and Wales, as we have already observed. The evidence taken before the Lords' Committee in 1845 proved the necessity of amending this act. The history of this piece of unwise legislation and of its correction is useful. It shows how ill-considered measures may sometimes become law in this country, in which the mass of public business is so enormous that important statutes are sometimes enacted without due deliberation. It also shows that the force of opinion, when sustained by sound reasons and directed by men of judgment, is strong enough to induce the legislature to amend their mistakes.

The law of debtor and creditor has been a difficulty in all countries. In England an insolvent debtor may, in certain cases, be subjected to the operation of the bankrupt laws. If he cannot claim the benefit of the bankrupt laws, he is subject to the law that relates to insolvent debtors. The question of arrest and imprisonment for debt has been chiefly discussed with reference to insolvent debtors, that is, the class of debtors whose debts have not been contracted in the operations of trade or commerce, or under such circumstances as to bring them within the bankrupt laws.

Formerly there were two kinds of arrest in civil cases, that which took place before trial, and was called arrest on mesne process; and that which takes place after trial and judgment, and is called arrest on final process. In the arrest on mesne process it was only necessary for the plaintiff to make an affidavit that the cause of action amounted to 20*l.* (7 & 8 Geo. IV. c. 71), upon which he could sue out a writ called a *capias*, which was directed to the sheriff, who thereupon gave his officers a warrant for seizing the alleged debtor. The statute 1 & 2 Vict. c. 110, §§ 2, 3, 4, 5, 6, enacted that no person can be arrested for alleged debt before a judgment has been obtained against him, unless it can be shown to the satisfaction of a judge of one of the superior courts that the plaintiff has a cause of action against such person to the amount of 20*l.* or upwards, and that there is probable cause to believe that the defendant is about to quit England. A defendant may also be arrested upon mesne process when be has received an unfavourable judgment in the court for the relief of insolvent debtors (1 & 2 Vict. c. 110, § 85).

Arrest in execution is therefore now the only arrest that is of any practical importance: it means the arresting of a man after a court of justice has decided that he owes a debt. The ground of arresting the man is, that he does not pay the debt pursuant to the judgment; in other words, he disobeys the command of the court, which has declared that he must pay a certain sum of money to the plaintiff.

On the subject of maintaining the law of arrest in execution there has been difference of opinion. The best arguments in favour of it that we have seen are contained in a 'Supplementary Paper on Bankruptcy and Insolvency, by William John Law, Esq. Dissentient from the Report. Presented to both Houses of Parliament, 1841.' Mr. Law did not sign the report of the other commissioners on the subject because he did not agree with them; and the Supplementary Paper contains the reasons of his dissent.

With respect to arrest in execution, Mr. Law's intimate knowledge of the relation of debtor and creditor has enabled him to answer fully all the arguments of those who attempt to show the insufficiency of this final arrest. He has proved beyond doubt the justice of this final arrest, or if the word justice be objected to, its usefulness to the community. A man is not now arrested till he has disobeyed the judgment of a court of justice. It is his business to show why he disobeyed the judgment; and in the mean time either his person must be secured, or the judgment of the court must be treated as a mere idle form. It may be said, the plaintiff can proceed to take the debtor's property: but even visible property cannot always be got at; for when the sheriff goes to seize it, 'some one on the premises holds up a bit of parchment called a bill of sale, and frightens him out again; there is not one plaintiff in five hundred, great or small, who has courage enough to indemnify the officer, and defy the fraud.' If there is this difficulty as to the taking possession of a debtor's visible property, what must be the difficulty of getting at the property of the debtor which is not visible? And what other mode can be suggested of compelling the defendant to give a true account of all his property than to imprison him until he does? 'A defendant has always been prone to place his property out of reach of an execution, but there has been this one restraint: he says to himself, "If I make my property safe, they will take me, and then I must bring it forward." When property only can be touched, the argument is changed; it becomes this: "If I make my property safe, my enemy can do nothing." So necessary is process against the person for process against the property, and so unreasonable is it to require of the creditor by record the establishment of any further case, in order to entitle him to an execution. His judgment is his case: the clearest duty lies on the other party to establish his exemption from the task of satisfying it.'

The great argument of the Report from which Mr. Law dissents is this: that all execution against the person presumes fraud. This argument is very absurd. The presumption ought to be against the debtor who does not obey the judgment of the court. He may be guilty of fraud or he may not: it is his business to explain why he disobeys the order of the court. This argument against execution is founded on the presumption being in the debtor's favour, instead of being, as it is, against him. 'The practical justice and wisdom is in subjecting all (debtors) to searching inquiry, for the purpose of ascertaining whether they are dishonest or not. I am quite sure that in that court (the Insolvent Court) where searching inquiry is known and practised, it is found necessary to be applied to every case as the means of disclosing its true character and merits.'

'Blamelessness must not be presumed: faultiness is to be presumed: it may or may not be that which is told by the word fraud; the precise shade cannot be presumed; the character and degree are to be learned through a deliberate and forced inquiry. It is misrepresentation to say that fraud is presumed and punished on presumption; the coercion which was once purely punishment is now necessary coercion to the investigation of a question in which presumption is and ought to be against the party coerced. The debtor in execution is the applicant for indulgence; he has to establish his case; but he is at liberty to institute proceedings towards this question instantly on his arrest; and not only is he at liberty to seek exemption from the consequences of the injury which he has done to the particular party who has pursued him, but to use the same opportunity for acquiring a privilege against every person in the kingdom towards whom he stands in a similar predicament: on giving to the true owners a part of their property, or on showing that there remains no part to surrender, he receives, if excuse is found for granting it, this great boon—a total freedom for the future of person and property; save that if ever he become in the full and fair sense of the words of ability to pay, there will reside in a competent tribunal the power to ascertain that ability and to exact that payment.

'It is almost unnecessary to say that these results ought not to be enjoyed without that full disclosure of the history of his property which is found in the schedule of an insolvent debtor; that full opportunity for the creditors to challenge this history; and that fair, deliberate, and effective investigation of its truth which is made in that court.'

These general arguments in favour of the justice of final execution are supported by Mr. Law with facts equally strong, which also prove the efficacy of such arrest. The mode in which he has examined the arguments in favour of abolishing arrest, which are derived from certain returns, is completely convincing. The efficacy of arrest must not be estimated 'by the extent of dividends made in the Insolvent Debtors' Court, or the proportion of unfavourable judgments;' though it must be remembered that the dividends are not none at all, as some people suppose.

It is clearly shown by Mr. Law that arrest does make people pay, who do not pay till they are arrested; it is found that the examination to which insolvents are subjected exposes a great amount of fraud; and it is also certain that the number of those who are induced to pay by the fear of arrest is considerable, just as the fear of other punishment prevents many persons from committing crimes, who have no other motive to deter them. The fear of arrest is precisely that preponderating weight which is wanted to induce those whose honesty is wavering to incline to the right side.

The arguments of Mr. Law should be read by every man who wishes to form a sound judgment on the law of insolvent debtors in England; and so much of his arguments as have here been given, may help to diffuse some juster opinions on a subject in which a sympathy with debtors, to the total forgetfulness of creditors, has led many well-meaning people to adopt conclusions that tend to unsettle all the relations of society, and to confound honest men and rogues. Some valuable observations on the laws relating to Imprisonment for Debt by Mr. Commissioner Fane are printed in the 'Banker's Magazine,' No. xix., October 1845. He concludes 1st, That the remedy given to creditors by the seizure of goods under a *fieri facias* [FIERI FACIAS, P. C.] is a delusive remedy; and 2nd, That such remedy, instead of being beneficial to the creditor, whom it is intended and supposed to assist, actually prejudices him, by enabling the debtor more effectually to cheat him under the form of law; and, therefore, so far as relates to this branch of the subject, the power which each creditor now possesses of seizing his debtor's goods under a fieri facias *for his own exclusive* benefit, is a mischievous power which ought to be abolished.

INSURANCE, MARINE. [MARINE INSURANCE, P.C.]

INTEGRATION. In the article INTEGRAL CALCULUS, P. C., the meaning of an integral was explained. The present article is devoted to the operation of integration, that is, of finding the primitive function which has a given function for its differential coefficient. Having given P a function of x required Q so that $dQ : dx$ may be P. In the article QUADRATURES, METHOD OF, P. C., is given the mode to which we must have recourse, in order to find particular values of Q, when the general methods for determining it fail. In this article we confine ourselves to what is most useful in operation, as a summary for the advanced student, not an explanation for the learner. Properly speaking, the problem requires some addition to make it definite. Thus $2x$ has x^2 for a primitive function, and also x^2+C, C being any constant quantity whatever. In the present article, we shall neglect this constant altogether, reminding the reader that he must never omit it in any application. If he should find in different books different functions given as the primitives of one and the same function, he will always find that those different primitives differ only by a constant quantity. Thus $(1-x)^{-1}$ and $x(1-x)^{-1}$ both occur as the primitive of $(1-x)^{-2}$; but they only differ by a constant, namely 1.

In the common process of integration, the actual passage from the differential coefficient to the primitive is always an act of memory. The algebraical work which occurs is always used either to reduce a form in which memory will not serve into one in which it will, or else to reduce the given differential coefficient to two terms, one of which can be integrated by memory, and the other of which is more simple than the original quantity.

The functions in which the simple remembrance of the forms of the differential calculus is of use are as follows:—

$$\int dx=x,\ \int a\,dx=ax,\ \int x^n dx=\frac{x^{n+1}}{n+1},\ \int\frac{dx}{\sqrt{x}}=2\sqrt{x},$$

$$\int\frac{dx}{x^n}=-\frac{1}{(n-1)\,x^{n-1}},\ \int\frac{dx}{x}=\log x,\ \int a^x dx=\frac{a^x}{\log a}$$

$$\int\epsilon^{ax}dx=\frac{\epsilon^{ax}}{a}$$

$$\int\sin x\,dx=-\cos x,\ \int\cos x\,dx=\sin x,\ \int\frac{dx}{\cos^2 x}=\tan x$$

$$\int\frac{dx}{\sqrt{(1-x^2)}}=\sin^{-1}x,\ \int\frac{-dx}{\sqrt{(1-x^2)}}=\cos^{-1}x,$$

$$\int\frac{dx}{1+x^2}=\tan^{-1}x$$

To these should be added the following, which may be obtained in various ways from the methods of this article, or from peculiar artifices which are found in works on the subject.

$$\int\frac{dx}{\sqrt{(a^2-x^2)}}=\sin^{-1}\frac{x}{a},\ \int\frac{-dx}{\sqrt{(a^2-x^2)}}=\cos^{-1}\frac{x}{a}$$

$$\int\frac{dx}{\sqrt{(x^2\pm a^2)}}=\log\{x\pm\sqrt{(x^2-a^2)}\}$$

$$\int\frac{dx}{a^2-x^2}=\frac{1}{2a}\log\left(\frac{a+x}{a-x}\right)\quad\int\frac{dx}{x^2-a^2}=\frac{1}{2a}\log\left(\frac{x-a}{x+a}\right)$$

$$\int\frac{dx}{x^2+a^2}=\frac{1}{a}\tan^{-1}\frac{x}{a}\quad\int\frac{dx}{(a^2\pm x^2)^{\frac{3}{2}}}=\frac{1}{a^2}\frac{x}{\sqrt{(a^2\pm x^2)}}$$

$$\int\frac{dx}{\sin x}=\log\tan\frac{x}{2}\quad\int\frac{dx}{\cos x}=\log\cot\left(\frac{\pi}{4}-\frac{x}{2}\right)$$

$$\int\tan x\,dx=-\log\cos x\quad\int\cot x\,dx=\log\sin x.$$

Among the peculiar artifices of integration may be reckoned the following, which are perhaps nearly all that can be useful to a learner:—

1. The reduction of such a form as $\int X dx$ to another form $\int V dv$, in which v is a different variable. Thus $\int(a^2+x^2)^n x\,dx$ can be immediately reduced to $\frac{1}{2}\int(a^2+x^2)^n d.(a^2+x^2)$ or $\frac{1}{2}\int v^n dv$, where v means a^2+x^2. The second form is immediately seen to be integrable. Cases of this kind are so various that the student must form the habit of looking for them, and recognising them at sight. Sometimes a slight transformation is required, thus; $(1+a\epsilon^x)^{-1}dx$, when reduced to $(\epsilon^{-x}+a)^{-1}\epsilon^{-x}dx$ clearly shows the form $-v^{-1}dv$, where v is $\epsilon^{-x}+a$.

2. The reduction of algebraical to trigonometrical functions, and the converse. Thus $(a^2-x^2)^m x^n dx$, if x be made $a\sin\theta$, becomes $a^{2m+n+1}\cos^{m+1}\theta\sin^n\theta d\theta$. Also $f(\sin\theta,\cos\theta).d\theta$, if $x=\sin\theta$, becomes $f\{x, \sqrt{(1-x^2)}\}.(1-x^2)^{-\frac{1}{2}}dx$.

3. When rational powers appear in a denominator, they

should be transferred to the numerator by changing x into $1:z$. By such a transformation, we change

$$\frac{dx}{x^m\sqrt{(a+bx+cx^2)}} \text{ into } -\frac{z^{m-1}dz}{\sqrt{(az^2+bz+c)}}.$$

4. When an irrational root of a polynomial appears in the numerator, it should generally be transferred to the denominator: thus, $\sqrt{X}\,dx$ should be written $Xdx:\sqrt{X}$. By such a transformation, we change

$$\sqrt{(a^2+x^2)}.dx \text{ into } \frac{a^2dx}{\sqrt{(a^2+x^2)}}+\frac{x^2dx}{\sqrt{(a^2+x^2)}}.$$

5. When, by the addition of more simple terms to the numerator, it can be made the differential of the prominent function of the denominator, such additions, with compensating subtractions, will frequently reduce the question of integration to a more simple one. Thus we alter

$$\frac{xdx}{\sqrt{(a+bx+cx^2)}} \text{ into } \frac{1}{2c}\,\frac{2cx+b-b}{\sqrt{(a+bx+cx^2)}}$$

$$\text{or } \frac{1}{2c}\,\frac{d(a+bx+x^2)}{\sqrt{a+bx+cx^2)}}-\frac{b}{2c}\,\frac{dx}{\sqrt{(a+bx+cx^2)}}$$

the first term of which can be integrated as in (1), leaving the second term, which can be simply integrated.

6. The process known by the name of *integration by parts*, consists in reducing the form Xdx into any convenient form Vdv, and using the obvious theorem

$$\int Vdv=Vv-\int vdV,$$

thus the finding of $\int Vdv$ is reduced to that of $\int vdV$, which it may often happen is the more simple of the two. Thus to find $\int x^m \log x dx$, we have

$$\int \log x d\frac{x^{m+1}}{m+1}=\frac{\log x.x^{m+1}}{m+1}-\int\frac{x^{m+1}}{m+1}\,\frac{dx}{x}$$

about the second term of which there is no difficulty. But it often happens that this method succeeds by a succession of reductions. Thus it gives

$$\int\epsilon^x x^6dx=x^6\epsilon^x-6\int\epsilon^x x^5dx$$

in which the second term must be again treated in the same manner.

7. In the last mode of proceeding, it is best to form, in general terms, an *equation of reduction*, as it may be called, which furnishes the key to the reduction of each case to the one below it. Thus if $\int\epsilon^{ax}x^ndx$ be considered as a function of n, and called V_n, integration by parts gives

$$V_n=a^{-1}\epsilon^{ax}x^n-na^{-1}V_{n-1},$$

thus showing how to find $\int\epsilon^{ax}x^ndx$ as soon as $\int\epsilon^{ax}x^{n-1}dx$ is known.

8. The use of the equation of reduction depends upon our being able at last to reduce the question to that of finding a visibly known integral. Thus, if in the preceding n be an integer, we must at last come to $\int\epsilon^{ax}x^0dx$, or $\int\epsilon^{ax}dx$, which is known. But if n were a fraction, no reduction of the value of n by units at a time would lead to an integrable form.

9. The integrable form at which we arrive by successive reductions is called the *ultimate form*. It frequently happens however that the reductions proceed by two or more steps at a time, in which case two or more ultimate forms result. For instance $V_n=\int(a^2-x^2)^{-\frac{1}{2}}x^ndx$ has for its equation of reduction

$$V_n=-\frac{x^{n-1}\sqrt{(a^2-x^2)}}{n}+\frac{n-1}{n}a^2V_{n-2}$$

Accordingly, when n is even, we are brought at last to V_0, and when n is odd, to V_1, or to $\sin^{-1}(x:a)$ and $-\sqrt{(a^2-x^2)}$.

10. In using equations of reduction, it will be found more convenient to work upwards from the ultimate form to the case required, than in the contrary way. Thus if we want $V_4=\int\epsilon^xx^4dx$, the equation of reduction being

$$V_n=x^n\epsilon^x-nV_{n-1},$$

We should proceed as follows:—

$$V_0=\epsilon^x,\quad V_1=x\epsilon^x-\epsilon^x$$

$$V_2=x^2\epsilon^x-2(x\epsilon^x-\epsilon^x)=x^2\epsilon^x-2x\epsilon^x+2\epsilon^x$$

$$V_3=x^3\epsilon^x-3x^2\epsilon^x+6x\epsilon^x-6\epsilon^x$$

$$V_4=x^4\epsilon^x-4x^3\epsilon^x+12x^2\epsilon^x-24x\epsilon^x+24\epsilon^x.$$

11. There are several cases in which the following extension of the theorem known by the name of John Bernoulli may be useful. Let u', u'', &c. be the successive differential coefficients of u with respect to x, and let v_1, v_2, v_3, &c. be the successive integrals of v with respect to x: then

$$\int udv=uv-u'v_1+u''v_2-u'''v_3+\ldots\pm u^{(n)}v_n\mp\int u^{(n+1)}v_ndv.$$

This is particularly useful when u is a rational and integral function, and v is successively integrable with ease, as when u is ϵ^{ax}, sin ax, or cos ax. The process can then be continued until the remainder vanishes.

12. In the case of $\phi xdx:\psi x$, where ϕx and ψx are rational and integral functions, the integration is always possible as soon as all the roots of $\psi x=0$ are found. The process in FRACTIONS, DECOMPOSITION OF, P. C. S., must be applied. When this is done, and the function thereby reduced to the sum of terms of the form $A(x-a)^{-n}dx$, the integration gives no trouble.

13. In the case of a pair of irrational roots, $\alpha\pm\beta\sqrt{-1}$, each occurring once, the sum of the terms which they produce can be reduced to the form

$$\int(Ax+B)dx:\{(x-\alpha)^2+\beta^2\}$$

the integral of which is

$$\frac{A}{2}\log\{(x-\alpha)^2+\beta^2\}+\frac{B+A\alpha}{\beta}\tan^{-1}\frac{x-\alpha}{\beta}$$

14. When ϕxdx is a function of powers of any one case of $ax+b$, it can, if irrational, be reduced to a rational function by assuming $ax+b=v^m$, where m is the least common multiple of all the denominators in the exponents. For dx becomes $mv^{m-1}dv:a$, and every power of $ax+b$ becomes an integer power of v.

15. The function $x^m(ax+b)^ndx$ can be integrated when either m or n is a positive integer: when n is integer, by simple expansion; when m is integer, but not n, by making $ax+b=v$, and substituting. But when both m and n are negative integers, let $x=1:y$ and after substitution, make $a+by=w$, and substitute for y.

16. The function $\phi xdx:(x^n\pm a^n)$ can be easily integrated by decomposition of fractions, the denominator never having equal roots. The same may be said if we substitute $x^{2n}\pm 2ba^nx^n+a^n$ in the denominator.

17. In $x^r(a+bx^s)^tdx$ we have an integrable function, whenever either of the following is a positive integer:—

$$\frac{r+1}{s},\text{ or}-\frac{r+1}{s}-t$$

The substitutions which succeed in the two cases are

$$a+bx^s=v^\delta,\text{ and } ax^{-s}+b=v^\delta$$

δ being the denominator of t.

18. The following transformation involves a large number of obvious cases, and is constantly occurring. If $\int\phi xdx=\psi x$, then $\int\phi(ax+b)dx=\psi(ax+b):a$.

Thus in no list would $\int\cos(ax+b)dx$ be set down, after $\int\cos x\,dx$ has been given.

19. The following integrals are worth giving separately as ultimate forms:—

$$\int\frac{dx}{x\sqrt{(x^2-a^2)}}=\frac{1}{a}\cos^{-1}\frac{a}{x},$$

$$\int\frac{dx}{x\sqrt{(a^2\pm x^2)}}=\frac{1}{a}\log\frac{x}{a+\sqrt{(a^2\pm x^2)}}$$

$$\int\frac{dx}{\sqrt{(2ax-x^2)}}=\cos^{-1}\frac{a-x}{a}=\text{vers}^{-1}\frac{x}{a}$$

$$\int\frac{dx}{\sqrt{(2ax+x^2)}}=\log\{x+a+\sqrt{(2ax+x^2)}\}$$

$$\int\frac{dx}{a+bx+cx^2}=2\int\frac{d(2cx+b)}{(2cx+b)^2+4ac-b^2}$$

which comes under one or another of three previously given forms, according as b^2-4ac is positive, nothing, or negative.

$$\int\frac{xdx}{a+bx+cx^2}=\frac{1}{2c}\log(a+bx+cx^2)-\frac{b}{2c}\int\frac{dx}{a+bx+cx^2}$$

$$\int\frac{dx}{\sqrt{(a+bx+cx^2)}}=\frac{1}{\sqrt{c}}\log\left\{2cx+b+\sqrt{\{4c(a+bx+cx^2)\}}\right\}$$

$$\int \frac{dx}{\sqrt{(a+bx-cx^2)}} = \frac{1}{\sqrt{c}} \sin^{-1} \frac{2cx-b}{\sqrt{(4ac+b^2)}}$$

$$\int \sqrt{a^2+x^2}\, dx = \frac{1}{2}x\sqrt{a^2+x^2} + \frac{a^2}{2} \log (x+\sqrt{a^2+x^2})$$

$$\int \sqrt{a^2-x^2}\, dx = \frac{1}{2}x\sqrt{a^2-x^2} + \frac{a^2}{2} \sin^{-1} \frac{x}{a}.$$

Let $X=(a+bx+cx^2)$. Then

$$\int \sqrt{X}\,.\,dx = \frac{2cx+b}{4c}\,.\,\sqrt{X} + \frac{4ac-b^2}{8c}\int\frac{dx}{\sqrt{X}}$$

$$\int \sqrt{X}\,.\,xdx = \frac{1}{3c}X^{\frac{3}{2}} - \frac{b}{2c}\int\sqrt{X}\,.\,dx$$

$$\int \frac{xdx}{\sqrt{X}} = \frac{\sqrt{X}}{c} - \frac{b}{2c}\int\frac{dx}{\sqrt{X}}$$

$$\int \frac{dx}{x\sqrt{X}} = \frac{1}{\sqrt{a}} \log \frac{2a+bx-2\sqrt{(aX)}}{x}$$

$$= \frac{1}{\sqrt{-a}} \sin^{-1} \frac{bx+2a}{x\sqrt{(b^2-4ac)}}$$

$$\int X^{-\frac{3}{2}}dx = \frac{2(2cx+b)}{4ac-b^2}X^{-\frac{1}{2}}$$

$$\text{Let} \int \frac{dx}{a+b\cos x} = \frac{1}{\sqrt{(a^2-b^2)}} \cos^{-1} \frac{b+a\cos x}{a+b\cos x}$$

$$= \frac{1}{\sqrt{(b^2-a^2)}} \log\left\{\frac{b+a\cos x+\sqrt{(b^2-a^2)}\,.\sin x}{a+b\cos x}\right\}.$$

20. All that it remains to give are the equations of reduction for remarkable cases. Many other differentials can be integrated in a finite form: but it is impossible to give a list of all which are sometimes useful. The transformation of unknown to known forms is one of the most necessary studies of the young mathematician.

21. Let $V_{m,n}=\int(\log x)^m x^n dx$. Then

$$V_{m,n}=(\log x)^m \frac{x^{n+1}}{n+1} - \frac{m}{n+1}V_{m-1,n}.$$

22. Let P stand for Ax^a+Bx^b, (m, n) for $\int x^m P^n dx$, g and h for $m+1+na$ and $m+1+nb$, and c for $a-b$. We shall then have

$$h(m, n)+ncA(m+a, n-1)=x^{m+1}P^n$$

$$g(m, n)-ncB(m+b, n-1)=x^{m+1}P^n$$

$$gA(m, n)+(h-c)B(m-c, n)=x^{m-a+1}P^{n+1}$$

$$hB(m, n)+(g+c)A(m+c, n)=x^{m-b+1}P^{n+1}$$

from the first pair of which formulæ of reduction can be found for n, be it positive or negative, and for m from the second pair. The most useful cases are those in which $a=0$, $b=1$, and in which $a=0$, $b=2$.

23. Let $V_n=\int(x^2\pm a^2)^{-n}dx$. Then

$$V_n=\pm\frac{x(x^2\pm a^2)^{-(n-1)}}{(2n-2)a^2}\pm\frac{2n-3}{(2n-2)a^2}V_{n-1}.$$

24. Let $V_n=\int(x^2\pm a^2)^n dx$. Then

$$V_n=\frac{x(x^2\pm a^2)^n}{2n+1}\pm\frac{2na^2}{2n+1}V_{n-1}.$$

25. Let $V_n=\int(a^2-x^2)^{-n}dx$ or $\int(a^2-x^2)^n dx$. The equations of reduction are those in (23.) (using the $+$ in $\pm$) and in (24), and writing a^2-x^2 for $x^2\pm a^2$.

26. Let $V_{m,n}=\int x^m(a^2\pm x^2)^{-n}dx$. Then

$$V_{m,n}=\mp\frac{x^{m-1}}{2(n-1)}\,\frac{1}{(a^2\pm x^2)^{n-1}}\pm\frac{m-1}{2(n-1)}V_{m-2,n-1}$$

$$V_{m,n}=\frac{x^{m+1}}{2(n-1)a^2}\,\frac{1}{(a^2\pm x^2)^{n-1}}-\frac{m+3-2n}{2(n-1)a^2}V_{m,n-1}$$

$$V_{m,n}=\pm\frac{x^{m-1}}{m+1-2n}\,\frac{1}{(a^2\pm x^2)^{n-1}}\mp\frac{m-1}{m+1-2n}a^2V_{m-2,n}.$$

27. Let $V_m=\int x^m(a^2\pm x^2)^{-\frac{1}{2}}$. Then

$$V_m=\pm\frac{x^{m-1}(a^2\pm x^2)^{\frac{1}{2}}}{m}\mp\frac{m-1}{m}a^2V_{m-2}.$$

28. Instead of giving a large number of forms which are all derivable from (22.), it will be better to give an instance of the derivation in full. Let the case be $\int x^{-m}(2ax-x^2)^n dx$, and let the formula be required to reduce both m and n in numerical magnitude. Here, to transform the formulæ in (22.)

For m write $-m$; retain n.
For A write $2a$; for B, -1.
For a write 1; for b, 2.
For g, $-m+1+n$; for h, $-m+1+2n$.
For c write -1.

The first formula connects $(-m, n)$ and $(-\overline{m-1}, n-1)$, the second, $(-m, n)$ and $(-\overline{m-2}\ n-1)$; the third, $(-m, n)$ and $(-\overline{m-1}, n)$; the fourth, $(-m, n)$ and $(-\overline{m+1}, n)$. By either of the first two we can therefore reduce both; by either of the last two we can reduce m only. Observe that whenever a formula will serve to raise either exponent it will also serve to reduce it. Thus, if a formula were

$$V_m=\phi(m, x)+\psi m\,.\,V_{m+1}$$

write $m-1$ for m and we have, by transformation,

$$V_m=-\frac{\phi(m-1, x)}{\psi(m-1)}+\frac{1}{\psi(m-1)}V_{m-1}$$

The two first formulæ become (P being $2ax-x^2$)

$$(2n-m+1)\,(-m, n)\,-2an\,(-\overline{m-1}, n-1)=x^{-m+1}P^n$$

$$(n-m+1)\,(-m, n)\,-n\,(-\overline{m-2}, n-1)=x^{-m+1}P^n$$

from which, writing $V_{m,n}$ for $(-m, n)$ or $\int x^{-m}P^n dx$, we have

$$V_{m,n}=\frac{1}{2n-m+1}\,\frac{(2ax-x^2)^n}{x^{m-1}}+\frac{2na}{2n-m+1}V_{m-1,n-1}$$

$$V_{m,n}=\frac{1}{n-m+1}\,\frac{(2ax-x^2)^n}{x^{m-1}}+\frac{n}{n-m+1}V_{m-2,n-1}.$$

If it were required to reduce n in the preceding without altering m, throw the formula $x^{-m}(2ax-x^2)^n$, into the form $x^{n-m}(2a-x)^n$ and use the first of the four formulæ.

29. All the preceding forms involving x^mP^n, are particularly in use when n is a fraction, positive or negative, with the denominator 2. These in fact form the most usual cases. Formulæ involving the powers of $A+Bx+Cx^2$ are so little wanted, that they are better omitted in a work in which space is of importance.

30. Let s and c stand for $\sin\theta$ and $\cos\theta$. The integral $\int s^m c^n d\theta$, m and n being positive integers, can be immediately found if $s^m c^n$ be reduced to the sum of terms of the form $A\cos k\theta$ or $A\sin k\theta$. But this process is as laborious as that of integration, and is seldom used except when there is some particular reason for exhibiting the result in the form of simple sines and cosines.

31. The following equations of reduction are those which are most commonly used:—

$$\int s^m d\theta=-\frac{cs^{m-1}}{m}+\frac{m-1}{m}\int s^{m-2}d\theta$$

$$\int c^n d\theta=\frac{sc^{n-1}}{n}+\frac{n-1}{n}\int c^{n-2}d\theta$$

$$\int\frac{d\theta}{s^m}=-\frac{c}{(m-1)s^{m-1}}+\frac{m-2}{m-1}\int\frac{d\theta}{s^{m-2}}$$

$$\int\frac{d\theta}{c^n}=\frac{s}{(n-1)c^{n-1}}+\frac{n-2}{n-1}\int\frac{d\theta}{c^{n-2}}$$

$$\int s^m c^n d\theta=\frac{s^{m+1}c^{n-1}}{m+n}+\frac{n-1}{m+n}\int s^m c^{n-2}d\theta$$

$$=-\frac{s^{m-1}c^{n+1}}{m+n}+\frac{m-1}{m+n}\int s^{m-2}c^n d\theta$$

$$\int\frac{c^n d\theta}{s^m}=-\frac{c^{n-1}}{(m-1)s^{m-1}}-\frac{n-1}{m-1}\int\frac{c^{n-2}d\theta}{s^{m-2}}$$

$$\int\frac{s^m d\theta}{c^n}=\frac{s^{m-1}}{(n-1)c^{n-1}}-\frac{m-1}{n-1}\int\frac{s^{m-2}d\theta}{c^{n-2}}$$

$$\int\frac{d\theta}{s^m c^n}=-\frac{1}{(n-1)s^{m-1}c^{n-1}}+\frac{m+n-2}{n-1}\int\frac{d\theta}{s^m c^{n-2}}$$

$$=\frac{1}{(m-1)s^{m-1}c^{n-1}}+\frac{m+n-2}{m-1}\int\frac{d\theta}{s^{m-2}c^{n}}$$

$$\int\frac{c^{n}d\theta}{s^{m}}=\frac{c^{n-1}}{(n-m)s^{m-1}}+\frac{n-1}{n-m}\int\frac{c^{n-2}d\theta}{s^{m}}$$

$$=-\frac{c^{n+1}}{(m-1)s^{m-1}}-\frac{n-m+2}{m-1}\int\frac{c^{n}d\theta}{s^{m-2}}$$

$$\int\frac{s^{m}d\theta}{c^{n}}=-\frac{s^{m-1}}{(m-n)c^{n-1}}+\frac{m-1}{m-n}\int\frac{s^{m-2}d\theta}{c^{n}}$$

$$=\frac{s^{m+1}}{(n-1)c^{n-1}}-\frac{m-n+2}{n-1}\int\frac{s^{m}d\theta}{c^{n-2}}$$

$$\int\tan^{n}\theta\,d\theta=\frac{\tan^{n-1}\theta}{n-1}-\int\tan^{n-2}\theta\,d\theta.$$

32. We have given the last steps in various forms, because in fact all the integrals of the form $\int x^{m}(a^{2}-x^{2})^{n}dx$ depend upon them. For if $x=a\sin\theta$, the last integral becomes $-a^{m+2n+1}\int\sin^{-m}\theta\cos^{2n+1}\theta\,d\theta$.

We have now given most of the forms which will be useful in an ordinary work of reference. Further forms and examples will be found in many works on the integral calculus, but the largest collection is in Meier Hirsch's 'Integraltafeln,' Berlin, 1810, 4to., a work of which there is also an English edition.

We have omitted notice of a great many such forms as $\int x^{n}\varepsilon^{ax}dx$, $\int x^{n}\varepsilon^{ax}\cos nx\,dx$, &c. which are little used, except in particular cases. When $\phi x\,.\,\varepsilon^{ax}dx$ can be integrated, it follows that $\phi x\,.\,\varepsilon^{ax}\cos bx\,dx$, &c. can also be integrated, since the second can be made into the sum or difference of two functions of the first form, by putting for $\cos bx$ or $\sin bx$ their exponential values.

The question of the possibility of integration in finite terms can often be settled by the following theorem:—Integration and differentiation, with respect to different variables, are convertible operations; thus

$$\frac{d\int u\,dx}{dy}=\int\frac{du}{dy}dx$$

If therefore $\int u\,dx$ can be found, so also can $\int(du:dy)dx$, if y be not a function of x. From this it will be seen that whenever $\phi x\varepsilon^{ax}dx$ can be integrated so can $\phi x\varepsilon^{ax}x^{n}dx$, which is obtained by n differentiations with respect to a: and also that whenever $\phi x\,.\,x^{n}dx$ can be integrated, so can $\phi x x^{n}(\log x)^{m}dx$, which is obtained by m differentiations with respect to n.

Functions involving the transcendental forms $\sin^{-1}\phi x$, &c. can sometimes be reduced to more algebraical forms by integration by parts. Thus,

$$\int V\sin^{-1}X\,.\,dx=\sin^{-1}X\,.\int V dx-\int\frac{X'\int V dx}{\sqrt{(1-X^{2})}}dx$$

$$\int V\log X dx=\log X\,.\int V dx-\int\frac{X'\int V dx}{X}dx\text{ \&c.}$$

in which X' means $dX:dx$.

INTEGRATION, DEFINITE. In the preceding article we have given some idea of the usual modes of integration. The results, which in the present article are given under the name of *definite integrals*, are mostly cases in which it is possible to find an integral when both limits are given [INTEGRAL CALCULUS, P. C.]; but not possible to find the integral in all cases. If we can integrate $\phi x dx$ generally, that is, if we can find the function $\phi_{1}x$, of which ϕx is the differential coefficient, we can always express the integral, the limit of the summation in the article just referred to, as follows:—

$$\int_{a}^{b}\phi x dx=\phi_{1}b-\phi_{1}a$$

but it frequently happens that ϕx is a function for which this cannot be done in a finite form, except for certain values of a and b. And it happens almost as frequently that these practicable values are of particular importance.

But the view of definite integrals which best shows their utility is the consideration of them as fundamental modes of expression. The ordinary symbols of algebra, it is well known, are incompetent to express in finite terms by far the greater number of integrals. Consequently the integrals themselves become modes of expression, and frequently the only ones. When we find a language with which we have much to do, and which has words which cannot be translated, we adopt the words of that language into our own. Precisely the same thing is done in the case of definite integrals. Thus in FACTORIALS, P. C. S., we adopt the integral $\int_{0}^{\infty}\varepsilon^{-x}x^{n}dx$, as the fundamental mode of expression for a function till then inexpressible, which becomes $1.2.3\ldots n$ whenever n is an integer, and remains intelligible, though not very easily found, when n is a fraction.

Further to illustrate this, let us suppose that the integral calculus had made some progress before the conception of a logarithm had been formed: a thing which might easily have happened. It would then have been found that $\int x^{-1}dx$ was wholly unattainable, a function which algebra could not express in finite terms. It would therefore itself have become a mode of expression, and it would soon have been proved that

$$\int_{1}^{a}\frac{dx}{x}+\int_{1}^{b}\frac{dx}{x}=\int_{1}^{ab}\frac{dx}{x}.$$

Here then would have been an obvious indication of the existence of a function proper to be made use of in performing multiplication by means of addition, &c.; and tables of the values of $\int_{1}^{a}x^{-1}dx$ would have been formed by the method of quadratures [QUADRATURES, P. C.] or otherwise; which would, so it happens, have been a much easier task than that which fell on the first calculators of logarithms. For all this however it happens that we are prepared by knowing logarithms and their properties; so that $\int x^{-1}dx$ is seen to be $\log.x+C$, and $\int_{1}^{a}x^{-1}dx$ to be $\log a$: the logarithms throughout this article being Naperian. But we are not equally ready for $\int\varepsilon^{-t^{2}}dt$, or for $\int\varepsilon^{-x}x^{n}dx$ (except when n is integer) or for $\int\cos x^{n}dx$: and accordingly we are obliged to study the properties of these functions as fundamental modes of expression.

To give some idea of the use of this view, we exhibit a mode of solving the following partial differential equation,

$$\frac{du}{dt}=a\frac{d^{2}u}{dx^{2}},$$

the general solution of which cannot be expressed in finite terms. It will easily be seen that $C\varepsilon^{\mu t+\nu x}$ is a solution for any value of C and ν, provided only that $\mu=a\nu^{2}$, and also that the sum of any number of such terms is a solution. Hence we assume an indefinite number of such terms, giving to C the form $\phi\nu.d\nu$, and summing them with such values of ν as will make the whole represent

$$\int_{p}^{q}\phi\nu\,.\,\varepsilon^{\nu x+a\nu^{2}t}d_{\nu}:$$

and we then see that this integral is a solution or general value of u, whatever the function $\phi\nu$ may be, and whatever may be the values of p and q. By a reduction which is rendered easy by some of the results presently mentioned, this solution is thrown into the form

$$u=\int_{-\infty}^{+\infty}\psi\left(x+2v\sqrt{at}\right)\varepsilon^{-v^{2}}dv.$$

where ψ may be the symbol of any function. From this it is clear that the given differential equation has numberless solutions which ordinary symbols are incapable of expressing in finite terms. The treatise in the Library of Useful Knowledge on the Differential Calculus, Gregory's 'Examples of the Differential Calculus,' and the 'Cambridge Mathematical Journal,' contain various examples of this mode of expression applied to differential equations.

We now proceed to give a selection from the enormous number of definite integrals which has been given. They have been found by detached methods, so that we could not attempt to give anything more than the results. Our article is intended for reference to the forms which it is probable will be noted in future elementary works, and which the mathematical reader may also wish to refer to. In order to avoid risk of broken or dropped letters, in an article in which the correct printing of the limits is of the utmost importance, we shall print what is usually denoted by $\int_{a}^{b}\phi x dx$ in the following way, $\int\phi x dx\,[a,b]$. Any conditions as to the values of constants will be expressed before the integral.

It need hardly be said that the article FACTORIALS, P. C. S., must be considered as a part of the present one.

Among the integrals which clearly depend on, or are connected with, factorials, are the following:—

$$(m+1<n)\int\frac{x^m dx}{1+x^n}[0,\infty]=\frac{\pi}{n\sin\left(\frac{m+1}{n}\pi\right)}.$$

$$(m+1<n)\int\frac{x^m dx}{(1+x)^n}[0,\infty]=\frac{\Gamma(m+1)\Gamma(n-m-1)}{\Gamma n}$$

$$(m \text{ and } n \text{ positive})\int x^{m-1}(1-x)^{n-1}dx\,[0,1]=\frac{\Gamma m.\Gamma n}{\Gamma(m+n)}$$

$$\int\frac{x^{m-1}(1-x)^{n-1}}{(x+a)^{m+n}}dx\,[0,1]=\frac{\Gamma m.\Gamma n}{a^n(1+a)^m\Gamma(m+n)}$$

$$(n \text{ positive})\int(-\log x)^{n-1}dx\,[0,1]=\Gamma n$$

$$(m \text{ and } n \text{ positive})\int x^{m-1}(-\log x)^{n-1}dx\,[0,1]=m^{-n}\Gamma n$$

$$(a \text{ and } n \text{ positive})\int x^{n-1}\varepsilon^{-ax}dx\,[0,\infty]=a^{-n}\Gamma n$$

$$(n \text{ positive})\int\varepsilon^{-x^n}dx\,[0,\infty]=\frac{1}{n}\Gamma\frac{1}{n}$$

$$\int\varepsilon^{-x^2}dx\,[0,\infty]=\tfrac{1}{2}\sqrt{\pi}.$$

Tables of the value of $(2:\sqrt{\pi})\int\varepsilon^{-x^2}dx\,[0,a]$, which are of great importance in the theory of probabilities, are given in modern works on that subject. The following expression by means of a continued fraction is useful. Let $q=1:2a^2$, then

$$\int\varepsilon^{-x^2}dx\;[a,\infty]=\frac{\varepsilon^{-a^2}}{2a}\;\frac{1}{1+}\;\frac{q}{1+}\;\frac{2q}{1+}\;\frac{3q}{1+}\;\frac{4q}{1+\&c.}$$

$$(n>-1)\int\frac{1-x^n}{1-x}dx\,[0,1]=\gamma+\frac{d\log\Gamma(1+n)}{dn};$$

γ being as in FACTORIALS, P. C. S.

One of Euler's integrals, generally called the second Eulerian integral, the factorial integral being the first, he denoted by the symbol

$$\left(\frac{n}{m}\right);\text{ it is}\int x^{n-1}(1-x^k)^{\frac{m}{k}-1}dx\,[0,1],$$

and it is included in those already given.

There is a class of multiple integrals closely connected with factorials, which may be made to save much trouble in applications to geometry. We shall take three variables as a specimen, but the same formulæ may be written with any number. The triple integration being made for all positive values which give $x+y+z$ not exceeding l, we have (a, b, c, being positive)

$$\int x^{a-1}y^{b-1}z^{c-1}dxdydz=\frac{\Gamma a.\Gamma b.\Gamma c}{\Gamma(a+b+c+1)}l^{a+b+c}$$

$$\int x^{a-1}y^{b-1}z^{c-1}f(x+y+z)\,dxdydz$$

$$=\frac{\Gamma a.\Gamma b.\Gamma c}{\Gamma(a+b+c)}\int x^{a+b+c-1}fxdx\,[0,l]$$

Similarly, the condition being that

$$\left(\frac{x}{\mathrm{P}}\right)^p+\left(\frac{y}{\mathrm{Q}}\right)^q+\left(\frac{z}{\mathrm{R}}\right)^r$$

shall not exceed l, wo have

$$\int x^{a-1}y^{b-1}z^{c-1}f\left\{\left(\frac{x}{\mathrm{P}}\right)^p+\left(\frac{y}{\mathrm{Q}}\right)^q+\left(\frac{z}{\mathrm{R}}\right)^r\right\}dxdydz$$

$$=\frac{\mathrm{P}^a\mathrm{Q}^b\mathrm{C}^r}{pqr}\;\frac{\Gamma\frac{a}{p}.\Gamma\frac{b}{q}\Gamma\frac{c}{r}}{\Gamma\left(\frac{a}{p}+\frac{b}{q}+\frac{c}{r}\right)}\int x^{\frac{a}{p}+\frac{b}{q}+\frac{c}{r}-1}fxdx\,[0,l]$$

We shall now give some specimens of the results of functions involving trigonometrical quantities. One of the most important of this class is the following:—

$$\int x^{-1}\sin bx\,dx\,[0,\infty]=\pm\tfrac{1}{2}\pi$$

according as b is positive or negative.

$$(a\text{ pos.})\int\frac{\cos ax\,dx}{1+x^2}[0,\infty]=\int\frac{\sin ax.xdx}{1+x^2}[0,\infty]=\frac{\pi}{2}\varepsilon^{-a}$$

$$\int\varepsilon^{-ax}\cos bxdx\,[0,\infty]=a:(a^2+b^2)$$

$$\int\varepsilon^{-ax}\sin bxdx\,[0,\infty]=b:(a^2+b^2):$$

from these come

$$\int\cos bxdx\,[0,\infty]=0,\ \int\sin bxdx\,[0,\infty]=1;$$

and from these come two equations which have been much used, long before they were openly expressed,

$$\sin\infty=0,\ \cos\infty=0.$$

Some difference of opinion exists abont these equations, which in fact involve a great deal of what has been done by mathematicians* in the last twenty years.

When a and n are both positive

$$\int\varepsilon^{-ax}\cos bx.x^{n-1}dx\,[0,\infty]=\frac{\Gamma n.\cos\{n\tan^{-1}(b:a)\}}{(a^2+b^2)^{\frac{n}{2}}}$$

$$\int\varepsilon^{-ax}\sin bx.x^{n-1}dx\,[0,\infty]=\frac{\Gamma n.\sin\{n\tan^{-1}(b:a)\}}{(a^2+b^2)^{\frac{n}{2}}}$$

$$\int\cos x^m.x^n dx\,[0,\infty]=\frac{1}{m}\Gamma\left(\frac{n+1}{m}\right)\cos\left(\frac{n+1}{2m}\pi\right)$$

$$\int\sin x^m.x^n dx\,[0,\infty]=\frac{1}{m}\Gamma\left(\frac{n+1}{m}\right)\sin\left(\frac{n+1}{2m}\pi\right)$$

$$a<b\int\frac{\sin ax}{\sin bx}\;\frac{dx}{1+x^2}[0,\infty]=\frac{\pi}{2}\;\frac{\varepsilon^a-\varepsilon^{-a}}{\varepsilon^b-\varepsilon^{-b}}.$$

But when $a=2mb\pm c$, m being an integer, the preceding integral is

$$\frac{\pi}{2}\;\frac{\varepsilon^c+\varepsilon^{-c}-2\varepsilon^{-a}}{\varepsilon^b-\varepsilon^{-b}}.$$

This is a specimen of a sort of discontinuity which very frequently occurs, and from not attending to which mistakes have often arisen.

If we call $\frac{1}{2}(\varepsilon^x+\varepsilon^{-x})$ and $\frac{1}{2}(\varepsilon^x-\varepsilon^{-x})$ the *hyperbolic* cosine and sine of x, and denote them by h. cos x and h. sin x, we have, the limits being 0 and ∞, and a being less than π,

$$\int\frac{\text{h. sin }ax}{\text{h. sin }\pi x}\cos cx\,dx=\frac{1}{2}\;\frac{\sin a}{\cos a+\text{h. cos }c}$$

$$\int\frac{\text{h. cos }ax}{\text{h. cos }\pi x}\cos cx\,dx=\frac{\cos\frac{1}{2}a.\text{h. cos }\frac{1}{2}c}{\cos a+\text{h. cos }c}$$

$$\int\frac{\text{h. cos }ax}{\text{h. sin }\pi x}\sin cx\,dx=\frac{1}{2}\;\frac{\text{h. sin }c}{\cos a+\text{h. cos }c}$$

$$\int\frac{\text{h. sin }ax}{\text{h. cos }\pi x}\sin cx\,dx=\frac{\sin\frac{1}{2}a.\text{h. sin }\frac{1}{2}c}{\cos a+\text{h. cos }c}$$

$$\int\frac{\sin cxdx}{\varepsilon^{2\pi x}-1}[0,\infty]=\frac{1}{4}\;\frac{\varepsilon^c+1}{\varepsilon^c-1}-\frac{1}{2c}.$$

The integral $4n\int\frac{t^{2n-1}dt}{\varepsilon^{2\pi t}-1}[0,\infty]$ is the nth number of Bernoulli [NUMBERS OF BERNOULLI, P. C.], meaning that opposite to which $2n-1$ is written in the article cited.

As specimens of the reduction of definite integrals, the integrals

$$\int\frac{\varepsilon^{-a^2t^2}\cos axt\,dt}{1+t^2}[0,\infty]\text{ and }\int\frac{\varepsilon^{-a^2t^2}\sin axt\,tdt}{1+t^2}[0,\infty],$$

are severally equal to

$$\frac{\sqrt{\pi}.\varepsilon^{a^2}}{2}\left\{\varepsilon^{-ax}\int\varepsilon^{-t^2}dt\;[-\infty,\tfrac{1}{2}x-a]\right.$$

$$\left.\pm\varepsilon^{ax}\int\varepsilon^{-t^2}dt\;[\tfrac{1}{2}x+a,\infty]\right\}$$

the first having +, the second −. Also

$$\int\frac{\varepsilon^{-a^2t^2}dt}{1+t^2}[0,\infty]=\sqrt{\pi}.\varepsilon^{a^2}\int\varepsilon^{-t^2}dt\,[a,\infty].$$

The following is fundamentally important,

$$\int\varepsilon^{-a^2x^2}\cos bxdx\,[0,\infty]=\frac{\sqrt{\pi}}{2a}\varepsilon^{-\frac{b^2}{4a^2}}$$

* With regard to these equations, it must be observed that they are not to have their algebraical consequences; thus, $\sin^2\infty$ is not 0, but $\frac{1}{2}$. The truth seems to be, as far as yet appears, that any function ϕx, which becomes indefinite in form, by the angle x becoming infinite, is properly represented by $\int\phi xdx\,[0,2\pi]$.

The integral $\int \frac{dx}{\log x}[0, a]$ has been tabulated [Diff. Calc., L. U. K., p. 662] by Soldner, and a great many integrals may be found from it. Soldner proposes to call it the *Logarithm-integral* of a, and to denote it by the abbreviation li. a. Adopting this notation, we have then, both in definite and indefinite forms,

$$\int \frac{x^m dx}{\log x} = \text{li. } x^{m+1} \qquad \int \frac{\epsilon^{\pm x} dx}{x} = \text{li. } \epsilon^{\pm x}$$

$$\int \frac{dx}{\log (a+bx)} = \frac{1}{b} \text{ li. } (a+bx) \qquad \int \epsilon^{\epsilon^x} dx = \text{li. } \epsilon^{\epsilon^x}$$

and so on.

Of miscellaneous integrals there is an immense number, of which we give a few instances:

$$\int \frac{(1-v^m)(1-v^n)\,dv}{(1-v)\log v}[0, 1] = \log \frac{\Gamma(1+m)\,\Gamma(1+n)}{\Gamma(1+m+n)}$$

$$(a \text{ pos.}) \int \frac{x \tan x\, dx}{a^2+x^2}[0, \infty] = \frac{\pi}{\epsilon^{2a}+1}$$

$$(a \text{ pos.}) \int \frac{x \cot x\, dx}{a^2+x^2}[0, \infty] = \frac{\pi}{\epsilon^{2a}-1}$$

$$(a \text{ pos.}) \int \epsilon^{-ax} \sin bx . x^{-1} dx\, [0, \infty] = \tan^{-1}(b : a)$$

$$\int \frac{\epsilon^{-ax} \cos bx - \epsilon^{-\alpha x} \cos \beta x}{x} dx\, [0, \infty] = \frac{1}{2} \log \frac{\alpha^2+\beta^2}{a^2+b^2}$$

if neither a nor α be negative.

$$\int \epsilon^{-x^2-\frac{a^2}{x^2}} dx\, [0, \infty] = \frac{1}{2} \sqrt{\pi}\, \epsilon^{-2a}$$

$$\int \frac{x \sin x\, dx}{1-2a \cos x+a^2}[0, \pi] = \frac{\pi}{a} \log (1+a) \text{ or } \frac{\pi}{a} \log \left(1+\frac{1}{a}\right)$$

according as a is less or greater than unity.

Among the means of producing or using definite integrals which are comprehensive enough to deserve the name of methods, there are four which particularly deserve the attention of elementary writers.

The first is Laplace's mode of finding the approximate value of a definite integral in which large constant exponents occur. Let ϕx be a function of x, such as $\epsilon^{-x}x^n$ or $x^n(1-x)^m$, &c., in which n, m, &c. are considerable exponents. Let this function vanish when $x = a$ and $x = b$, and, continuing positive and finite throughout the interval, let it come to its maximum Y, when $x = \text{X}$. Let v_2 mean the value of the second differential coefficient of $\log \phi x$, when $x = \text{X}$, and assume $\phi x = \text{Y}\epsilon^{-t^2}$. Then

$$\int \phi x\, dx = \text{Y} \sqrt{\left(-\frac{2}{v_2}\right)} \int \epsilon^{-t^2} dt \text{ nearly,}$$

provided that the limiting values of t on the second side are those which, in the equation $\phi x = \text{Y}\epsilon^{-t^2}$, belong to the limiting values of x taken on the first side. The best approximating cases are as follows. First, when a and b are the limiting values of x, in which case $-\infty$ and $+\infty$ are those of t, and the result is

$$\int \phi x dx\, [a, b] = \text{Y} \sqrt{\left(-\frac{2}{v_2}\right)} . \sqrt{\pi}.$$

Secondly, when the limiting values of x are $\text{X} \pm \xi$, ξ being small. In this case

$$\int \phi x dx\, [\text{X} \pm \xi] = \text{Y} \sqrt{\left(-\frac{2}{v_2}\right)}\, 2 \int \epsilon^{-t^2} dt \left[0, \xi \sqrt{\left(-\frac{v_2}{2}\right)}\right]$$

This method is found, by itself, almost sufficient to meet the wants of the more complicated problems in the theory of probabilities.

Secondly, Fourier's theorem, as it is usually called, by which a discontinuous function can be expressed. This theorem is as follows,

$$\phi x = \frac{1}{\pi} \iint \cos w\,(x-v) . \phi v . dw dv,$$

from $v = -\infty$ to $v = +\infty$, and from $w = 0$ to $w = \infty$. Or thus: the equation

$$\phi x = \frac{1}{\pi} \int_0^\infty \int_{-\infty}^{+\infty} \cos w(x-v) . \phi v . \epsilon^{-kw} dw dv.$$

is one which, for all values of x, approaches without limit to truth, as k is diminished without limit positively. But if instead of the limits $-\infty$ and $+\infty$, for v, we write a and b, a being less than b, then

$$\frac{1}{\pi} \int_0^\infty \int_a^b \cos w(x-v) \phi v dw dv$$

is a discontinuous function, as follows:—From $x = -\infty$ to $x = a$ exclusive, it is nothing: when $x = a$, it is $\frac{1}{2}\phi a$; from $x = a$ to $x = b$ both exclusive, it is ϕx; when $x = b$, it is $\frac{1}{2}\phi b$; and from $x = b$ to $x = \infty$ it is nothing.

Thirdly, the following methods of expanding a function in series of sines and cosines has been extensively used by Lagrange, Poisson, and Fourier. We give it in the most general form after the manner of Poisson. Let

$$\phi x = \text{A}_0 + \text{A}_1 \cos \frac{\pi x}{l} + \text{A}_2 \cos \frac{2\pi x}{l} + \ldots$$

then for every value of x from $x = 0$ to $x = l$, both inclusive, this equation is true if

$$\text{A}_0 = \frac{1}{l} \int \phi v dv\, [0, l], \quad \text{A}_m = \frac{2}{l} \int \cos \frac{m\pi v}{l} \phi v dv [0, l].$$

Again, the equation

$$\phi x = \text{B}_1 \sin \frac{\pi x}{l} + \text{B}_2 \sin \frac{2\pi x}{l} + \ldots.$$

is true from $x = 0$ to $x = l$, both exclusive, if

$$\text{B}_m = \frac{2}{l} \int \sin \frac{m\pi v}{l} \phi v dv [0, l].$$

Further, the equation

$$\phi x = \text{A}_0 + \text{A}_1 \cos \frac{\pi x}{l} + \text{A}_2 \cos \frac{2\pi x}{l} + \ldots.$$
$$+ \text{B}_1 \sin \frac{\pi x}{l} + \text{B}_2 \sin \frac{2\pi x}{l} + \ldots.$$

is true for all values of x from $x = 0$ to $x = l$, both exclusive (becoming $\frac{1}{2}\phi l$ when $x = l$) if

$$\text{A}_0 = \frac{1}{2l} \int \phi v dv [0, l], \quad \text{A}_m = \frac{1}{l} \int \cos \frac{m\pi v}{l} \phi v dv [0, l]$$
$$\text{B}_m = \frac{1}{l} \int \sin \frac{m\pi v}{l} \phi v dv [0, l]$$

But write $2l$ instead of l, *in the limits only*, or write $[0, 2l]$ instead of $[0, l]$ and the equation becomes true for all values of x from 0 to $2l$, both inclusive.

Fourthly, we shall give two cases of the method deduced by Cauchy, as specimens: the complete method itself has some difficulties which are not yet overcome.

First, let ϕx be such a function of x that $\phi(x+y\sqrt{-1})$ vanishes when $x = -\infty$ or $+\infty$, whatever y may be, and when y equals ∞, whatever x may be. For every root of the form $a+b\sqrt{-1}$ (a being either positive or negative, and b being positive, but both finite) which makes ϕx infinite, let $(x-a-b\sqrt{-1})\phi x$ be finite; calculate the value of this last product for each root. For every real root a, of $\phi x = \infty$ ($x = 0$ not being one) calculate half the value of $(x-a)\, \phi x$. Let the sum of all these values and half values be P. Then

$$\int \phi x dx[-\infty, +\infty] = 2\pi\sqrt{-1} . \text{P}.$$

Secondly, let ϕx be such a function that $\phi(x+y\sqrt{-1})$ vanishes when $x = +\infty$ or $-\infty$ independently of y, and when $y = +\infty$ or $-\infty$ independently of x. Take the imaginary roots only which make ϕx infinite, and let $(x-a-b\sqrt{-1})$ ϕx be always finite when $a+b\sqrt{-1}$ is one of those roots, and $x = a+b\sqrt{-1}$. Let the sum of all the values of the last product, for the cases in which b is positive, be P; and for the cases in which b is negative let it be Q. Then

$$\int \phi x dx[-\infty, +\infty] = \pi\sqrt{-1} . (\text{P}-\text{Q}).$$

The subject of definite integrals is one in which the difficulties which have always appeared at the boundaries of mathematical knowledge are constantly met with. The consequence is, considerable difference of opinion about many points. On these the student who desires to use the higher parts of analysis must hope to form his opinion independently, when his reading and reflection are sufficient for the purpose. Most of these difficulties belong, in principle, to that which accompanies the use of divergent series, which is the most important mathematical question now under discussion. If we were to judge of the future by the past, we should prophesy that divergent series would one day take their undisputed place among well understood objects of analysis, as negative quantities and their logarithms, imaginary quantities and their exponentials, infinitely small quantities with their different orders, discontinuous solutions of differential equations, &c. have successively done, each under a fire of objections which has well served the progress of science, by the defensive researches which it has rendered necessary. It is fortunate for analysis that so many of those who find difficulties propose the entire rejection of the symbols or methods in which the difficulties exist: the proposition excites those who are against any rejection to efforts which they perhaps would not make, if they had only to meet the doubts of allies, instead of the attacks of opponents. That the symbolic expressions of which we are speaking, will never vanish out of remembrance, we may confidently predict: of all the points of difficulty of which we have spoken, it may be said, in the words of Horace

'Naturam expellas furca, tamen usque recurret;'

they will come, and will demand explanation until they get it. They will conquer by numbers, as Fontenelle said the symbol of infinity had done. And it is to be hoped and expected, that no difficulty will be completely resolved, without the appearance of a successor, to excite new efforts, and be the stimulating cause of further progress. We should be sorry to think we had arrived at the 'last impossibilities* of pure mathematics.'

INTERDICT, in the law of Scotland, supplies the place of an injunction from a court of equity in England. It is a prohibitory order, forbidding some act from being done, and it is obtained on the application of the party who would be injured by the performance of the act. It may be issued by the Court of Session, or by the Sheriff's Court. Interdicts in the Court of Session are frequently obtained for preventing inferior courts, or courts of limited operation, such as the ecclesiastical courts, from exceeding their jurisdiction. To this end the form was frequently adopted in the late dispute in the Church of Scotland, which ended in a secession. [Free Church, P.C.S.] Interdict is applied for by what is called a 'Note of Suspension and Interdict' presented to the Lord Ordinary on the Bills. In pressing matters, interim interdict is awarded before the parties are heard, but in the general case intimation is given to the other party, who gives in answers. If there are means by which the applicant's interests can be kept safe, as by the finding security, or otherwise, the interdict will not be granted, but the 'vote will be passed to try the question,' and the matter will proceed as an ordinary litigation.

INTERMENT. [Interment, P. C.] Of late years the subject of interment has attracted much attention in England, and a great amount of information has been collected. Though opinions are not unanimous, the evidence, the further it is examined, appears to prove that emanations from crowded burial-grounds and from the vaults of churches do injuriously affect the health of persons who live near them; and that these emanations when sufficiently concentrated may produce speedy death. The general 'conclusion that all interments in churches or in towns are essentially of an injurious and dangerous tendency' (*Report on the Practice of Interment in Towns*), is at least made a strong probability, and strong enough, coupled with other reasons, to justify the legislature in forbidding such interments, and placing all burying-grounds under such regulations as may prevent the effluvia from the dead from becoming detrimental to the health of the living. The Report to which reference has been made contains, in addition to the evidence on the injurious effects of crowded burial-places, much valuable information on the injury to health caused, particularly among the poor, by the delay in interments. The following remark will show the nature and extent of this evil: 'In a large proportion of cases in the metropolis and in some of the manufacturing districts, one room serves for one family of the labouring classes: it is their bed-room, their kitchen, their wash-house, their sitting-room, their dining-room; and when they do not follow any out-door occupation, it is frequently their work-room and their shop. In this one room they are born, and live, and sleep, and die amidst the other inmates.' Among the poor in some parts of London the average time that a body is kept is about a week, which sometimes arises from inability to raise money for the funeral expenses, as well as other causes; and where there is only a single apartment, the dead and the living occupy it together. The injurious consequences to health from the presence of a dead body sometimes in a state of rapid decomposition, in a small ill-ventilated apartment, and particularly when death has been the consequence of malignant disease, cannot be disputed; and the effect on the living is demoralizing. The expense of funerals is another head which is examined in this Report, where it is well remarked that 'the expense of interments, though it falls with the greatest severity on the poorest classes, acts as a most severe infliction on the middle classes of society' (p. 46). The cost of interment in London varies from 4*l.* for a labourer to 1000*l.* for a gentleman: for persons of the condition of a gentleman it is stated that 150*l.* would be a low average. But these charges do not include anything but the undertaker's bill. The account of the details of an expensive funeral, 'which is strictly the heraldic array of a baronial funeral, the two men who stand at the doors being supposed to be the two porters of the castle, with their staves in black,' &c., is ludicrous enough; but the disposition to laugh is checked by considering the pecuniary embarrassment which this absurd display often entails on the survivors. Many persons incur a heavy debt by the expenses of interment. It is not unusual for poor people to liquidate such debt by instalments paid weekly, or at other short periods.

The subject of interment, like many others relating to the economy of society, may at first sight not seem to require any particular attention on the part of the state. It may be said, let every man bury his dead as he best can, and as he chooses. With respect to the rich, the expense is an absurd waste of money, and the example is bad; with respect to the middling classes, it is a heavy burden; but to the poor, interment of their dead is often almost an impossibility. To diminish these expenses, to secure the decency of interment amongst all classes, and particularly among the poor, and to prevent the contamination of the living by the dead, are objects well worthy of the attention of a legislator. The information collected in the report above alluded to lays bare a revolting picture of moral and physical facts; but it is truly said, 'General conclusions can only be distinctly made out from the various classes of particular facts, and the object being the suggestion of remedies and preventions, it were obviously as unbecoming to yield to disgusts or to evade the enumeration and calm consideration of these facts, as it would be in the physician or surgeon, in the performance of his duty with the like object, to shrink from the investigation of the most offensive manifestations of disease.'

The Report makes a proximate estimate of the total expense of funerals in London, which, according to the estimate, amounts to 626,604*l.* per annum; and a like estimate of the expense of all the funerals in England and Wales in one year is 4,870,493*l.* This sum, enormous as it is, may be considered an under estimate. 'The cost of the funerals of persons of rank and title varies from 1500*l.* to 1000*l.* or 800*l.* or less, as it is a town or country funeral. The expenses of the funerals of gentry of the better condition vary from 200*l.* to 400*l.*, and are stated to be seldom so low as 150*l.*' The average cost of funerals of persons of every rank above paupers in the metropolis may be taken at 14*l.* 16*s.* 9*d.* per head. But owing to circumstances, fully explained in the Report, even this lavish expenditure does not secure the proper and solemn discharge of the funeral ceremony, which, in crowded and busy districts seems to be totally impracticable. It is fully shown that the expenses of funerals may be greatly reduced, and the due performance of the religious ceremonies may be secured by other arrangements. The establishment of cemeteries by Joint Stock Companies has done something by diminishing the amount of interments in crowded places, but the expenses of interment have perhaps not been at all diminished by them.

The Report concludes (p. 197) with a summary of the evils which require remedies; and there is not one of the evils which has not been proved to exist. There may be difference of opinion as to the degree in which the evils exist; but none as to the existence itself. The remedies that are suggested for these evils appear to have been well considered, though, when an evil is ascertained to exist, people are not always agreed as to the best remedy. One of the proposed remedies, which involves many important considerations, and would probably meet with some opposition, is 'that r tions.

* These are the words of Mr. A. F. Vogel, of Leipsic, who has recently published in this country a tract on the resolution of all kinds of equations, printed at Leipsic, in his own English.

cemeteries of a suitable description ought to be provided and maintained (as to the material arrangements) under the direction of officers duly qualified for the care of the public health.' Another is, 'that for the abatement of oppressive charges for funeral materials, decorations, and services, provision should be made (in conformity to successful examples abroad) by the officers having charge of the national cemeteries, for the supply of the requisite materials and services, securing to all classes, but especially to the poor, the means of respectable interment, at reduced and moderate prices, suitable to the state of the deceased and the condition of the survivors.' The numerous matters contained in the Report can only be indicated here. It should be consulted by all who take an interest in the well-being of society, as a most valuable contribution to the statistics of civilized life.

(*A Supplementary Report on the Results of a Special Inquiry as to the Practice of Interment in Towns, made at the request of her Majesty's principal Secretary of State for the Home Department*, by Edwin Chadwick, Esq. Barrister-at-Law. London, 1843.)

INTERNATIONAL LAW. This term was originally applied by Bentham to what was previously called the 'law of nations,' and it has been generally received as a more apt designation than that which it superseded. When the term 'law of nations' was in use, that of 'law of peace and war' was sometimes employed as a synonyme, and as indicative of the boundaries of the subject. It was thus in its proper sense restricted to the disputes which governments might have with each other, and did not in general apply to questions between subjects of different states, arising out of the position of the states with regard to each other, or out of the divergences in the internal laws of the separate states. But under the more expressive designation, International Law, the whole of these subjects, intimately connected with each other as they will be found to be, can be comprehended and examined, and thus several arbitrary distinctions and exclusions are saved. To show how these subjects are interwoven, the following instances may be taken:—A port is put in a state of blockade; a vessel of war of a neutral power breaks the blockade: this is distinctly a question between nations, to be provided for by the law of peace and war, in as far as there are any consuetudinary rules on the subject, and the parties will submit to them. But suppose a merchant vessel belonging to a subject of a neutral power attempts an infringement of the blockade, and is seized—here there is no question between nations in the first place. The matter is adjudicated on in the country which has made the seizure, as absolutely and unconditionally as if it were a question of internal smuggling; and it will depend on the extent to which just rules guide the judicature of that country, and not on any question settled between contending powers, whether any respect will be paid to what the party can plead in his own favour, on the ground of the comity of nations, or otherwise. But there is a third class of cases most intimately linked with these latter, but which are completely independent of any treaties, declarations of war, or other acts by nations towards each other. They arise entirely out of the internal laws of the respective nations of the world, in as far as they differ from each other. The 'conflict of laws' is a term very generally applied to this branch of international law, and the circumstances in which it comes into operation are when the judicial settlement of the question takes place in one country, but some of the circumstances of which cognizance had to be taken have occurred in some other country where the law applicable to the matter is different. One of the most common illustrations of this subject is,—a judicial inquiry in England whether a marriage has taken place in Scotland according to the law of that country; or an inquiry in Scotland whether a marriage has taken place according to the law of England; in either of which cases there will generally be the further and nicer question, Which country's law ought to prevail as the criterion?

Thus the three leading departments of international law are—

1. The principles that should regulate the conduct of states to each other.

2. The principles that should regulate the rights and obligations of private parties, arising out of the conduct of states to each other.

3. The principles that should regulate the rights and obligations of private parties, when they are affected by the separate internal codes of distinct nations.

The first of these has been the principal subject of the well-known works of Grotius, Puffendorf, Vattel, and other publicists, who have derived from general principles of morality and justice a series of minute abstract rules for the conduct of nations towards each other, and subsidiarily for the conduct of their subjects in relation to international questions. It has been usual to call this department the 'Law of Nature,' as well as the Law of Nations, on the supposition that, though it has not the support of the authority of any legislature, it is founded on the universal principles of natural justice.

It is clear that thus in its large features, as a rule for the conduct of independent communities towards each other, the Law of Nations wants one essential feature of that which is entitled to the term law—a binding authority. Nations even the most powerful are not without checks in the fear of raising hostile combinations and otherwise; but there can be no uniformity in these checks; and in general when the interest is of overwhelming importance, and the nation powerful, it takes its own way. The importance of the questions which may be involved in the Law of Nations thus materially affects the question how far it is uniformly obeyed. In a set of minor questions—such as the safety of the persons of ambassadors, and their exemption from responsibility to the laws of the country to which they are accredited, and in other matters of personal etiquette, a set of uniform rules has been established by the practice of all the civilized world, which are rarely infringed. But in the more important questions, regarding what is a justifiable ground for declaring war? what territory a nation is entitled to the sovereignty of? what is a legitimate method of conducting a war once commenced? &c. —the rules of the publicists are often precise enough; but the practice of nations has been far from regular, and has been, as every reader of history knows, influenced by the relative strength of the disputing parties more than by the justice of their cause. The later writers on this subject have from this circumstance directed their attention more to the means by which any system of international law can be enforced, than to minute and abstract statements of what may be theoretical justice, but has little chance of being enforced. They have found several circumstances which have an influence in the preservation of international justice, though of course no sanctions which can give it the uniformity and consistency of internal laws.

The combinations for the preservation of what is called the Balance of Power [BALANCE OF POWER, P. C.] are among the most useful restrictions of ambition. All periods of history furnish illustrations of this principle. Hume found that the Peloponnesian war was carried on for the preservation of the balance of power against Athens. The late war exhibited a noted illustration of combination to prevent universal conquest on the part of the French. The safety of small states from being absorbed by their larger neighbours, is in the jealousy which these neighbours feel of each other's aggrandisement. Thus the jealousy of rulers is one barrier to national injustice. Another is public opinion: sometimes that of the nation whose rulers would be prepared to commit injustice—sometimes that of other nations. Of course it can only be to a very limited extent that the public feeling of a despotic government can check the grasping spirit of its rulers; but the public feeling of the constitutional and democratic states is the great check on the injustice that might be perpetrated by a nation when it becomes so powerful as Great Britain.

The seizure of the Danish fleet by the English has been a subject of warm censure in this country. Necessity—even the plea that Napoleon would have used the fleet to invade our own shores—has not been accepted in palliation of the act; and the manner in which it has been canvassed is very likely to prevent any British government from adopting the precedent. The partition of Poland is an instance of national injustice condemned by the public feeling of countries other than those by which it was perpetrated; and it may be questioned whether the states which accomplished the partition may not yet suffer by it. Good fame in the community of nations is like respectability in private circles, a source of power through external support; and the conduct of Russia towards Poland has frequently diverted from the former country the sympathy of free nations. It need scarcely be observed that the press, whether fugitive or permanent, is the most powerful organ of this public opinion, and that the views of able historians, jurists, and moralists, have much influence in the preservation of international justice. Among the principal subjects of dispute in this department of international law are—the sovereignty of territory and the proper boundaries of states, as in the question at present under debate regarding the Oregon territory in North America; questions as to discovery and first occupancy of barbarous countries; questions as to any exclusive right to frequent certain seas,—and here there is a well-known distinction between the broad ocean and the narrow seas that lie close to particular territories; questions regarding the right of navigation in rivers which may be either between the upper and lower territories, or between states on opposite banks; questions as to the right of harbour or fishing, &c.; and questions as to the right of trading with particular states. A very advantageous method of adjusting minor international disputes has been frequently had recourse to of late in a submission to the arbitration of a neutral power. Pride and the spirit of not yielding to intimidation or aggrandisement have often more influence in a nation's resistance of another's claim, than the desire to keep what is demanded. In such a case the national pride is not injured when that which is yielded to is the award of a neutral party, not the demand of an opponent. It has been suggested by Bentham and Mill that the civilized states of the world should establish among themselves a congress, which should adjudicate on all disputes between its members, the members being excluded from voting in their own disputes.

The Second department into which we have considered international law divided—the rights and obligations of individuals as affected by the conduct of states towards each other—has, like the first, been examined by the publicists in their theoretical manner; but it has never, perhaps, received so much practical illustration as it did in the British courts, particularly the Prize Admiralty Court, during the late wars. In a despotic country it would of course scarcely ever occur that the bench should fail to give effect to the national policy of the government, whatever that may be. But in England it was the rule that foreigners as well as natives were entitled to the rigid administration of the law, and that, if the proceedings of the government were at variance with the rights of parties according to the law of peace and war, individuals might have redress. Thus, when Great Britain, in opposition to the Berlin decrees, tried to establish a 'paper blockade,' that is to say, by force of orders in council to declare places to be under blockade, whether there were a force present to support it or not, Sir William Scott found that 'in the very notion of a complete blockade, it is included that the besieging force can apply its power to every point in the blockaded state. If it cannot, it is no blockade of that quarter where its power cannot be brought to bear.'

It has frequently been observed, that as to all departments of the law of nations, uncivilized countries are at the mercy of the civilized: that not having any means of reciprocating the action of international laws, from their having no systematic judicatories of their own, they have not even the frail tenure of generally received opinions as to what the conduct of independent nations towards each other ought to be, for their protection. This is in some measure true. If a weak civilized nation, which can eloquently appeal to the law of nations, is feebly protected against the injustice of a strong nation, still less effectually are a barbarous community, who never heard of international law, and know not how to appeal to its acknowledged principles, protected by it; and, in regard to them, the humanity and conscience of the powerful nations coming in contact with them are their protection, rather than any rules of international law. Thus when, as in the instance of a colonial government or otherwise, such a nation as the British has to deal with the inhabitants of a barbarous country, it cannot be said that these inhabitants have the law of nations to appeal to if they are unjustly treated, and there is no sanction for their being well and humanely used but the morality and conscience of the British nation and its government. How far civilized nations had in former times disregarded all feelings of common humanity in their intercourse with inferior races, the history of colonization, and especially that relating to the continent of America, is a horrible record. In later days higher notions have been entertained of the responsibility of superior power, and the civilized man has in some measure ceased to make his first advances to the notice of the barbarian in the character of a murderer and a pillager. Britain has in this improved morality so far advanced before other nations, as to be the protector of barbarous races from the oppression of others, in her efforts for the abolition of the slave trade and the preservation of aboriginal nations. These efforts, in so far as they are an anomaly in the general conduct of nations, have introduced some necessary exceptions to the rules of international law applicable to the rights of persons. This has consisted in the necessity of treating those who are injured by the slave trade, viz. the slaves carried off, as if they were subjects of this country subjected to injury, while the deporters have likewise been of necessity treated in the general case as if they were subjects of this country doing the injury. The effect of this state of matters, as an exceptional principle in international law, sometimes occasions difficult questions. In the late case of the Felicidade, a foreign slaver had been captured and taken possession of. The crew rose, and putting the captors to death, recaptured the vessel. They were tried and condemned to death for murder in an English court; and the judge who conducted the trial would not admit the plea that, as the capture had taken place under our laws, not their laws, they were entitled to regain possession by any means which they might choose to adopt. He held it right, in fact, to treat the ship as a prison, and the captured seamen as persons in a British prison. On the question however coming before all the judges, the conviction was declared invalid, the principal ground of the reversal being, that the vessel not having slaves on board was not legally liable to seizure. In those cases where it is necessary to diverge from the general principle of international law, for the protection of the weak, it is fortunate that the humane and enlightened motive of proceeding is a guarantee for its being beneficially exercised.

The rights of individuals have sometimes been so much affected by the conduct of nations towards each other, that their own nation has been induced to make war against the nation aggressing. This has twice occurred in our intercourse with America: one war was caused by our restrictions on the commerce of America by the orders in council; another by our searching American merchant vessels for British seamen. On the subject of the present unsatisfactory state of the question as to this right of search, Mr. Reddie, in his 'Maritime International Law' (ii. pp. 43-44), says, 'Unfortunately this claim of right was left undecided either way even by the hastily concluded treaty of Ghent in 1814, which terminated the war between the parent state and what were originally her colonies. And as the divergence in the personal appearance, language, habits, and manners of the inhabitants of the two countries was not likely, for generations, to be such as to facilitate the discrimination of the subjects of the two states, it is to be regretted the question was not subsequently settled by the negotiations of 1818 upon the equitable footing of regular authentic lists or registers of British and American seamen being made up and kept, and of the nationality of the seamen being thereby determined.'

The Third division of international law is that which most properly comes under the head 'Conflict of Laws,' viz. the principles that should regulate the rights and obligations of private parties when they are affected by the separate internal codes of distinct nations. This has some points in common with the preceding department of the subject. It involves questions with individuals, and not, at least in the first instance, questions with states; and the adjustment of each question depends on the view taken by the law of the country to which the individual or his property is amenable. But it has this distinctive feature, that the circumstances under which disputes may arise are not in the conduct of one nation towards another, but in differences between the internal laws of the countries, which internal laws disagree, not because the one nation has a dispute with the other, but in the general case because its legislators have taken its internal situation solely into consideration, and have overlooked the existence of other nations. There can be no part of the world where this species of international law can be so well illustrated as in the United States—a collection of communities, each having an internal system of administration, but each acting on principles of harmony and alliance with the other states of the Union. It is thus natural that America should have produced the best work on the subject, in Professor Story's 'Commentaries on the Conflict of Laws Foreign and Domestic, in regard to Contracts, Rights, and Remedies; and especially in regard to Marriages, Divorces, Wills, Successions, and Judgments,' of which two editions are now known and esteemed in this country. The leading rule of international law in this department is, that each civilized nation is to give efficacy to the laws of another country, unless its own laws or the general principles of justice are thereby invaded. We have the broadest and most distinct illustrations of this rule in the criminal law. The progress of opinion has lately been in favour of each nation rendering back fugitive criminals, to be dealt with according to the law of the country where they have committed any private crime against person or property. In conformity with this principle, treaties were lately made with France and the United States of America, for enforcing which, in this country, two acts of parliament were passed (6 & 7 Vict. c. 75 and c. 76), by which a secretary of state, on the requisition of the ambassador or other representative of France or the United States, might issue a warrant to magistrates to seize a person accused of a crime, a magistrate being enjoined to put it in force on his being satisfied that the charge is of such a nature as would authorise him to commit a person charged with perpetrating it in his own jurisdiction. [CONVENTION TREATIES, P. C. S.] But it has been a rule in many countries, and particularly in our own, that no aid is to be given for the enforcement of the political laws of foreign states. As in other branches of international law, our enlightened principles on the subject of slavery have here been the cause of perplexing difficulties. With slave-holding countries slavery comes to be a question of property, but with us it can only be a question of government; and we cannot view any rules regarding property in slaves as laws relating to private rights, an infringement of which, when held to be criminal in the slave-holding country, must be so also here. Accordingly, in the celebrated case of the Creole, in November, 1841, when certain American slaves escaped and found protection in a British settlement, it was found that we could not send them back to their owners as robbers who had with violence stolen their own persons from the custody of their proprietors.

As on the one hand the criminal law is that to which this department of international law most broadly and distinctly applies, on the other hand the position of real or landed property is that to which it has generally the least reference. The reasons of this distinction are very obvious: his own personal conduct is that object of the law which a man most completely carries about from one country to another; his connection with landed property is the relation in which a tribunal out of the country in which the property is, can have the least chance of adjudicating. Between these extremes there are many questions regarding persons in their relations to each other, and regarding contracts as to moveable or personal property. It came thus to be a general principle, that rights connected with landed property must always be settled by the law of the place where the land lies, while questions regarding other property might be subjected to other criterions of jurisdiction. Perhaps historical circumstances in the early history of the European nations favoured this division. The various tribes which occupied the territory of the Roman empire appear to have carried with them their own peculiar laws and customs. Savigny quotes a letter from Bishop Agobardus, in which he says it often happens that five men, each under a different law, may be found walking or sitting together—a state of society at this day exemplified in some oriental nations. Among all these distinct tribes the feudal system arose as the general and uniform territorial law. Through a series of circumstances which need not be here narrated, the civil or Roman law became the ruling principle as to persons in their relation to each other when that relation was not of a feudal character, and as to claims regarding moveable goods. The common law of England has perhaps had the least affinity with the other European codes. But it has fortunately happened that those departments of the law with which international questions are chiefly concerned,—the consistorial and the admiralty law, have been considered as the legitimate offspring of the civil law, and have adopted in a great measure its principles as they have been in practice throughout Europe. The mercantile law in general of England has accommodated itself to the custom of merchants; and this custom has in a great measure arisen out of the adaptation to modern commerce of the principles of the civil law. The portion of the commercial code of England which is least in harmony with that of other countries is perhaps the bankruptcy law, which, being statutory, has not so pliantly adapted itself to the exigencies of foreign commerce as the consuetudinary portions of the commercial law have done. Thus, under the old sequestration or bankruptcy statute of Scotland, which was supposed to give the trustee or assignee full power for obtaining possession of the bankrupt's property in all parts of the world, it was found that he had no right of action for a debt due to the bankrupt in England—the right of the trustee being that of an assignee merely, and a right to a debt being a chose in action, and therefore not capable of being assigned by the law of England. See Jeffrey *v.* M'Taggart, 6 M. & S. (K. B.), 126. The law of bankruptcy appears to be one of the most difficult of adjustment to international principles. There are clauses in the bankruptcy and insolvency acts of England by which, through registration of the vesting order, the assignee becomes invested with all real or landed property in any part of the British dominions where a conveyance of such property requires to be recorded. (See 1 & 2 Wm. IV. c. 56, § 27, and 1 & 2 Vict. c. 110, § 46.) It could not have been the intention of this provision to give an English assignee privileges which a trustee of a bankrupt estate does not hold in Scotland; but while the latter requires to make up a feudal title before he can be the recorded proprietor of real property, it was found by the Court of Session in the strict interpretation of the English provision that no such preliminary was necessary, and that the registration of the vesting order was sufficient. (Rattray *v.* White, 8th March, 1842, 4 D., 880.)

The conflicts of laws between England and Scotland are of course in this part of the world the most important and interesting. The consuetudinary or unstatutory law of England has perhaps fewer principles in common with that of Scotland than the latter has with the law of any other country in Europe; and this divergency has been the cause of many difficult questions. In these the law of marriage and that of succession have been particularly fertile. In the former the difference between the institutions of the two countries, when subjected to the principles of international law, has been productive of very remarkable effects. In England there are certain acts which are necessary ingredients, by the statute law, of a valid marriage. In Scotland the consent of parties to hold each other as man and wife, when sufficiently attested, is, according to the doctrines of the civilians, sufficient. But in England it is a principle of international law that a marriage valid in the place where it is contracted is valid in England; the consequence is, that the lax principle of marriage by simple attested consent would have probably fallen into desuetude and oblivion in Scotland, were it not kept up by English parties, who thus evade the restrictions of their own law. On the subject of succession, a series of decisions in both countries has settled two very important principles—that in the case of landed property it follows the *lex rei sitæ*, or the law of the place where the property is; while in moveable or personal property it follows the *lex domicilii*, or law of the domicile in which the person leaving it died.

INTERROGATORIES. [EQUITY, P. C.]

INVENTION. [PATENT, P. C.; COPYRIGHT, P. C. S.]

INVENTION AND DISCOVERY. The rights of individuals, as to the honour due to the origination of new views, processes, or methods, are matters of constant discussion in the history of letters and science. It is strange that the subject should never have been generally treated: and in default of better, we intend to put together some rude materials for consideration, which may perhaps help the young reader of the history of science (from which our examples will mostly be drawn) in forming his opinion of the controversies which there abound.

Invention and discovery are, for our present purpose, synonymous terms. As commonly used, the first word signifies the formation of something which would not necessarily have existed, but for the invention; the second means the finding out that which always did exist, and would have existed whether the discovery had been made or not. We all perfectly see the error in the assertion, set down for correction in the English exercise-books, that 'Galileo *discovered* the telescope, and Harvey *invented* the circulation of the blood:' and also the propriety of the assignment of words made by Mr. Macaulay, when he says that the terms in which Machiavelli is usually described would seem to import that he was 'the discoverer of ambition and revenge, the original inventor of perjury.' We can imagine the possibility of a telescope having never been framed, or a false oath having never been sworn; but as long as man exists, and his blood circulates, feelings of ambition and revenge will spring up in his mind. The words have some analogy with those of problem and theorem in geometry: and particularly in this, that invention must be ultimately a suggestion of discovery. The inventor of modern ink, which till his time had never existed, discovered that a mixture of galls and sulphate of iron would produce a durable dark fluid: his invention consisted in the application of his discovery to the art of writing. In this manner it may be asserted by some [BACON, ROGER, P. C.] that Roger Bacon discovered the telescope. There must be a discovery preceding every invention; but it does not follow that every discovery leads to invention. But yet there are some cases in which the preceding definitions fail to describe the actual use of words: for example, bichromate of potash was never found in nature, never discovered: its elements were compounded in the laboratory by its inventor. But the chemists would not call this an invention, nor anything but a discovery: we should recommend them to draw the distinction, as useful to the memory in relation to the history of their science.

There is in the words discovery and invention a tempting resemblance, often just, and often fallacious, to those of theory and practice. But in fact each of the things must be subdivided into theoretical and practical. The effect of the non-spherical form of the earth upon the moon's motion was discovered theoretically: the variation and the evection were discovered practically. As to inventions, we call Davy's safety lamp a theoretical invention: for the question given was how to overcome a certain danger, generally; and it was not even assumed that a lamp was to be constructed. But the common story of the boy who saved his labour by tying a string from the valve he was employed to open and shut to a part of the machinery which moved in such a manner as to do it for him, is, if true, a record of a practical invention. Still there is truth in this, that practical men, properly so called [THEORY AND PRACTICE, P. C.], have invented oftener than they have discovered; and that theoretical men have discovered more often than they have invented.

It is no wonder that the early history of discovery should be confused and uncertain: the loss of documents, which operates on all our first knowledge of antiquity, is a sufficient explanation. Nor is it surprising that first writers should be persons of unsettled claims; that in the case of Euclid, for example, we should not be so well able to say where his discoveries began as where they ended. But it does seem strange that in matters of our own day, or that immediately preceding, it should be a question to whom a right of discovery should belong, when the only tangible matter is a book, to the date of the publication of which there is every possible attestation.

There is one most important preliminary consideration, which will, in the minds of those who for the first time give it due attention, change the face of the whole question. When the period arrives at which a discovery becomes possible, there are many courses which lead to it, and many ships sailing on each of these courses. The analogy may be carried further. When a new island is discovered in or near a frequented track, as soon as a ship of some one country casts anchor in a port and takes possession, it may be afterwards found in some logs that something like land had been suspected before, in others that land birds had been seen, in others that the colour of the water was noted, in others that an alteration of the current was observed, and so on, all near the same point, and any one of which might have led to the discovery, if the hint had been followed. It is the same in matters of science, to an extent which will not be easily credited by those who are unacquainted with its history. And this greatly enhances the merit of most original researches. It is much to the credit of Newton that Huyghens had gone as far as to determine the conditions of circular motion, that Grimaldi had noted the effect of the prism on light, that Fermat and Cavalieri had all but discovered the method of fluxions. The character of accidental good fortune disappears when we see that the progress of knowledge seems to bring new results within the possible reach of many, but within the actual grasp only of one. Is there then nothing accidental in discovery and invention? We answer that there is something, but that the accidents which *might* produce discovery are happening to all, and frequently; while the accidents which *do* produce it happen to those only who are ready to take advantage of them. But this it may be said is reasoning in a circle; for if we are asked how we distinguish the person who is ready to take advantage from the one who is not, we have only the discovery to point to. We reply, that it generally happens that the persons who can thus fix a casualty, are also those who give evidence of successful research in cases where fortune shows no special favour. It was by a mere accident that Mr. Baily [FLAMSTEED, P. C.; BAILY, P. C. S.] bought a house opposite to the possessor of a large bundle of Flamsteed's letters, and nothing more than the fact of their existence came to his ears. Many perhaps had seen them, and either taken it for granted that the contents were all in print, or been unable to judge of their value. But the life of Flamsteed is not the only evidence of Mr. Baily's success in a point of astronomical history: there was no accident about the editorship of the old catalogues. It is said to have been by a casual effect of sun-light at a window that Malus discovered the polarisation of reflected light; but then Malus was a profound optical investigator. It is our conviction that no accidents are valid except those which happen to the proper men at the right times; and that there are usually other means of showing this besides the success of the accidents themselves.

Before we can examine the title to a discovery, it must first be settled what the discovery is: and this is frequently the greatest difficulty. The case of the steam-engine is constantly under discussion; and the principal point at issue is, what is the steam-engine. Heron of Alexandria certainly produced rotatory motion by steam, and, with sufficient funds, could have ground all the corn in Egypt by his method. If we assign the merit to the person who contrived such an economy of fuel as to place the use of steam on something like its present footing of convenience, it then becomes a doubt whether any except Watt has the claim. M. Arago remarks on this subject, that a watchmaker would be struck dumb by the question, who invented a watch? The thing as it now exists is not the invention of any one person. As long as there is any national feeling in the discussion, one or another definition will be proposed, constructed to suit the advocacy of one or another claim. We have not here to settle the cases which we cite; it is enough that they illustrate our point.

It may happen that in a complicated instrument or method, the perfecting of which extends over a long period, there is some one distinguishing characteristic the introduction of which marks the main epoch of the invention. In the case of the watch, for instance, if we ask for the distinctive definition of the term, we find that it is not merely an instrument for measuring time, which would include the clepsydra, nor an application of wheel-work for that purpose, which would include the clock; but it is the use of a spring for the regulator, in which consists the distinction between a watch and other horologes. In a similar manner we look upon the additions made by Vieta to the mechanism of algebra as constituting the main groundwork of what now bears the name. But it would be exceedingly wrong to say that Hooke invented a watch, or that Vieta invented algebra: things done before and after both essentially belong to the ideas we mean to convey by the words. But it is not an uncommon practice of writers to strip a word of all its accessories, and to attribute (justly enough perhaps) the invention so cut down to some one person, and then to clothe the word with all its most modern associations, and the favoured inventor with all the glory which ought to be divided among many. When the steam-engine is reduced to a teakettle, or at most to a pump, it is Avery, or De Caus, or Worcester, or Newcomen, or Papin, &c. &c. who invented it, according to the country or the fancy of the writer; but when once the claim is established, the teakettle throws out a condenser, and the pump runs along the railroad at sixty miles an hour.

The common sense of the law requires that the applicant for a patent should make a distinct specification, not merely of what he intends to construct, but of that particular part of the contrivance which he claims as his own; and here a claim upon anything old, or an omission of anything new, vitiates the patent. [PATENT, P. C.] The cases which have occurred under this law would be good study for those who write on discovery.

It may indeed happen that the amount of claim may be materially augmented by the view which the discoverer takes of his title. Columbus inferred, on true principles, the possibility of crossing the Atlantic, spent the energies of a life in procuring the means of making a trial, and is therefore properly and truly the discoverer of all the new world: the Northmen who had visited it long before did not promulgate their discovery, and it might as well be given to the aboriginal inhabitants of the continent itself as to them. It does not depreciate the merit of Columbus that he could not but suppose he should reach India or China: these were the certainties at which he aimed, and which he would have reached had he not been stopped by the intermediate continent which ought to bear his name. Had Heron, when he first announced and executed his revolving boiler, been able to point out that it was a method of producing force from fuel, which might supply the place of human labour—that all which remained was adaptation—and that skill in the use of this new kind of force would make it a substitute for the strength of men and beasts—it would have been difficult to have denied him the title of the discoverer of the steam-engine, and the inventor of the first step. Among the consequences of attempting to describe discoveries under too general terms, is this, that both things and persons are allowed to clash unnecessarily.

It is not always, to be sure, that this goes such a length as procuring for Dalton's atomic theory the character of being a republication of the notions adopted by Epicurus from his predecessors; if it did there would be the less harm: there are many theories between which mischievous confusion is more easily brought about than between those of the philosophers of Athens and of Manchester. The nomenclature of science is perplexed by phrases of no precision—as that Newton discovered gravitation, instead of a true explanation of the heavenly motions by means of gravitation—that he first advanced the true theory of astronomy, which he did in one sense, and Copernicus in another; whence the provinces of the two are frequently confounded. It must also be noticed that a mere opinion, the result of choice between several, one or other of which must have been taken, is confounded with the same opinion advanced and supported by reasons. Thus Philolaus and Aristarchus asserted the motion of the earth, and Copernicus is said to have only revived their opinion. The difference between the two cases lies in this, that the antient philosophers merely asserted their belief, the modern one made his hypothesis the means of accounting for all the known motions of the heavens, diurnal, annual, and precessional.

The specification, to borrow a term, having been agreed upon, the next question is, what constitutes a claim to discovery? The answer is, priority of publication. If, as has often happened, two persons should discover the same thing about the same time, the one who first publishes is universally recognised as the discoverer. Of course, if a fraud can be proved, if it can be satisfactorily shown that the first publisher stole his matter from another, he would not be allowed the advantage of his wrong: but the onus of proving the fraud lies entirely upon the assertor of it, and, until the evidence and verdict arrive, the first publisher is in possession. The reasons for this rule are not altogether those which exist for the rule in law. The objects of the latter are the protection of private rights and public peace; or rather the assignment of private rights in such a manner, as best, in the long run, to promote the welfare of the community, and particularly its peace, without any great shock to the natural feelings of equity. It is not difficult to conceive a case in which men would gladly give up a small per centage of decisions consonant to natural justice, or what is so called, for the sake of a rule which would present decided advantages as a rule, in the imperfect state of private morality. But the object of the scientific historian is truth for its own sake; he has nothing to do with conventions made for the sake of peace.

This rule, that first publication gives the right, until the contrary is proved, is adopted for the sake of its own probability, as a starting point. Select, at hazard, the name of a result, and of its first announcer; no doubt will exist in the mind of any one, used to the history of science, that it is at least fifty to one the name of the real discoverer is thus given. But if it be *the fact* that the discovery was made at an earlier period, and if that fact can be established, the history of the human mind must not be falsified by adherence to a rule. If, for example, it could be made out, from internal evidence, that Archimedes must have had an algebra and a differential calculus, which deference to the notions of his time prevented him from publishing, it would never do to let the formal claims of Leibnitz and Newton prevent the allowance of that of Archimedes: for then would result the suppression of the actual fact, which, if true, would be of great consequence, namely, that the Greek mathematics were powerful enough to lead their best minds to the discoveries of modern times. We insist upon this because we have observed a considerable tendency in writers of history to establish a rule on legal grounds of peace and convenience. There is also a confusion between two distinct things; the claims of history, and the claims of the individual: the former demands true facts, the latter just appreciation of his merit. By a perversity of the human mind, Newton and Leibnitz would lose fame to-morrow, more or less,—that is, more with some and less with others—if an undoubted manuscript of Archimedes were to turn up, showing that he possessed a formal differential calculus. We are apt to assign praise to mere priority, independently of originality, and to withdraw it on failure of priority. But it is forgotten that the merit of priority only lies in this, that the earlier an invention or discovery is made the ruder are the methods and instruments, and the fewer the hints to which it is due. For example, D'Alembert reinvented Taylor's theorem [TAYLOR, P. C., p. 126] in, or shortly before, 1754. He has all the merit due to the discovery, as n 1754. But could it be proved now that Taylor's works, &c. were recent forgeries, so that D'Alembert should stand as the original inventor, it would be impossible to put him in Taylor's place; the differential calculus was in two very different states in 1716 and in 1754.

There is also an injurious tendency to stand by the fixed rule as a thing of good consequences, in the way of punishment or stimulus: and certainly there is no denying that if it were but right to substitute, in history, the thing which is not for the thing which is, there are advantages arising from the adoption of the rigid rule of first publication. Tartaglia [TARTAGLIA, P. C.] suppressed his method for cubic equations from a selfish motive: Cardan, to whom he had communicated it under promise of secrecy, published it, with a sufficient acknowledgment; nevertheless the rule always goes by Cardan's name. There is little to regret here: Tartaglia was willing, simply that he might be able to puzzle his contemporaries, to retard the progress of algebra; it is not certain that he ever would have published his discoveries. The public has rewarded the individual to whom they were indebted for knowledge by affixing his name to the rules he announced. If it were understood that the name attached to any scientific result was always that of the first publisher, saving all the rights of history over the truth of the discovery, this and similar acts of nomenclature might be a satisfactory use of the *norma loquendi*. It has sometimes happened that individuals have deposited sealed packets with public scientific bodies, to reserve their rights in the event of any one else arriving at results which they wished to avoid making public until they had followed them out to their remote conclusions. This practice is one which would not prevent the name of any other person from being attached to the contents of the packet, if he came independently by the same results, and published them before the packet was opened.

The next question is, what constitutes a sufficient publication. And here the answer is, that the only mode which can give the discoverer no further duty in the matter, is the press. If any one should prefer written correspondence, public lectures, or oral conversation, it must be at his own risk. A printed book, pamphlet, magazine, or newspaper which any one who likes may buy, is a record of the court of history from the day of its appearance: but any other mode of communication, which is of its own nature not addressed to the public at large, must be put in. and proved before it can be available. A communication to a scientific body, for example, is only so much better than a letter to a friend, as it is more public and more easily proved: but unless it be published in the transactions of that body, in which case it ranks with a book from the date of publication, it will require subsequent establishment. There is, however, always a difficulty with regard to such communications, particularly when the transactions of the academy in question do not appear till some time after the reading of the memoir. It is impossible to know what an author has added as the paper went through the press: that is, if a contest of dates should arise, it will always be necessary to assume the date of publication, unless some proof can be given that the memoir as published is, in the matter under dispute, the same as that which was originally communicated. It has happened before now, that a communication presented has been almost entirely remodelled before it was printed We have little doubt that, in course of time, bodies which publish transactions will find it necessary to require that authors shall either print their communications as presented, or date such additions as they feel desirous of making.

The most remarkable question of publication that ever arose was that relative to the invention of fluxions. [FLUXIONS, P.C.; COMMERCIUM EPISTOLICUM, P. C.] There never was a case in which it was more necessary to consider the rights of history, and not to judge by any fixed rule. Newton, unquestionably the first inventor, made no publication whatever at the time: an anagram, or transposed sentence, cannot be looked upon in any other light than as a sealed packet. Leibnitz has accordingly the full merit of an inventor, and priority of publication. Newton has given proof that he could have published it, if he had chosen.

It frequently happens, as before observed, that independent discoveries take place about the same time: there is no doubt that such is the fact. When the publications take place very nearly at the same time, particularly when they are in different countries, it is easy enough to admit the real independence of the two. If the same thing should appear in the notices of the Royal Society and the Comptes Rendus of the French Institute within a few weeks of each other, the presumption is strong in favour of neither writer having had a communication, directly or indirectly, from the other: and this presumption must be rebutted by any one who desires to prove plagiarism. But as the interval of time becomes greater, the presumption, so far as it is derived from time only, is weakened. In such a case, the internal evidence of the writings themselves must be carefully looked at. There is usually a very great difference between the modes in which different investigators arrive at, and even in which they state, the same conclusions: those who would do a dishonest thing might know this as well as others, and might endeavour to counterfeit originality. To detect the base metal is not always easy: to prove its baseness is next to impossible. But it mostly happens that really independent investigators carry their results to different lengths; one will go further in one part of the subject, another in another.

As may be supposed, the most disputed cases are national ones; including in that term the schisms of different classes in the same country, as the scientific feuds of universities, of literary societies, &c. And between people of different countries and governments, the question arises in two distinct ways, not only as to the definition of the discovery itself, and the priority of publication, but as to the country to which the discoverer is to be said to belong. And here there seems to us to be a necessity for a distinction which is rarely made, and no wonder; national pride is the mortal enemy of discriminative argument. All people like to believe that their race is gifted by nature with talent, and that their public policy is calculated to draw it out. For proof of this they appeal to their great writers and thinkers, among whom they include all whom they have drawn into their country, and all whom they have driven out. Now it is clear that the eminent men who have been induced to settle in a country not their own, may be a credit to the institutions, but can be none to the race, of their adopted country: while those who are driven away may do honour to the race but not to the institutions of the land from which they are exiled. Take the cases for instance of Lagrange and De Moivre. Lagrange, who, of many offers made to him when he left Prussia, preferred that of the king of France, resided in that country from 1787 till his death in 1813, was exempted from the expulsion of foreigners ordered by Robespierre, and received, during all governments from the old monarchy to the empire, every possible honour and aid,—is a greater credit to French institutions and feelings than if he had been born in their country. But as far as blood is concerned, he is almost wholly Italian, having been born, and established his first reputation, at Turin: it is said, we do not know on what authority, that his great grandfather was a Frenchman, which may entitle France to claim the eighth part of him. De Moivre, on the other hand, born of French parents and educated in France, was driven from his country by religious fanaticism, and none of his works were published either in France or in French. Whatever credit his talents may do to his race, he is the disgrace of their institutions, as to the time in which he lived. Not that he received such encouragement here as would entitle us to say that the honour lost by France was wholly gained by England.* While picking up a scanty living by private teaching, the only way in which he could find time to read the Principia was by tearing it leaf from leaf, and carrying a leaf in his pocket to look at while walking from one pupil to another, or at any other chance interval.

There is much absurdity in the mode by which national prowess in matters of discovery is tested. A few of the very first names are made the only subjects of comparison. There is some presumption, certainly, that the great names are the best of many, and that the plants most abound where the largest plants are found. But this presumption must not be urged when an attentive consideration will settle the question without it. Archimedes was the greatest of the Greek mathematicians; but Sicily was not therefore the most celebrated in science of all the countries in which Greece had colonized. So far from it, that when in the sixteenth century, Maurolico lived and wrote, the following epigram was made upon him—

Te quoque Zancla tulit, Maurolyce, ne sit in uno
Clara Syracosio Sicelis ora sene.

The most difficult question of all is undoubtedly what degree of merit belongs to a discovery, and the settlement of the question where in the list it places its author. The public in general judges by utility; whereas it is notorious that many discoveries show more power of mind than others of much greater value to the world. The rule of utility is a good one for mankind in general; but it must be taken with modification by the historian of science. Who has most benefited his species, and who has shown himself most above his species in intellect, are two different questions. The merit of the inventor, and his genius, are not comparable quantities. The former is determined by the study, the personal risk or inconvenience which it was requisite to undergo, the patience and perseverance which must have been shown, and the goodness of the motive which appears to have actuated. The latter is the greater the less the pain and labour, and is wholly independent of moral considerations. A patient schoolboy who multiplies one number by another with time and care, has more merit than the wonderful youths who have sometimes appeared, and who can do it in their heads; but the first has far less mental power, in this one line, than the second. All these things are plain on the first statement; but they are far from receiving due attention, and will so remain until the history of discovery is written without too much deference to popular reputation.

We may mention, as a thing to be guarded against, the disposition to depreciate a discovery because it is not something more than it pretends to be, which is frequently combined with a wish to judge of its merit by an arbitrary *à priori* standard of what it ought to have been. Sturm's theorem is a very pretty instance. Before it appeared, a purely theoretical and strictly certain method was eagerly sought after, and any such, however difficult, would have been held a great gain. The object is at last attained, but in a manner which is troublesome to use. To look at the way in which some writers now mention it, one would suppose they had entirely forgotten how many investigators of the first order had given up the subject without producing any method at all.

INVESTITURE. [FEUDAL SYSTEM, P. C.]

INVOLUTION AND EVOLUTION. In our article under this head, we gave an account, with instances, of the method of solving equations, which is commonly known by the name of the late Mr. W. G. Horner, schoolmaster, of Bath. We believe we may usefully give that article a considerable extension: first, because the method [COMPUTATION, P. C. S.] is one of the best exercises in computation; secondly, because neither its meaning nor its history is very generally understood, and the latter is very instructive. We suppose the reader of this article familiar with the one which preceded it.

The process of *involution*, as defined in the article cited, is the formation of the value of a rational and integral algebraical expression, such as ax^3+bx^2+cx+d, by a succession of multiplications separated by additions, as in

$$\{(ax+b)x+c\}x+d.$$

Horner's mode of doing this, takes the figures from left to right, or takes those of largest value first; and exhibits a plan of performing the operation, which combines the result of each figure with the joint result of all that come before. Thus in finding the value of the preceding when $x=123{\cdot}456$, the value is first found when $x=100$; then, by help of the preceding, when $x=120$; then, when $x=123$; then when $x=123{\cdot}4$; and so on. By this means we are enabled to proceed, when the value of the succeeding figures depends upon the results of those already found, as happens in all the cases of *evolution*, the inverse process. To take, however, the direct process first, we shall exhibit at length the finding of $9x^3-3{\cdot}141x^2+{\cdot}009x-1427{\cdot}499$, when $x=121{\cdot}23$; or, to avoid decimals in the expression, we may consider this as the thousandth part of $9000x^3-3141x^2+9x-1427499$. The process is as follows: a great many figures (about 115) being repeated twice over, in a manner wholly unnecessary in computation, in order to facilitate the explanation.

* We take this opportunity to correct an insinuation against a statement made by Newton which appears in FLUXIONS, P. C., p. 832. According to the registers of the Royal Society, as cited by Dr. Thomson and Sir David Brewster, the committee appointed to report on the dispute about the invention of Fluxions consisted of Arbuthnot, Hill, Halley, Jones, Machin, and Burnet. This, we said, is what Newton called a committee of different nations. We could not suppose that the list in the Royal Society's own records was incorrect: nor that all the English historians had failed to discover an existing minute. But in the life of De Moivre, written by 'Mr. Maty,' as he calls himself, but who must have been Dr. Matthew Maty, who was secretary of the Royal Society, and was the friend of De Moivre, we find it stated that the committee consisted of Arbuthnot, Hill, Halley, Jones, Machin, Burnet, Robarts, (the father of Lord Radnor), *Bonet, (the Prussian Minister), De Moivre*, Aston, and Taylor (no doubt Brook Taylor). On making inquiry at the Royal Society, we find that Maty's statement is correct, and that the five last names were subsequently added. Newton was therefore justified in saying that the committee was composed of 'gentlemen of different nations,' though the negligence of those who ought to have searched all the minutes which intervene between the first appointment of the Committee and its Report has made him appear to state what was absolutely false, in a matter of which he must have known the truth.

9000,	− 31,41	,0009	− 1,427499(121·23
	8968,59	8968,5909	8967,163401
	17968,59	26937,1809	A
	26968,59	A	8967163,401
	A	2693718,09	15505343,181
	269685,9	3269089,89	B
	287685,9	3880461,69	15505343181
	305685,9	B	15896635209
	323685,9	388046169	C
	B	391292028	15896635209000
	3236859	394546887	15975675212760
	3245859	C	D
	3254859	39454688700	15975675212760000
	3263859	39520001880	15987553760654100
	C	39585351060	
	32638590	D	
	32656590	3958535106000	
	32674590	3959515964700	
	32692590	3960496904400	
	D		
	326925900		
	326952900		
	326979900		
	328006900		

We first put down the coefficients as usual, not changing the sign of the last (which is only a convenience for *evolution*, and does not alter any figure). The value of x heing 121·23, we begin with 100, which, having two ciphers, we mark off by commas from the several coefficients 0, 2, 4, 6 places. We then proceed hy Horner's process with the figure 1 (not 100), taking care to make commas fall under commas, or to use the commas as if they were decimal points (which they are in fact, though not *unit-points*). As soon as we have done the first process, containing all that comes before the lines A, we learn as follows. Let

$$\phi x = 9x^3 - 3{\cdot}141x^2 + {\cdot}009x - 1427{\cdot}499$$

then, x being 100, ϕx, $\phi' x$, $\frac{1}{2}\phi'' x$ and $\frac{1}{6}\phi''' x$ are severally 8967163·401, 269371·809, 2696·859, and 9. We then write down the results again, after the lines A (which is not necessary in calculation), merely to show the new disposition of the commas. We are now to proceed with 20 (from the first 2 in 121·23), which, having one cipher, we mark off 0, 1, 2, 3 places in the several columns. Immediately before the lines B we learn that when $x = 120$, ϕx, $\phi' x$, and $\frac{1}{2}\phi'' x$ are severally 15505343·181, 388046·169, and 3236·859. We then write down these results without any commas, and proceed with the second 1 in 121, from which we find that when $x = 121$, the functions are 15896635·209, 394546·887, and 3263·859. We then begin to provide for the decimal point, hy annexing one, two, and three ciphers to the working columns, and taking the second 2 in 121·23 to work with, and applying Horner's process, we find, when $x = 121{\cdot}2$, that ϕx, $\phi' x$, and $\frac{1}{2}\phi'' x$, are severally (remembering that all the annexed ciphers are so many additional decimal places) 15975675·212760, 395853·51060, and 3269·2590. Finally, we annex the ciphers again, and with the 3 we find that $x = 121{\cdot}23$ gives 15987553·760654100, 396049·6904400, and 3280·06900.

Let us now compare the trouhle of this process with that of any other method of doing the same. If we throw out all the figures which we have written twice over merely for explanation, and also the last two and one lines in the second and third columns, which are only wanted to go on further with, we have written down about 280 figures. The ordinary verification costs about 340 figures. It is true that every step is both a multiplication and an addition in one: but this can be done and ought to be done in the use of this method, and is not done in the ordinary method. And we have not only the advantage of a purely mechanical method, in which the first arrangement causes the succeeding steps to require nothing except a look at the successive figures of the value, hut the still greater advantage of being able, at the end of the process, to make any small alteration of value with ease. If, for instance, having discovered that 121·297 would do better than 121·23, we wish to get additional accuracy, we have but to ruh out the last 3-process, and proceed with 9 and 7. In the ordinary mode, we must either repeat the whole process again, or correct approximately by substituting 121·23 − ·003, which will reqnire us to calculate $\phi' x$, and perhaps $\frac{1}{2}\phi'' x$.

We will now exhibit a common multiplication, and the formation of a square: not, of course, that we attach any particular value to these simple cases, but that we may show the uniformity of the process. Required 14796 × 32316, or the value of $14796x + 0$ when $x = 32316$. We repeat the lines as before, which is more than is necessary, and makes this process look very long.

14796	0,0000(32316
	44388,0000
	443880,000
	473472,000
	4734720,00
	4779108,00
	47791080,0
	47805876,0
	478058760
Answer	478147536

Required the square of 279·46, or the value of $x^2 + 0x + 0$, when $x = 279{\cdot}46$.

1	,00	,0000(279·46
	2,00	4,0000
	4,00	400,00
	40,0	729,00
	47,0	72900
	54,0	77841
	540	7784100
	549	7806436
	558	780643600
	5580	780978916
	5584	
	5588	Answer 78097·8916
	55880	
	55886	
	55892	

The process here described is one which, we venture to say positively, has neither been put in its right place, nor received its due reward. It is the natural extension of the common process of multiplication, and its inversion is as naturally and necessarily the proper mode of solving equations, as that of multiplication is the same for the simple equation $ax = b$, or common division. The inventor of it must rank, not with the analyst or the algebraist, commonly so called, hut with the discoverer of the process of multiplication and division, and the extraction of the square root.

The application of this method to the solution of $\phi x = 0$ consists in finding the first figure hy trial, and making use of the Newtonian approximation to find successive figures; namely, that if a be nearly a value of x, $a - \phi a : \phi' a$ is more nearly so. This method becomes difficult when two roots are nearly equal; hut the difficulty lies in what may be called Newton's part of the complete method, not in Horner's part. When the difficulty of algehra shall he conquered, the process of arithmetic may easily be amended in the *trial part;* but to suppose that a capital improvement in the manner of conducting computations is little worth, because it is not accompanied hy a victory over difficulties of quite another kind, is as unreasonable as to quarrel with a calculating-machine because it is not an inventing-machine. This much can be said, that, with a little more trial, Horner's method may be applied to the case of nearly equal roots; and that, as it is, it is more efficacious in discovering them than any other method.

To what is said in INVOLUTION and EVOLUTION, P. C., we may add the following remarks:—1. When the last term is positive, and would in the ordinary process be made negative, it is better, instead of changing the sign of the last coefficient only, to change the sign of all but the last. Thus in solving $x^3-11x+1=0$, the heads of the columns should be -1, 0, 11, and 1, instead of 1, 0, -11, and -1. Also, that if at any period of the process the divisor and dividend columns should become negative, the signs of all should be immediately changed.

2. In making the contractions, it will be advisable to make the figure which comes next after the separating line correct, to continue it, in fact, till the next contraction, and to use it to carry from. This is not done in our main article (P. C.), but it is done in the instance in COMPUTATION, P. C. S. In that instance, the following figures, seen one over the other in the last column but one, as follows 3, 5, 7 — 6, 9, 1, — 2, 2, 2, are figures cut off by the contraction, but made up from the second column to carry from into the fourth.

3. If, at the beginning of the process, all the beads of the columns be multiplied by 9, the root will not be altered, and, until the contraction begins, the verification by casting out nines is rendered easy, since every result in every column is divisible by 9.

We shall now show how the process works in some equations which have equal, and nearly equal, roots.

Let $x^4-6x^2+9=0$, which has two roots, each equal to $\sqrt{3}$.

−1	0	6	0	9 (1·7320
	−1	5	5	40000
	−2	3	8000	1210000
	−3	000	5697	5041
	−40	−329	748000	3
	−47	−707	401653	
	−54	−113400	49132	
	−61	−115449	25190	
	−680	−117507	1220	
	−683	−119574		
	−686	−11971		
	−689	−11985		
	−692	−11999		

The existence of equal roots, or of nearly equal roots, might be here suspected from the slow increase of the divisor column; but the method could not verify the fact of their being two absolutely equal roots. The column preceding the divisor column being large and negative, requires us to make trial of figures above, not below, those which the divisor column seems to indicate. But nearly equal roots may sometimes be detected, as in the following instance. Let $7x^3-10x^2-14x+20=0$, of which it is known that ono root lies between 1 and 2. The ordinary process gives

−7	10	14	20 (1·41421356
	3	17	3000
	−4	1300	8000
	−110	748	1547000
	−138	8400	61608
	−166	6453	3859
	−1940	449900	1013
	−1947	371348	160
	−1954	292684	18
	−19610	288745	1
	−19638	284806	
	−19666	28460	
	−19694	28440	

Tbis root may be carried on without difficulty. But at the end of the second process, when tbe dividend is reduced to 8000, the divisor only 8400, and the preceding column as much as -1940, it may be worth whilc to try another figure. This state of things gives a suspicion tbat there is another root in the immediate vicinity of the one in hand. If the three last columns be $+a$, b, and c, and if wo find that $pa+b$ is nearly $c\div p$, whicb is tbe trial test of p being a new figure of the root, we are sure that $(p+1)\,a+b$ will not be near $c\div(p+1)$: and moreover $p\,(pa+b)=c$ has not two positive roots. But if the three last columns be $-a$, b, and c, it may very easily bappen that $b-pa$ may be nearly $c\div p$, and $b-qa$ nearly $c\div q$; for $p\,(b-pa)=c$ has two positive roots. Perfect certainty, in the absence of an easy algebraical criterion, may only be attainable by trying every figure. In the instance before us, finding 1·41 succeed, with a presumption of a larger root, we try 1·43, beginning with

−7	−1940	8400	8000
	−1961	2517	449
	−1982	−3429	
	−2003		

Tbis figure will not do, for now a permanent difference of sign is established between the dividend and divisor columns. We then try 2, as follows:—

−7	−1940	8400	8000
	−1954	4492	−984
	−1968	556	
	−1982		

There is now a difference of sign between the two last columns, but, looking at tbe second column, we see that agreement may be restored by the next figure. The figure 8 will do it, as follows:—

−7	−19820	55600	−984000
	−19876	−103408	−156736
	−19932	−262864	
	−19988		

and 26286400 is not contained 10 times in 156736000. All the signs being now negative, we may chsnge them all. If we had tried 7 instead of 8, we should bave had

−7	−19820	55600	−984000
	−19869	−83483	−399619
	−19918	−222909	
	−19967		

But now 22290900 is contained more than 10 times in 399619000, which shows that 7 is not high enongh. If we try 9, we have

−7	−19820	55600	−984000
	−19883	−123347	+126123

and a permanent difference of sign is establisbed between tho two last columns, whence 9 is too high. Proceed then with

7 199880 26286400 156736000 (1·428

and we find 1·42857142857 ... for a root. Tbe reader msy watch tbe operation in the following equation:

$$2430x^3-8667x^2+10293x-4070=0$$

the roots of which are 1·111 ..., 1·222..., and 1·233 ...

Whatever common figures two roots of $\phi x=0$ may have begun with, there must be a root of $\phi' x=0$ wbich begins with these figures. And whatever common figures three roots may begin with, there must be two roots of $\phi' x=0$, and one root of $\phi'' x=0$ which begin with those figures: and so on. If tbere were a difficult equation having three roots nearly equal, no method of detecting them would be easier, of all those known at present, than solving contemporaneously the tbree equations $\phi x=0$, $\phi' x=0$, $\phi'' x=0$, not making any step in one till all had been brought np; that is, one step of each first, then the second of each, and so on.

It may happen that a finite root is establisbed, and yet that the process must be continued to obtain another root beginning with the same figures. For example,

$$9x^3-46x^2+75x-38=0$$

It will be seen in the following process that 2 is a root, with a presumption, from the appearance of the divisor column and thc one beforo it, that there is another root beginning with 2. And by trial 2·1111 ... is found to succeed.

9	−46	75	38 (2·11111
	−28	19	0
	−10	−100	11000
	80	− 11	1221
	89	8700	23
	98	9779	12
	1070	10867	1
	1079	10977	
	1088	11087	
	1097		

We shall now proceed to a snort account of the bistory of tbis problem, and of the controversies which have existed, and to some extent still exist. For a fuller account of it up to the time of Mr. Horner, see an article in the 'Companion to the Almanac' for 1839.

Before the time of Vieta, evolution consisted in the rules for the performance of division, and extraction of the square and cube roots, in forms probably derived from the East. To him [VIETA, P. C., p. 315] we owe the first publication of a numerical method of finding the successive figures of the root of an algebraical equation by means of the value of the function equated to zero in the equation. This method of Vieta is in fact that which Horner's process now makes so easily practicable. If $\phi x=0$ be the equation, and a a part of the root, it uses ϕa, and $\phi\,(a+1)-\phi a$ as a divisor. The process is so cumbersome, that Vieta does not attempt to apply it to equations having more than two figures in the root.

This method attracted but little attention on the continent:

but in England, where everything relating to numerical calculation has been always diligently studied, it was much noticed, and received extensions of power. In the posthumous work (1631) of Harriot [Harriot, P. C.] examples of it are given with the improvement of forming only so many figures of the divisor as are wanted: and he ventures upon roots of three places. In the second edition of Oughtred's 'Clavis Mathematica' (1647) Vieta's method is given without Harriot's improvements. But we did not find till very recently that the first who used Vieta's method to any great extent was Briggs, in the calculation of the sines, &c., in the 'Trigonometria Britannica.' In the preface the method is applied to equations of the third and fifth degree, and partially described for the seventh and higher degrees: with examples carried to fifteen and sixteen figures of the root. It is for the facilitation of these solutions that the *Abacus* παγχρηστος is given, which some have unreasonably interpreted as giving Briggs a claim on the binomial theorem. Gellibrand tells us that Briggs formed his tables of sines by algebraic equations and differences about thirty years before his death. Now Briggs died in 1630, and Vieta's tract appeared in 1600: the former must then have received the work soon, immediately seen the importance of the method, and commenced operations by means of it. We cannot give Briggs any independent title to the invention; for it is likely enough that he was in correspondence with Vieta, whose works he certainly knew. One of his examples is the solution of what would now be written

$$x^3-3x=1{\cdot}298896096660366$$

for which he gets $x=1{\cdot}917639469736386$. He puts down the work as far as... 697, proceeding towards the end by several figures at a time: and he has got what Vieta had not, the Newtonian divisor $\phi'x$ instead of $\phi(x+1)-\phi x$. Of course it adds materially to the historical value of this method that it was thus used in an operation of so much importance to the progress of mathematics in general. The dates above given may even cause a suspicion that it was the power of solving equations thus suddenly acquired, which first suggested the calculation of the natural sines, &c., in the 'Trigonometria Britannica.'

Wallis, in his Algebra (1684), gives the method of the '*numerose exegesis*,' as he calls it (Vieta had called it *potestatum adfectarum ad exegesin Resolutio*) with an example of the fourth degree worked to seventeen places of the root. He makes use of the method of contracting the figures towards the end. In this same Algebra appeared, for the first time, Newton's method of approximation, which soon superseded the exegesis, into which however it had been virtually incorporated by Briggs. Newton's approximation, at least in the general form which it took in the hands of Taylor, is as follows. If a be a near value of x in $\phi x=0$, then, except when there are two nearly equal roots, a nearer value is

$$a-\frac{\phi a}{\phi' a} \text{ or } a+\frac{-\phi a}{\phi' a}$$

The old exegesis, and especially Briggs's form of it, employs this principle; $-\phi a$ is calculated, and either $\phi' a$ or $\phi(a+1)-\phi a$. Briggs, who proceeds by several figures at a time, and uses $\phi' a$, does really use what was afterwards called Newton's method.

When the exegesis was abandoned by Raphson and others, in favour of Newton's form of operation, no further improvement was made in the direct numerical solution of equations, until the time of Mr. Horner; at least no further improvement was published. Mr. Henry Atkinson, a young man of Newcastle, re-invented the whole method in 1801, applying Newton's divisor, and giving rules by which one divisor was made to help in forming the next. This was read to the Philosophical Society of Newcastle in 1809, and published posthumously, as 'A new Method of extracting the Roots of Equations,' Newcastle, 1831, 4to. In our article in the 'Companion to the Almanac,' already cited, we have supposed that no one can be shown either to have used $\phi' a$, or to have made each value of it help the next, before Mr. Atkinson: but we now find that Briggs was before him in both points.

Lagrange's method of transforming the root into a continued fraction [Theory of Equations, P. C.] does not need notice here, because it beloogs to another mode of expression. But it ought to be noticed that Horner's process very much abridges the labour of Lagrange's method, as much indeed as it does that of Vieta's exegesis, and for the same reason. Mr. Exley, of Bristol, in the 'Imperial Encyclopædia,' article Arithmetic, improved (according to Horner himself) the common method of extracting the cube root, so as to precede Horner in this particular case. We believe more than one method had been given for reducing the enormous labour of the ordinary extraction of the cube root: we may mention one, which is ingenious and effective, and almost exactly a particular case of Horner's method, given by Mr. A. Ingram, in his edition of Hutton's Arithmetic, Hawick, 1811, 8vo.: and Mr. Horner himself refers to an edition of Melrose's Arithmetic, by Mr. Ingram (the same, we suppose) as containing such a method.

Mr. Horner's paper was read to the Royal Society on the 1st of July, 1819, and was published in the current volume of the Transactions, on the 1st of December. These dates are of importance: the publication of the above paper was the signal for more than one person to make a nibbling claim to the invention. Mr. Horner was unfortunate in two points. First, he had not sufficient knowledge of antient algebra to be aware that his method contained the process of Vieta, and that his real claim consisted in the discovery of the beautiful process by which the labour is immensely reduced, and completely systematized. Secondly, he appears to desire to be the analyst rather than the arithmetician, and will not show anything except to those who can take all. It is true, beyond a doubt, that his method is adapted to every sort of equation, and that it is as great a help to the person who desires to solve $\tan x-ax=0$, or $\varepsilon^{\sin x}=x$, as to the other who wants nothing but a common algebraical equation. So far, then, it is more than Vieta's method simplified; it is the same also extended. But if the inventor had proceeded from simple algebra to the more complicated cases, his merits would have been more rapidly appreciated. He did not well see that his mode of solution applies as well to the integer part of the root as to the fractional; nor did he fully comprehend how much of his own discovery consisted in the general mode of calculating the value of ϕx, as given at the beginning of this article. But that we may not do him injustice, and still more that we may enable those of our readers who have not access to the original paper to see how completely he had got hold even of the most convenient arithmetical process, we give his solution of the famous Newtonian instance $x^3-2x=5$. After reducing the root by 2, the heads of his columns are 1, 6, 10, and 1 (the first column, which is always vacant, he does not set down). He then annexes either dots or ciphers, and proceeds exactly as follows

```
  6..          10....              1000000(·0945514815
 609             5481               949329
  184          105481               50671000
 62|74           5562..             44517584
   |.8           25096               6153416
..|62|82       11129396              5578825
                 2511 2               574591
                  314 12              558055
               111576 4 92   1,1,1,6,1)16536(14815
                   31|4 1                11161
                    3|1 4                 5375
               111611|0 4                 4465
                    3|1                    910
             11161|4|1                     893
                                            17
                                            11
                                             6
                                             6
```

As soon as Mr. Horner's paper had been published six months appeared 'A new Method of Solviog Equations,' by Theophilus Holdred, London, 1820, (preface dated June 1,) 4to. The method is taken from Harriot; and a supplement is added, which gives Horner's method. Both are claimed as independent inventions, and Horner's name is not mentioned. Mr. Holdred asserts that, after having had his method for forty years, he was led to that in the supplement* by a mistake he committed in solving an equation sent him by one of his subscribers. We have given, in the article of the 'Companion to the Almanac,' already cited, our reasons for coming

* We cannot but believe that Mr. Holdred did see Mr. Horner's paper. Had he mentioned it, and the name of the subscriber, his equation, the mistake made, &c., &c., distinctly declaring when and where he first saw Horner' paper, he might have possibly established a claim to be a second inventor.

to the conclusion that Mr. Holdred took his first method from Harriot, and his second from Horner.

A claim was made by Mr. Peter Nicholson in various places, which is quite futile. We acquit Mr. Nicholson (a highly respectable man, eminent in the application of mathematics to the arts) of all unfair intention: and we must remind our readers of a point without the knowledge of which the various controversial writings on this subject will be full of confusion. Hardly any one knew of Vieta's Exegesis, which there is little doubt that both Horner and Atkinson reinvented. In fact, so completely had this exegesis dropped out of sight, that even Dr. Peacock, in his short account of Horner's method ('Report on Analysis to the British Association') does not allude to it. Accordingly, all the re-inventors of Vieta's method speak of quite new rules discovered for the solution of equations, and treat Horner's process as a constituent part of one of the new inventions. But a person acquainted with the history of the subject finds nothing new except Horner's process. Vieta had the main system, Briggs had the Newtonian divisor, Wallis had the method of contraction, Briggs had *a* method of making one divisor help the rest: Horner had *the* method which must finally be adopted. Budan, as we shall see, had only a particular case of that method, and did not apply it to any mechanical process of numerical solution.

Mr. Nicholson claims Horner's identical process, and fairly refers to the very place in which he says it is to be found. But on looking there (see the article already cited in the 'Companion to the Almanac'), we find that he has been deceived by a distant resemblance, and that, though he has given a new and useful process for a useful purpose, neither the process nor the purpose is Horner's. At the same time it is but justice to Mr. Nicholson to say, that in his 'Elements of Algebra,' London, 1819,* 12mo, he made as near an approach to Horner's method as could well be done, and applied it in the case of equations of the second and third degrees. The succession of columns is seen, each column helps the next, and each step in any one column helps the next step. But the grand simplification, which the controversialists called the 'non-figurate method,' is wanting: so that this process of Nicholson's is perhaps hardly more than Briggs was in possession of. Mr. Nicholson had received Mr. Holdred's method, whose name he properly mentions in the preface. This method he had greatly improved; and it seems he wished that Holdred should publish his amended methods; but he asserts (in the preface to his work on Involution and Evolution) that the latter refused, alleging that his own credit would be diminished, unless he could pass them as his own.

Dr. Peacock had never seen Holdred's tract, and his result, derived from the assertions of Mr. Nicholson and from Horner's paper, is that Nicholson, by a combination of the methods of Holdred and Horner, reduced the method to its present practicable form. But any one who will solve $x^3-2x=5$ in the systematic form we have given, will see that Horner had that form. Nicholson was, we believe, the one who first clearly saw that the method, in its simplest organization, applies as well to the integer as to the fractional portion of a root. All Mr. Nicholson's simplifications, as given in his latest writings, consist in doing in the head some of the things which Horner put down on paper. The form we give carries this still further; and those who can do what we have recommended all arithmeticians to practise in COMPUTATION, P.C.S. can follow us: but there is no invention in this.

Some have been disposed to give a good deal of the merit of this system to Budan; and his claim must be considered. Two editions of the 'Nouvelle Méthode pour la Résolution des Equations numériques,' Paris, 4to., were published in 1807 and 1822. The basis of M. Budan's operations is the simple case of Horner's process in which the root of an equation is diminished by unity. This is done exactly in the mode by which Horner afterwards proceeded. Thus to lessen the root of $x^3-2x-5=0$ by unity, Budan proceeds thus:—

$$
\text{(A)}\quad
\begin{array}{l}
1+0-2-5\\
1+1-1-6\\
1+2+1\\
1+3\\
1
\end{array}
$$

Answer $x^3+3x^2+x-6=0$

But to lessen the root by 2, Budan is never able to arrive at the process on the left, which is Horner's: he must repeat the process of diminishing the last root by one, as on the right.

$$
\text{(B)}\quad
\begin{array}{l}
1+0-2-5\\
1+2+2-1\\
1+4+10\\
1+6\\
1
\end{array}
\qquad\Bigg|\qquad
\begin{array}{l}
1+3+1-6\\
1+4+5-1\\
1+5+10\\
1+6\\
1
\end{array}
\quad\text{(C)}
$$

Accordingly Budan has both (A) and (C) to do, where Horner has only (B). To diminish a root by 3, Budan has three processes, and so on. To diminish a root by 10, 20, &c., he divides the roots of the original equation by 10, then diminishes by 1, by 1 more, &c., and then multiplies the resulting roots by 10; and similarly for 100, &c. It is obviously possible, by a large amount of calculation, to obtain the root of an equation in this manner; but Budan is not only obliged to call in other methods, and even thus to spend very great labour, but he ends by presenting the root in the form of a sum of common fractions, each of which must be reduced to a decimal. Thus for $x^3-2x=5$, he gets

$$x=2+\frac{1}{11}+\frac{1}{275}+\frac{1}{165925}=2\cdot094551481364$$

Budan's method is not then even of the same species* as Horner's. In an appendix added to the edition of 1822, two years after Horner's paper, there is the method extended to the process for diminishing the root by n (Horner's process), but no use is made of it, and singularly enough the only example given is one in which n is -1.

Mr. Horner ('Leybourn's Repository,' page 38, of part ii., vol. v.) denies ever having seen Budan's work until 1818, after his method was finished. This, in one point of view, counts for nothing; for every discoverer has a right to have it supposed that those who come after him have used his works: that is to say, he would have a right to the credit therefrom arising, even though it could be shown that subsequent discoveries were made without his aid. If a partial or unfinished method turn out to have a value of quite a new character when made complete, it is impossible to deny to its author the credit of having been further than his contemporaries on the road towards the complete method: consequently, Budan must have, in one sense, the merit of having proposed a particular case of that which Horner afterwards used. But, as it happens, a contemporary of Mr. Horner, in trying to insinuate that he had taken his method from Budan, has furnished independent evidence to the contrary. Mr. Nicholson, in a note to the preface (page ix.) of his essay 'On Involution and Evolution' states: "I am informed by Mr. Dickson that about twelve months ago he (Horner) purchased at his shop, in St. Martin's-le-Grand, an 'Essay on the Numerical Solution of Equations,' by Budan; at which time he mentioned that he was engaged expressly on this subject." This called forth the preceding statement from Mr. Horner, who, had he had any unfair intention, and had he really been indebted to Budan, would have argued from the date of Mr. Nicholson's preface that he must have bought Budan only just time enough to insert the note about him in his paper before he sent it to the Royal Society. Instead of this, he answers in the most straightforward manner, that he bought Budan about July, 1818, nearly *two* years before Mr. Nicholson wrote; but avers that his method was then finished. And this we entirely believe; and also that it would have been impossible for him, fully engaged as he was in teaching a school, to have produced his method, so as to send it to the Royal Society in the spring of 1819, if he had only seen the first hint in the summer of 1818. But had he seen Budan's work, and had he thence derived the hint which he improved, his merit would not have been the less: Lagrange, the greatest writer on equations then existing, had seen it, Legendre had seen it: and both had closely examined it, and reported to the Institute upon it. The members of the Institute had seen it. Lagrange, too, knew of Vieta's Exegesis. But no one,

* The preface is dated May 17, 1819, and the publication took place early in July, Mr. Horner's paper having been publicly read at the Royal Society on the first of that month.

* He recommends that when more than *two* or *three* decimals of a root are wanted, the work should be turned over to *workmen* (*manœuvriers*) who are to be a distinct class from the mathematicians. The best comment on this will be to insert in this little foot note every figure of the work for *six* places of the equation on which this remark was made with a guess at the *seventh*.

1	0	−2	5 (2·0945515
	2	2	1000000
	4	100000	50671
	600	105481	6153
	609	111043	574
	618	111204	16
	627	111545	5
		11157	0
		11160	

except the Bath schoolmaster, ever brought forward Budan's method, or any extension of it, either from Budan, or independently, to the improvement of Vieta. Fourier had seen Budan's book, and had invented a method of his own of solving equations; or rather had given his own mode of conducting Newton's approximation; but this method is far below that of Horner.

We have written so much on the discovery of this method, because unfair attempts were made by claimants who had no title whatever to deprive the author, who was a man of real genius, of his rights over his own discovery. We refer to MM. Holdred and Nicholson: though we do not believe the second was knowingly unfair. Mr. Atkinson, when he first saw the 'non-figurate method,' (as some called the subject of this paper,) saw and said that it was a 'capital improvement.' We have written also because it can hardly yet be said that mathematicians are alive to the value of this grand completion of the system of arithmetic. The continental writers show no knowledge of it; the Oxford and Cambridge elementary works do not yet recognise its existence. The fact is, that mathematicians dislike calculation, and are apt to form hasty opinions on numerical methods before they have given them sufficient trial. The first elementary writer who brought Horner's method into instruction was Mr. (now Professor) Young, in his 'Elements of Algebra,' published in 1823.

In 1831, eleven years after this method was published, appeared Fourier's posthumous work on equations, containing an extended use of Newton's method. It amounts to employing ϕa, $\phi' a.h$, $\frac{1}{2}\phi'' a.h^2$, &c., to calculate the value of $\phi\,(a+h)$, and $\phi' a$, $\phi'' a.h$, &c., *separately*, to calculate $\phi'\,(a+h)$; and so on. Fourier was an expert arithmetician, and in this very work shows his power of suggesting new forms of arithmetical process; but he does not come near anything like making the previous calculation of $\phi^{(n)}\,(a+h)$ give assistance to that of $\phi^{(n-1)}(a+h)$. The equation $x^3-2x=5$, which Wallis happened to take as his instance of Newton's method, has always been the example on which numerical solvers have shown their power. No one can be said to have carried a method beyond those which preceded, unless he has solved this equation to more places than they have done. Fourier went to thirty-two decimal places, which we do not know that any one had done before. Some students of University College, London, (and one of King's College) none exceeding eighteen years of age, carried Horner's process further still, their independent calculations giving, as the root to 52 figures;—

2·09455,14815,42326,59148,23865,40579,30296,38573, 06105,62824,2

Mr. Nicholson gives, as the work of a young computer, the following solution of

$$4x^6+7x^5+9x^4+6x^3+5x^2+3x=792$$

$$x=2{\cdot}05204,21768,79605,36521,40434,01281,20197,34602, 75599,54554,17242,14$$

We have left entirely out of sight all the irrelevant controversy relating to the method of finding the limits of the roots, conducting the process when two roots are nearly equal, and so on. The claims of Budan, Fourier, Horner, &c., are here mixed up in a manner which requires a sifting investigation. Very frequently the value of Horner's method is stated as depending upon points of this kind. When any of the doubtful cases arise, which we noticed at the beginning of this article, we find, for ourselves, that the ease with which repeated trials are made by Horner's process gives us more command of these questions than anything else; in fact Fourier's theorem [STURM'S THEOREM, P. C.] is very easily brought to bear by means of it. But it must be admitted, that all methods which in any way include the Newtonian approximation are imperfect, when roots are nearly equal, in not having a better addition to the root a already obtained than $-\phi a:\phi' a$. Let a better method come, and we have no doubt that Horner's process is more ready to make easy use of it than any other. A student who is very slow at finding out the trial figures of common division, might as reasonably depreciate the rule of division altogether, as quarrel with Horner's method because there is now and then a difficulty in ascertaining whether or no more than one figure will do to proceed with. The same difficulty must exist in every method, as matters now stand. In the meanwhile, we think the discoverer of the process, which is now beginning to take its proper place, deserves attention to his request when he says, speaking of the antagonist claims which had started up—"All I ask of them [mathematicians] in recompense for the facilities consigned to their use in the non-figurate method, is to bear in mind that I alone am the author of it." And we have no doubt whatever, and are willing to stake our credit upon it, that when the inertia of the higher mathematicians in matters of computation is overcome, and when the mode of solving equations has reached the schoolboys, as it is rapidly doing, the name of Horner will be one of the household words of pure arithmetic, and himself looked upon as one of the greatest of its modern benefactors. Justice requires that his name should remain attached to his process.

INWOOD, the family name of three architects, father and two sons, who constructed many public and private buildings in London and elsewhere.

WILLIAM INWOOD was born about the year 1771. His father, Daniel Inwood, was bailiff to Lord Mansfield, at Caen Wood, Highgate, near London. William Inwood was brought up to the professions of architect and surveyor. He was employed as steward to Lord Colchester, was surveyor to a large number of persons, and several architects now living were instructed by him. He had two sons, one or other of whom was employed conjointly with himself in most of his larger works of architecture, and he was assisted generally in all his professional pursuits by both. He died March 16, 1843, aged about seventy-two. He was the author of 'Tables for the Purchasing of Estates, Freehold, Copyhold, or Leasehold; Annuities, and for the Renewing of Leases held under Cathedral Churches, Colleges, or other corporate Bodies, for Terms of Years certain and for Lives, &c.,' London, 1811, 8vo., a work founded on those of Baily and Smart. It principally differs from previous works in giving the values to years and quarters, as well as to decimals of a year; the former being intended for those who cannot read decimal fractions.

HENRY WILLIAM INWOOD, the eldest son of William Inwood, was born May 22, 1794. He was brought up by his father to his own professions. He was several years in Greece, and examined with great care the architectural remains at Athens and elsewhere, and made plans and drawings of them. He assisted his father in most of his architectural pursuits, especially in designing and constructing St. Pancras Church, and had he not suffered so much as he did for many years from ill health, would probably have attained to great eminence as an architect. His death is supposed to have occurred March 20, 1843, about which time a ship in which he had sailed for Spain was wrecked, and all on board perished.

Henry Inwood published in 1827 'The Erectheion at Athens, Fragments of Athenian Architecture, &c., illustrated with Thirty-nine Plates.' The work, which consists of 162 pages exclusive of the plates (engraved by Nicholson), is printed on elephant paper of very large size, and was published by subscription. He had also commenced a work entitled 'Of the Resources of Design in the Architecture of Greece, Egypt, and other Countries, obtained by the Studies of the Architects of those Countries from Nature,' 4to. London, 1834, with explanatory engravings. Two parts were published, but owing to ill health and his untimely death the work was never completed. He collected many fossils and remains of antient art, most of which are now in the British Museum.

CHARLES FREDERIC INWOOD, second son of William Inwood, born November 28, 1798, besides assisting his father in his works, was the architect of the church of All Saints at Great Marlow, in Buckinghamshire, which was completed in 1835. He also built the St. Pancras National School, in Southampton Street, Euston Square, a large plain brick building of little architectural pretension. He died in May, 1840, aged forty-two.

St. Pancras Church, New Road, London, which was the conjoint work of William Inwood and his son Henry, is in its kind and in its peculiar beauties unique among the churches of the metropolis. The building was commenced July 1, 1819, was completed May 7, 1822, and cost 76,769*l*. The exterior of the body of the church is, with certain necessary deviations, an imitation of the Ionic temple called the Erectheion on the Acropolis at Athens [ERECTHEION, P. C.]; the tower is an adaptation from the building commonly called the Tower of the Winds, also at Athens, which is properly the Horologium, or water-clock, of Andronicus Cyrrhestes. The measurements and drawings of these buildings were made by Henry Inwood on the spot. The semicircular apsis at the east end of the church supplies the place of the straight west wall of the Pandrosion, or temple of Pandrosos, which adjoined the Erectheion at the west end. The two covered buildings which project from each side of the east end, forming the entrances to the catacombs of the church, are adaptations from the south portico of the Pandrosion. The caryatid figures, of which there were six, four in front and one at each side, were in the place of columns, and supported the pediment of the south portico of the Pandrosion; the opposite north portico had columns. There is one of the original caryatid figures in the Elgin Room of the British Museum. The sarcophagus beneath each roof indicates the purpose for which the projecting buildings have been constructed. The two Ionic half columns engaged in the walls on both sides of the west end are additions made to form an apparent basis for the tower. The windows are adaptations modelled in accordance with the form of the doors. Grecian temples had no windows; large temples had a central portion of the roof open to the sky; small temples generally received light only from the door, which was wide and lofty. The octagonal tower, with its two ranges of eight columns each, in its form and general effect, combines well with the building and portico, and is in itself an object of peculiar beauty. In the interior the galleries are supported by very elegant slender columns. The ceiling is flat, and formed into a number of ornamented pannels. The general effect of the interior is good, though rather deficient in light, especially below the galleries, from the small size of the windows.

The Westminster Hospital, near the west end of Westminster Abbey, was built by William Inwood in conjunction with his son Charles. It was begun in 1832, completed in 1834, and cost 27,500*l*. The architecture is Tudor Gothic, the material is gray Suffolk brick, with stone facings. It is quite plain except the front and the truncated angles which connect the front with the two ends. The front extends about 200 feet in length, and is 72 feet high in the centre, which projects slightly and is a story higher than the two wings. The entrance is by a flight of stairs beneath a large stone porch constructed in three divisions with flat pointed arches, enriched pinnacles, and other appropriate ornaments. Above the porch is an oriel window which extends to the height of the two upper stories; and at each of the truncated angles is an oriel window similar to the one over the porch. The flat windows are deeply indented, and are divided into four equal compartments by a mullion and transom, but the two upper compartments are distinguished from the two lower by trefoil tracery at the tops, and each window is surmounted by a weather-moulding. There are in all 260 windows. The brick harmonizes well with the stone portico and dressings, and the general appearance of the front is very handsome. Perhaps the battlemented parapet may be objected to as inappropriate to the purposes of the building, and as less handsome than a parapet of open-work would have been, similar, for instance, to that of Westminster Abbey in the part which has been renewed, where such a pierced parapet occupies the place of the old battlement. The interior arrangements and ventilation are excellent. There are 19 wards and about 250 beds.

William Inwood also built the Regent Square Chapel, opened in 1826; the Camden Town Chapel, opened in 1824; and Somers Chapel, in Seymour Street, opened in 1826, all of which are chapels of ease to St. Pancras Church. He also built numerous other structures, mansions, villas, barracks, warehouses, &c.

(*Written Communication*; *Companion to the Almanac*; Knight's *London*; 'Elgin Marbles,' in *Library of Entertaining Knowledge*.)

IOWA, a territory of the United States of North America, is bounded on the west by the Missouri river and the White Rock river; on the east, by the Mississippi and a line drawn direct north from the sources of the Mississippi to the Lake of the Woods; on the north, by the parallel of 49° N. lat., which separates it from the British possessions; on the south, by the parallel of 40° 35′ N. lat., which separates it from the State of Missouri. The area has been estimated at 200,000 square miles, which is nearly four times the area of England, exclusive of Wales.

Of the northern part of the territory a very large portion is occupied by a vast extent of high ground, called the Coteau des Prairies, which commences about 48° N. lat., and terminates about 43° N. lat., extending in width more than fifty miles between 98° W. long., and 99° W. long. This huge mass, which is said to rise more than 1000 feet above the surrounding country, has generally a rounded surface, with few irregularities, and is for the most part destitute of trees. East of the Coteau des Prairies is an extensive valley, in which the Red River runs northward to Lake Winnipeg, and the St. Peter's River south-east and then north-east to the Mississippi. West of Coteau des Prairies is a broad valley of prairie land traversed by the James River, and this valley is separated from the Missouri by a high range of ground similar to the Coteau des Prairies. The upper parts of both of these great river-valleys have been estimated to be more than 1000 feet above the level of the sea. The rest of the country between the Mississippi and the Missouri contains no mountains nor even hills of large size, but consists of rounded sweeps with broad valleys in which rivers flow, the upland tracts being connected with the valleys by gentle slopes. Belts of forest occur near the rivers, especially contiguous to the Mississippi and the Missouri, but the rest of the country either consists of prairies or is covered with brushwood. The south-east part of the territory, which is the only part in which the settlers are numerous, and where the lands have been sold by the federal government, is generally undulating, interspersed with timber-lands and prairies, and abounding in springs and streams. This tract, which is very fertile, extends from the Des Moines River south to the Turkey River north, and westward from the Mississippi fifty or sixty miles to the Indian boundary.

In Iowa there are numerous rivers, which rising in the elevated grounds of the northern parts of the territory, flow respectively eastward into the Mississippi, westward and southward into the Missouri, and northward into the British possessions. Those which flow into the Missouri are comparatively small, except the James River, which has a course southwards of upwards of 400 miles, and falls into the Missouri where that river flows to the east some distance below Grand Detour. Of the rivers which fall into the Mississippi, one of the largest is the Des Moines River, which is navigable for 300 miles from its mouth at the south-eastern extremity of the territory. Next in size is the St. Peter's River with its numerous tributaries, which rises in the Big-Stone Lake, flows about 300 miles south-east, then about 200 miles north-east, and falls into the Mississippi a little below the Falls of St. Anthony; its course is very winding, so that if measured in a straight line, its length perhaps does not exceed 300 miles. The Skunk River, the Lower Iowa, with its affluent the Cedar River, the Wabepisipimecon River, the Great Macquoquetois River, the Turkey River, and the Upper Iowa, are also rivers of large size. Of the rivers which flow northward the Red River is the largest; it rises in the same valley as the St. Peter's River, in Lake Travers, which is near the Big-Stone Lake, and has a course of from 300 to 400 miles northward before it enters the British possessions, through which it flows to Lake Winnipeg. In the most northern and north-eastern part of the territory, though the elevation above the sea is not much less perhaps than 1000 feet, the country is flat and swampy, and there are numerous lakes. There is a lead-mine district in the south-eastern part of the territory, and considerable quantities of the metal are obtained.

There are no towns yet of sufficient size to require description; the largest are Burlington, Bloomington, Iowa city, Du Buque, and Fort Madison. There is a newspaper published at Burlington. Iowa, the capital, is in 41° 28′ N. lat. and 13° 45′ W. long. from Washington.

Iowa was constituted a territory by an Act of Congress, dated June, 1838, and the government commenced July 4, 1838. It was then divided into sixteen counties, and the population, according to the census, was 22,859; in 1840 the population was 43,112; in 1844, it had become 81,920, a rapidity of increase probably exceeding that of any other state or territory in the Union.

The legislative power is vested in a governor, a council of 13 members elected for two years, and a house of representatives consisting of 26 members elected annually. The governor's salary is 2,500 dollars a year, and there is a secretary who receives 1,200 dollars a year. The members have three dollars a day, and three dollars for every twenty miles of travelling. There are three judges, who are appointed for four years, and who each receive 1,800 dollars a year; the territory is divided into three judicial districts, in which the judges perform circuit duties; the supreme court, composed of all the judges, meets annually in July at Iowa city. Congress voted 20,000 dollars for the erection of public buildings at the seat of government, for which Burlington was first chosen, but it has been since fixed at Iowa city, where the legislative assembly meets annually on the 1st of December. Congress voted also 5000 dollars towards the purchase of a territorial library. The territory sends one member to the House of Representatives.

On the 5th of April, 1844, the people of Iowa passed a vote, by a majority of 2,400, for forming the Territory into a State, which they were entitled to do when the population reached 60,000. A convention met in October, formed a constitution, afterwards submitted it to Congress, and claimed to be admitted into the Union as a State. A law was passed by Congress for that purpose, March 3, 1845, which fixed the boundaries of the State thus:—From the mouth of tho Des Moines River to a parallel of latitude passing through the mouth of the Munkato, or Blue-Earth River; thence west along this parallel of latitude to where it is intersected by a meridian line 17° 30′ W. from Washington; thence due south to the northern boundary-line of the State of Missouri; thence east along that boundary to where it intersects the Des Moines River. The Blue-Earth River falls into the St. Peter's River near the point where the St. Peter's changes its course from south-east to north-east. The boundaries fixed by Congress not only very greatly reduced tho size of the Territory, as was expected, but differed so materially from the boundaries proposed by the convention, that the people of Iowa refused to be formed into a State on the conditions laid down in the Act of Congress, and Iowa therefore remains still a Territory.

The quantity of public lands sold in Iowa from 1838 to 1844 (but including only the two first quarters of the latter year) was 1,462,624 acres, which produced to the public treasury of the United States 1,829,426 dollars, which is rather more than a dollar and a quarter per acre. There are still a great number of squatters.

The inhabitants of the Territory of Florida had applied for admission to the Union as a State, in January, 1839, but the application was not granted till March 3, 1845, when it was constituted a state by the same Act which would have admitted Iowa. Florida made no objection to the terms of admission, and is therefore now one of the United States of North America. A sketch of the new constitution of Florida and other particulars is given under UNITED STATES OF NORTH AMERICA, P. C. S.

(American Almanacs, 1839 and 1846; Buckingham's *America (Eastern and Western States)*, vol. iii.; *Geography of America*, published by the Useful Knowledge Society; Flint's *History and Geography of the Western States.*)

IRIS, a genus of plants the type of the natural order Iridaceæ. It has a tubular perianth with a petaloid membranous limb, the segments of the sepals revolute, often bearded, those of the petals erect and converging; three stamens, concealed beneath the lobes of the style; the style 3-parted near the upper end with petaloid segments overarching the anthers and bearing a two-lipped transverse stigma below their ends; the capsule 3-celled, bursting through the cells into three valves, coriaceous, with numerous flat or round and fleshy seeds.

I. versicolor, Blue Flag, has sword-shaped striated leaves sheathing at the base, a stem two or three feet high, round on one side and acute on the other, and bearing from two to six flowers. This plant is a native of swamps and wet meadows in the United States. The rootstock has a nauseous acrid taste. It acts as a cathartic, and its action is attended with great depression of the nervous system and prostration of strength. It also acts upon the kidneys, and is useful in cases where diuretics are indicated.

I. pseud-acorus, Yellow Flag, has sword-shaped leaves; the stem round; perianth beardless, its inner segments narrower and shorter than the stigmas. It is a native of wet places in Great Britain, France, Germany, and most countries of Europe. The rootstock is acrid and possesses an emetic and purgative action. The seeds when roasted are said to form a good substitute for coffee.

I. Florentina, Florentine Iris, has broad and somewhat falcate leaves shorter than the stem, the petals two inches long and one inch broad, reflexed at the edge and rather plaited towards the base. The dried rootstock is known in the shops under the name of *orris-root*. The plant is a native of the southern parts of Europe and the islands of the Mediterranean. The rootstock has an aromatic odour and subacrid taste, and is employed as a dentifrice. It enters into the composition of Ruspini's tincture and tooth-powder, and other popular dentifrices. It was at one time used in medicine and admitted into the British Pharmacopœias. The fresh rootstock acts as a purgative, and was also employed as an expectorant in diseases of the chest. When dried and turned into small balls it is used for issue-peas. According to Sibthorp this plant is found in Greece at the present day. It is the ἶρις of Hippocrates (*Morb. Mul.*, 2, 673) and the ἶρις ἰλλυρική of Theophrastus (*Hist. Plant.*, 7, 12).

I. fœtidissima, Stinking Flag, has sword-shaped leaves, the stem compressed, the perianth beardless, its inner segments about as long as the stigmas. This plant is a native of Great Britain and other parts of Europe. It has a peculiar smell, which some have compared to roast beef, but which to others suggests much less pleasant associations. It is the ἶρις ἀγρία of Theophrastus (*Hist. Plant.*, 9, 8) and ξυρίς of Dioscorides (4, 12).

I. tuberosa has tetragonal leaves, the segments of the perianth acute, the roots tuberose. It is not a common plant in Europe, but has been naturalised at Penzance in Cornwall, and near Cork in Ireland.

Many other species of Iris have been described. *I. Germanica* has been used for the same purposes as *I. Florentina*, and they are considered by some botanists as identical. The roots of many of them contain starch, and Pallas says that the roots of *I. dichotoma* are eaten in Siberia. *I. edulis* is eaten by the Hottentots of Africa, where it is called *Oenkjes*. All these species are cultivated in gardens on account of handsome showy flowers.

(Fraas, *Synopsis Floræ Classicæ;* Lindley, *Flora Medica;* Sibthorp, *Flora Græca;* Babington, *Manual of British Botany;* Burnett, *Outlines of Botany.*)

IRISH MOSS. [CETRARIA ISLANDICA, P. C. S.; SEA WEEDS, P. C.]

IRON BOATS AND SHIPS. [SHIP-BUILDING, P. C., p. 395.]

IRRADIATION denotes, properly, the emission of rays from a luminous object, but tho word is generally used to signify an apparent enlargement of the disc of a celestial body: this enlargement being caused either by a deviation of the rays of light from a rectilinear direction, or by some illusion arising from the action of light on the eye.

When rays of light from points at the surface of an object fall on the retina, there may be produced on the latter an agitation extending within short distances about the points to which the rays in the pencils are made to converge by the humours of the eye: hence there may arise a perception of a fringe or border about a luminous body, and consequently an apparent enlargement of such body. Thus the image of a star, when seen by the eye, appears to be a disc of sensible magnitude, instead of a mere point; which, on account of its remoteness, would be the case if the rays of each pencil produced no effect beyond their mathematical point of convergence: the disc of the sun or of the moon is conceived to be, in like manner, apparently enlarged; and thus, also, tho part of the moon which, when the latter is nearly new, is enlightened by the sun, appears to be a portion of a sphere of greater diameter than the part which is more faintly enlightened by the rays reflected from the earth.

A species of irradiation is caused by the blending together, upon the retina, of the circles of light produced by the pencils which fall upon it either before or after the rays in each have converged to a point; the humours of the eye not permitting that convergence to take place exactly on the membrane. [ENLARGEMENT OF OBJECTS, P. C. S.]

Before the invention of telescopes, the apparent magnitudes of celestial bodies were very erroneously estimated; thus, Tycho Brahe made the diameter of Venus twelve times, and Kepler made it seven times as great as it is now known to be. Telescopes do not entirely remove the cause of such error, but, by diminishing the apparent brightness of the bodies, the error in the estimation of their apparent magnitudes is proportionally diminished. Du Séjour, Lexell, and other astronomers, on comparing the calculated with the observed times ot the contacts of the sun and moon in eclipses of the former, have, in order to produce an agreement between them, found it necessary to diminish tho apparent semidiameters of the luminaries by $3\frac{1}{2}$ minutes each; on account, it is supposed, of the effects of irradiation.

It is a consequence of irradiation, that objects which are in reality of equal magnitudes appear frequently to differ in size according to their colour or to the quantity of light which falls upon them. Sir William Herschel remarked (Phil. Trans., 1783) that when a bright circle was viewed together with a dark one on a bright ground, the latter always appeared smaller than the other; and, in order to correct the erroneous estimate of the magnitudes of the columns about temples when they are seen against a bright ground, it appears that the antients made the thickness of the columns to increase proportionally to the distance between them. The reason assigned for this practice by Vitruvius ('De Architectura,' lib. 3, cap. 2) is that the columns with wide intervals, being more surrounded by the air than those which are closer, appear on that account to be more slender: it must be observed, however, that the perceptions of magnitude depend partly on those of distance; and a contrary effect frequently takes place with objects viewed against the sky when conceived to be more remote than they really are.

ISA'TIS. [WOAD, P. C.]

ISCHY'ODUS, a genus of fossil fishes included in Chimæra by Agassiz.

ISNARDIA, a genus of plants named by Linnæus in memory of M. Antoine Dante Isnard, member of the Academy of Sciences. It belongs to the natural order Onagrarieæ, and has a 4-cleft calyx, 4 petals, 8 stamens, and a filiform style, with a clavate or cruciform stigma. There is one British species of this genus. *I. palustris* has a procumbent rooting glabrous stem, opposite ovate acute leaves, terminating in a petiole axillary solitary sessile flowers, with the petals absent. It is found in pools and marshes in Europe, Siberia, and Persia, and in Sussex in England.

I. alternifolia has an erect branched stem, alternate leaves, rather scabrous on the margins, and hoary beneath. It is a native of Virginia and Carolina, in marshy places, and has oval yellow petals. The root is used as an emetic, and is called Bowman's Root.

None of the species of this genus possess qualities which entitle them to cultivation except in botanical gardens. They may, however, be reared in a hot-bed, and then planted in an open border in a moist situation.

(Don, *Gardener's Dictionary;* Babington, *British Botany.*)

ISOCHROMATIC LINES are those coloured rings which appear when a pencil of polarized light is transmitted along the axis of a crystal, as mica or nitre, and is received in the eye after passing through a plate of tourmaline. If a plate of nitre having its surfaces perpendicular to the axis of the natural prism, and highly polished, be placed between two plates of tourmaline having their axes at right angles to one another, and a lens of short focus be placed so as to transmit the light of the sky through the plates to the eye of the observer, that focus falling a little below the surface of the nitre, the rays of light will be polarized by passing through the first plate of tourmaline, and there will be seen a series of oval rings, about each of two points as poles, forming together figures which may be considered as resembling *lemniscates.*

By the nature of the lemniscate, the rectangle contained by two lines drawn from the poles to any point in the curve is constant; and the curves have received their designation from the circumstance that the tint of any one is represented by the equivalent of such rectangle for that curve: when the light is viewed through plates of nitre of different thicknesses, the tint depends also on the thickness of the plate.

The curves are conceived to exist on the surface of a sphere of which a point in the crystal is the centre; and when the optical axes of the crystal are at a considerable distance from one another, if the curves be projected on a plane, the tint in each curve will depend on the product of the sines of the angles subtended by two lines drawn from the poles to a point in its periphery, and also upon the length of the path described by a ray of light in passing through the crystal.

ISOCRINITES, a genus of Crinoidea (Goldfuss).

I'SOETES (from ἴσος, equal, and ἔτος, year), a cryptogamic genus of plants, belonging to the natural order Lycopodiaceæ. The capsule of the plant does not open, and the fructification is enclosed within the swollen base of the leaves; it has sporules of two kinds, which are attached to filiform receptacles. The organs of fructification in this plant are small cases, which are situated in the angles formed by the union of the leaves and the contracted stem; those seated in the axillæ of the outer or inferior leaves are divided into three cavities, containing about fifty spherical bodies (granules); the cases in the axillæ of the internal or superior leaves are divided by numerous transverse partitions into many cavities, all of which are filled with an impalpably fine powder, in the early stages of its development white, but subsequently becoming black.

The species of Isoetes grow at the bottoms of ponds and lakes, and are said to afford excellent food for fish. They are called Quillworts from the rush or quill-like appearance of the leaves.

I. lacustris, Quillwort, has subulate roundish-quadrangular leaves with four longitudinal jointed tubes. The rhizoma of this plant is a blunt tuber; the leaves are slender, broad and flat at the base, but elsewhere between cylindrical and quadrangular. It is found in Great Britain, at the bottom of lakes and ponds in hilly districts. The structure of the fructification of this plant, and other species of the genus, is only imperfectly understood. It is on this account refered to Marsilleaceæ by some authors, and made to form an independent order by others. Lindley refers it to Lycopodiaceæ, and observes, 'I follow De Candolle and Brongniart, in referring it here. Delile has published an account of the germination of Isoetes setacea, from which it appears that its sporules sprout upwards and downwards, forming an intermediate solid body, which ultimately becomes the stem or cormus, but it is not stated whether the points from which the ascending and descending axes take their rise are uniform; as no analogy in structure is discoverable between these sporules and seeds, it is probable that they are not. Delile points out the great affinity that exists between Isoetes and Lycopodium, particularly in the relative position of the two kinds of reproductive matter. 'In Lycopodium,' he says, 'the pulverulent thecæ occupy the upper ends of the shoots and the granular thecæ the lower parts; while in Isoetes the former are found in the centre and the latter at the circumference. If this comparison is good, it will afford some evidence of the identity of nature of those thecæ, and that the pulverulent ones are at least not anthers, as has been supposed; for in Isoetes the pulverulent inner thecæ have the same organization, *even to the presence of what has been called their stigma*, as the outer granular ones: so that if Isoetes has sexes, it will offer the singular fact of its anther having a stigma.'

(Babington, *Manual of British Botany;* Newman, *History of British Ferns;* Lindley, *Natural System;* Burnett, *Outlines of Botany.*)

ISO'TELUS, a genus of fossil Crustacea (Trilobites) from the Silurian strata, especially of North America (Green).

ISSUE PEAS are round bodies employed for the purpose of maintaining irritation in a wound of the skin which is called an issue. [ISSUE, P. C.] It is a matter of indifference of what substance the peas are composed, so long as they do not introduce poisonous matters into the wound. The seed of the common garden pea is frequently used. It is however more common to use the young unripe fruits of the common orange (*Citrus aurantium*). The fruits are dried and afterwards turned in a lathe before they are used as issue peas. The unripe oranges, dried, are sold under the name of orangettes or Curaçoa oranges. The rootstock of the *Iris Florentina* is also formed into peas and used for keeping up the discharge from issues.

(Lindley, *Flora Medica;* Christison, *Dispensatory.*)

IU'LUS, a genus established by Linnæus for such *Insecta Myriapoda* as now form the order *Chilognatha* (χεῖλος, γνάθος), the first division of *Myriapoda* in the arrangements of Leach and Latreille. The *Chilognatha* have crustaceous and usually cylindrical bodies, formed of numerous unequal segments, very short feet, each terminating in a single hook; a vertical rounded head, furnished with two mandibles, which are either thick and robust or united with the labium and elongated. They have no palpi. The antennæ are two, very short, either slightly thickened towards their extremities, or filiform throughout, and composed usually of seven, more rarely (as in the genus *Sphæropœus*) of six joints. Their eyes are smooth and vary greatly in number. These animals move slowly and with a gliding motion. When disturbed, they roll themselves up spirally, or into a ball. They feed on decomposing animal and vegetable matter.

The position assigned to the Chilognatha, at the head of the Myriapoda, by Latreille and others, has recently been disputed by Professor Brandt and by Mr. Newport. The following remarks on this subject by the latter naturalist, of all living zoologists the most competent to decide in questions affecting this difficult class, are taken from his catalogue of Chilognatha in the British Museum, published in the 'Annals of Natural History for April, 1844,' and afford in a brief compass much information respecting these curious animals.

'The Chilognatha have usually been regarded by naturalists as the first order of *Myriapoda*, partly in consequence of the more compact form of the head, and its similarity to that of the larva state of hexapod insects, and partly from the general form of their bodies being similar to that of the larvæ. This was the view taken of these animals by Latreille, Leach, Gervais, and some others, and very recently by Lucas. But a different and, as I believe, more correct view and arrangement have been followed hy Professor Brandt, who regards the *Chilopoda* as the first, and the *Chilognatha* as the second division of the class. Although I cannot entirely agree with Brandt in his division of the *Chilognatha* into masticating and sucking species, because, as Lucas has recently remarked, there are species even among the *Chilopoda* which have the external organs of nutrition fitted only for taking liquid food, as in the little *Scolopendrella*, I fully agree with him in the superiority of the *Chilopoda*, as an order, over the *Chilognatha*, notwithstanding the less compact structure of the head in the former. The general characters of the *Chilopoda* certainly point them out as the most perfect animals of the osculant class of Articulata. The more compact frame of body, the reduced number of the organs of locomotion, the greater activity, and the predaceous habits of the higher species, approximate the Chilopoda to the predaceous insects on the one hand, and to the Arachnida on the other. The form of the head, in the two divisions of *Myriapoda*, seems to have reference chiefly to the particular habits of the species. Thus, in those which seize their prey and subsist like the Arachnidans on living objects, those segments which in reality compose the whole head are not all anchylosed together, but are in part freely moveable on each other, and thus allow of a more prehensile function to the large forcipated foot-jaws, the true mandibles of the Articulata. Some naturalists have believed that these foot-jaws in the *Chilopoda* are not the true analogues of insects and of *Chilognatha;* but I am satisfied, by recent examinations, that this is truly the case. In the *Chilognatha* the foot-jaws have the form of true mandibles, because the habits of the species require that compact form of the organ which alone can be subservient, not to the seizing and piercing of living prey, but to the grinding or comminuting of more or less solid vegetable matter, on which most of the genera of *Chilognatha* entirely subsist. In all other respects, both in their internal as well as their external anatomy, and in their physiology and mode of growth, the *Chilognatha* are decidedly inferior to the *Chilopoda.* They seem to conduct us down to the Annelida from the vegetable-feeding crustacea, as the *Chilopoda* do from the *Arachnidans* to the same class.'

Tho Chilognathous Myriapoda are found in all parts of the world, certain genera, however, affecting certain geographical divisions. Thus the species of *Glomeris* are European; those of *Spirastreptus* and *Sphæropœus* African and Eastern. The genus *Iulus*, in its most limited sense, includes European, Asiatic, and North American species. *Iulus terrestris* is a familiar British example.

A synopsis of the genera of Chilognatha will be found in the third part of the nineteenth volume of the 'Linnæan Transactions,' appended to a valuable memoir on the Myriapoda by Mr. Newport. Professor Brandt's papers on these animals are published in the 'Transactions and Proceedings of the Imperial Academy of St. Petersburg.'

IVORY, JAMES, a distinguished British mathematician, was born at Dundee, in 1765, and received the rudiments of education in the public schools of that town. At fourteen years of age he was sent to the university of St. Andrew's; his father, who was a watchmaker, intending that he should become a clergyman of the church of Scotland. In that university the young man remained six years, during four of which he was occupied with the study of mathematics, languages, and philosophy; but the first of these subjects, from a natural inclination to that branch of science, particularly engaged his attention: he was encouraged and ably assisted in his favourite pursuit by the Rev. John West, one of the instructors at the university; and his great progress, which is said to have excited considerable notice, gave already indications of the eminence which, as a mathematician, he was afterwards to attain. The two following years were passed in the study of theology; and Mr. Ivory then removed, in company with Mr. (afterwards Sir John) Leslie, who had been his fellow-student at St. Andrew's, to the university of Edinburgh, where he spent one year in completing the course of study required as his qualification for admission to the office of minister in the Scottish church.

It is not known what circumstances prevented Mr. Ivory from carrying out the intentions of his father in this respect; but, on quitting the university, in 1786, he accepted an appointment as an assistant teacher in an academy then recently established in Dundee, and he continued to fulfil the duties of that post during three years. At the end of that time he engaged with some other persons in the establishment, at Douglastown in Forfarshire, of a factory for spinning flax; and of this association he appears to have been the principal person.

During fifteen years (from 1789 to 1804) Mr. Ivory was employed daily in operations apparently very uncongenial with the taste of a man of science; but it may be presumed that all his leisure hours were devoted to the prosecution of scientific researches. It must have been at this time that, though residing in a retired district, he diligently studied the writings of the English mathematicians, together with those of the illustrious foreigners whose works were in the public libraries of Scotland; also that he obtained access to, and made himself thoroughly acquainted with, the later productions of the continental mathematicians.

It is scarcely to be expected that a factory carried on under the superintendence of a man the greater part of whose time was probably spent in researches which require nearly a total abstraction of the mind from the ordinary concerns of life, should have succeeded; accordingly we find that in 1804 the company ceased to exist; and Mr. Ivory, who then obtained the appointment to a professorship of mathematics in the Royal Military College, quitted Scotland, and went to reside at Marlow, in Buckinghamshire, where that institution had, a few years previously, been formed. On the removal of the college to its present site (Sandhurst in Berkshire), Mr. Ivory accompanied it to the latter place, where he remained till his retirement from public service. He fulfilled the duties of his professorship to the great satisfaction of the governor; his attention to the students who were placed under him was unremitting; and it should be remarked that, however irksome it might have been to a man of high attainments in science to communicate the elements of knowledge to young persons, Mr. Ivory always evinced the utmost readiness to assist, by the most appropriate and familiar illustrations, in smoothing the path of science to his pupils. An edition of Euclid's 'Elements,' which is known to have been his work, though his name does not appear on the title-page, was prepared by him for the use of the students in the college; and the manner in which he has treated the book on proportion, and those which relate to solids, must have greatly diminished the difficulties which the generality of learners experience in acquiring a knowledge of those parts of elementary mathematics.

In the beginning of the year 1819 Mr. Ivory, feeling his health decline under the great exertions which he made in carrying on his scientific researches and performing his duties as a professor, those duties leaving him but short intervals of leisure, was induced to resign his professorship and retire into private life. In consequence of his great merit there was granted to him the pension due to the full period which, by the regulations, the civil officers of the institution are required to serve previously to obtaining such pension; and which period he had not completed. After his retirement from Sandhurst, Mr. Ivory devoted himself wholly to scientific researches, and the results of his labours have been printed chiefly in the volumes of the 'Philosophical Transactions.' In 1831, in consideration of the great talent displayed in his investigations, he was by Lord Brougham, to whom he had been known in early life, recommended to the king (William IV.), who, with the Hanoverian Guelphic Order of Knighthood, gave him an annual pension of 300*l.*, which he enjoyed during the rest of his life; and, in 1839, the University of St. Andrew's conferred on him the degree of doctor in laws. He lived in great privacy in or near London till the time of his death, which happened September 21st, 1842, in the seventy-seventh year of his age.

Mr. Ivory's earliest writings were three Memoirs which he communicated in the years 1796, 1799, and 1802 to the Royal Society of Edinburgh: the first of these was entitled 'A New Series for the Rectification of the Ellipse;' the second, 'A new Method of resolving Cubic Equations;' and the third, 'A New and Universal Solution of Kepler's Problem;' all of them evincing great analytical skill, as well as originality of thought. He contributed fifteen papers to the 'Transactions of the Royal Society of London,' nearly all of them relating to physical astronomy, and every one containing mathematical investigations of the most refined nature. The first, which is entitled 'On the Attractions of Homogeneous Ellipsoids,' is in the volume for 1809, and contains investigations of the attractions of such ellipsoids on points situated within them and on their exterior: the former case presents few difficulties; but the process used by Laplace for the solution of the other was very complex, and Mr. Ivory had the merit of discovering one which is remarkable for its simplicity. A given point being on the exterior of an ellipsoid, he imagined another ellipsoid having the same centre and the same foci as the first to pass through the point; then taking, on the surface of the interior ellipsoid, a point so situated that the co-ordinates of the two points are in the ratio of the semiaxes to which they are parallel, he showed that the attraction in the direction of each axis which one of the two bodies exercises upon a point on the surface of the other, is to the attraction of the latter body on the corresponding point at the surface of the first, as the product of the two other axes of the first ellipsoid is to the product of the two other axes of the second. A direct investigation of this case has since been given by M. Poisson.

In the volumes for 1812 and 1822 there are three papers on the Attractions of Spheroids, in which Mr. Ivory substituted a refined analytical process for the indirect method of Laplace: the papers contain also some observations on the method employed by that great geometer in computing the attractions of spheroids of any form differing but little from spheres. The analytical skill shown by Mr. Ivory in these papers was frankly acknowledged by Laplace himself in a conversation which, in 1826, he had with Sir Humphry Davy.

The Transactions for 1814 contain an investigation, by Ivory, relating to the orbits of comets, on the supposition that these orbits are parabolical: the paper is entitled 'A New Method of deducing a first Approximation to the Orbit of a Comet from three Geocentric Observations.' And the volumes for 1823 and 1838 contain his investigations relating to Astronomical Refractions: in the first of these the temperature of the air is supposed to decrease uniformly with a uniform increase of height; and in the other the expressions are rendered general for all laws of temperature. The volumes for 1824, 1831, 1834, and 1839 contain, each, a paper on the equilibrium of fluid bodies; and in the volume for 1838 Mr. Ivory demonstrated that a homogeneous ellipsoid with three unequal axes may be in equilibrio when revolving about one of the axes: he also examined in detail the limitations of the proportions of the axes. The subject of planetary perturbations is treated by him in two papers which are contained in the volumes for 1832 and 1833; in the first he has simplified the theory of the variations of the elements, and in the other he has given some facilities for developing the excentricities and inclinations. He has given in the 'Transactions' only one paper which is purely mathematical, and this is contained in the volume for 1831: it is entitled, 'On the Theory of Elliptic Transcendants.'

Mr. Ivory contributed several papers to the 'Philosophical Magazine:' in the number of that work for August, 1821, is his method of finding the latitude of a ship by two observations of the sun's altitude, with the time elapsed between them; and in the volumes for 1825 and 1827 are his investigations relating to sound and heat. Several valuable communications from his pen are contained in Maseres's 'Scriptores Logarithmici;' in Leybourn's 'Mathematical Repository;' and in the Supplement to the sixth edition of the 'Encyclopædia Britannica.'

In estimating the merits of Mr. Ivory as a mathematician, it must be borne in mind that his researches were conducted by a most refined analysis at the time when even the notation of the differential calculus was not familiar to the English mathematicians; and that, when he wrote the papers relating to the attraction of spheroids, the volume of the 'Mécanique Céleste,' in which that subject is treated, had probably not been read by any person in this country except himself.

In 1815 Mr. Ivory was elected a fellow of the Royal Society of London: he was also an honorary fellow of the Royal Society of Edinburgh; an honorary member of the Royal Irish Academy, and of the Cambridge Philosophical Society; a corresponding member of the Institute of France, of the Royal Academy of Sciences of Berlin, and of the Royal Society of Göttingen. He received, in 1814, the Copley medal for his mathematical communications to the Royal Society: in 1826 one of the royal medals was awarded to him for his paper on Astronomical Refractions, published in 1823; and in 1839 he received another royal medal for his Theory of Astronomical Refractions, which was published in 1838.

(From the Marquis of Northampton's Address to the Royal Society, November 17, 1842.)

IVY. [HEDERA, P. C.]

IZALCO is the name of a village in the State of San Salvador in Central America, and remarkable for a volcano situated about three miles from the village, and between eight and nine from the town of Zonsonate. This volcano is of recent origin. It is stated that it was formed about sixty years ago, and it is to be regretted that no particular account has hitherto been published of such a remarkable event. It broke out on the top of a hill of moderate elevation, which however since that event has been increased in size by the addition of lava, scoria, ashes, and other volcanic matter, and at present it may be called a considerable mountain. It is one of the few volcanos which are in uninterrupted activity, like the Stromboli of the Lipari Islands. The eruptions are almost continual, and whenever they slacken the country in its vicinity is subject to almost continual earthquakes. Sometimes the activity of the volcano is increased, and then large quantities of lava inundate the country at its base, the greater part of which has thus been changed into a stony waste.

(Thompson, *Visit to Guatimala;* Haefkens, *Central Amerika;* Montgomery, *Narrative of a Journey to Guatimala.*)

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VOLUME II.

J

JACARANDA of commerce is said by Prince Maximilian to be the timber of a Brazilian Mimosa.

(Burnett, *Outlines of Botany.*)

JACKSON, JOHN, R.A., was born in 1778 at Lastingham, in Yorkshire, where his father carried on the business of a tailor, and he was himself bred to the same business. He however hated his occupation; he had seen the collection of Lord Mulgrave, and the pictures at Castle Howard, and he had a strong inclination to become a painter. An attempt which he made to imitate a picture by Reynolds was shown by his schoolmaster to Lord Mulgrave, who perceiving in it and others, notwithstanding their crudeness, some talent, supplied Jackson with proper materials, and encouraged him to go on. Lord Mulgrave and Sir G. Beaumont purchased the two years of Jackson's unexpired apprenticeship, and the latter in 1797 gave him an allowance of 50*l.* per annum, and an apartment in his house in town, to enable him to prosecute his studies at the Royal Academy.

Jackson soon obtained a name for his portraits in black lead-pencil and water-colours, but it took him many years to equal the successful oil-painters of that day. He first attracted notice in this department about 1806, and in 1817 when he was elected a member of the Royal Academy, his reputation was little inferior to that of Lawrence, though he was comparatively little patronized; his portraits were bold and effective, but they wanted the delicacy of the works of Lawrence: Jackson could paint five heads while Lawrence was painting one. In the summer of 1819 he visited Rome in company with Chantrey, and painted for him there a portrait of Canova. Jackson astonished the Roman painters, says Cunningham, by copying in four days the Borghese Titian of 'Sacred and Profane Love' as it is called, a picture which many Romans required two or three months to copy: Passavant says, the figure of Divine Love, in three days, which is more likely; the rest of the picture is scarcely worth copying. Jackson was elected a member of the Academy of St. Luke, at Rome. He was in all his works extraordinarily rapid and sure. A story is related, that he commenced and finished in a single summer's day, as a wager, the portraits of five gentlemen: he received 25 guineas for each of them—125 guineas in one day; probably no painter ever earned as much by his own labour before. The story is told by Passavant. Jackson died at his house in St. John's Wood on June the 1st, 1831. His best works are the portraits of Lady Dover, of Flaxman, and of himself, both painted for Lord Dover, and the portrait already mentioned of Canova. He painted in all the portraits of thirteen of his fellow Academicians, but that of Flaxman, is in all respects the best; Allan Cunningham truly observes of this picture, that there is a 'sombre grandeur about it which awes one;' it is certainly one of the finest portraits in the world.

Jackson exhibited in all, at the Royal Academy, between the years 1804 and 1830, one hundred and forty-five pictures; he of course painted very many portraits that were not exhibited, for he was latterly constantly employed. His nominal price for a head was fifty guineas, and though he must have been making a large income, he died without leaving a provision for his family. He was twice married; his second wife, who survived him, was the daughter of his fellow-academician, Ward.

(Cunningham, *Lives of British Painters*, &c.; Passavant, *Kunstreise durch England*, &c.)

JACKSON, ANDREW, the late American general and president, was himself a native of the United States; although his father, of the same names, was an Irishman, the youngest of the four sons of Hugh Jackson, a linendraper near Carrickfergus; and either the linendraper himself, or one of his recent progenitors, had come over from Scotland.* Andrew Jackson went over to America in 1765, taking with him a wife and two sons. With them he established himself in the Waxhaw settlement in South Carolina; and here his third and youngest son, the subject of the present notice, was born on the 15th of March, 1767. Andrew Jackson died soon after; and his widow found herself left with a half-cleared farm, without slaves, whereupon to bring up her three sons.

Andrew, her latest born, appears to have been his mother's favourite; and the original destination of the future General and President of the United States was to be a clergyman, we are not informed of what denomination. With this view, after having finished his school education, he was sent to the Waxhaw Academy; and here he seems to have studied theology for some years. When the war of independence, however, made all Americans soldiers, the young Jacksons did not hold back. Andrew is recorded to have fought, along with his next eldest brother Robert, under Sumter in his attack on the British garrison at Rocky Mount, on the 6th of August, 1780; at which date he would be little more than thirteen. And from this time he is stated to have taken a part in the campaigns as long as the war lasted. Nor did he altogether escape the usual dissipated habits of a military life; but, with the decision of character which was his most remarkable characteristic, he suddenly changed his course before it was too late, and, collecting what remained of his means, put himself, in the winter of 1784, into the hands of Spruce M'Cay, Esq., an eminent advocate and afterwards a judge, to be instructed in the practice of the law. This new study he prosecuted with so much success that in 1787 he was appointed solicitor for what was then called the Western District of North Carolina, and is now the State of Tennessee. The circumstances of the time, however, did not suffer him, even if he had been so inclined, to throw off his military character, or to let the experience he had gained in camps and campaigns go to rust. Although the war with the mother country was over, the borders of the republican territory were still infested with another most troublesome enemy in the original occupants of the soil; and Jackson, although he would only serve as a private, is said to have so much distinguished himself in the contest with those natural rivals of his race, that he was honoured among them with the titles, or descriptive appellations, of Sharp Knife and Pointed Arrow.

He continued to be thus employed till the year 1796, when, after having first acted as one of the members of the Convention for establishing a constitution for the state of Tennessee, he was, under that new arrangement, elected to a seat in the House of Representatives. The next year he was chosen a Senator; but he resigned his seat after holding it for one session. On this he was immediately appointed by the legislature of Tennessee Judge of the Supreme Court in that state; having also been shortly before chosen a Major General of the state forces. But he soon resigned his judicial office; and, settling himself on a farm, a few miles from Nashville, on the Cumberland river, he resided there in retirement till the breaking out of the war with England in 1812. With that event commences the most memorable portion of Jackson's career.

His first command was that of a body of between two and three thousand volunteers, who had assembled on his invitation, and with whom he was directed to proceed down the Mississippi for the defence of the lower country. This was in November, 1812. The next year he greatly distinguished himself by a campaign against the Creek tribes. An account of it may be found in a message from the President (Madison) to Congress, dated 7th December, 1813, in which it is stated that the best hopes of a satisfactory issue of the contest were already warranted by the complete success of a well-planned enterprise against the Indians, executed by a detachment of the volunteer militia of Tennessee under the command of General Coffee; 'and by a still more important victory over a larger body of them, gained under the immediate command of Major General Jackson, an officer equally distinguished for his patriotism and his military talents.' The Creeks were repeatedly afterwards defeated by Jackson. The war was terminated in August, 1814, by a treaty, by which they agreed to lay down their arms. (Message of President Madison, dated 20th September, 1814.)

In 1814 Jackson was appointed a Major General in the service of the United States; and, among other operations, he succeeded in taking Pensacola on the 7th of November, and raised himself to the highest point of reputation and popularity among his countrymen by the famous repulse of the British forces in their attack on New Orleans, on the 8th of January, 1815. The next military command which he held, was that of

* It is a remarkable fact that three of the Presidents of the United States have been descendants of Scottish colonists of the North of Ireland; Monroe, Jackson, and the present President, Polk. (1846)

the war against the Seminole Indians of Florida in 1818, for the details of which the reader may be referred to President Monroe's Message to Congress of the 16th of November in that year, and to the Report of the Committee of Senate on the Seminole war, dated 24th February, 1819. Jackson's proceedings in this war, from first to last, were extremely irregular and high-handed; the force at the head of which he placed himself was raised and officered not only without but in direct opposition to the orders of the general government; in carrying on his operations against the Indians, he did not scruple to seize, one after another, several forts and ports belonging to Spain, with which country the United States were at peace, and to put down the Spanish authorities by the power of the sword—conduct of which his government marked its disapproval in the most emphatic manner, by the immediate restoration of the places thus unwarrantably seized; but his most extraordinary act was the execution of the two Englishmen Arbuthnot and Ambrister. Alexander Arbuthnot was taken in the Spanish Fort of St. Mark's, along with two Indian chiefs, and Robert C. Ambrister, a few days afterwards, on an excursion which the force made from that post to destroy a neighbouring Indian village. The two Indian chiefs were hanged at once, and without trial; the justification urged being that by their own usual practice in like cases, and by the general manner in which they carried on war, the Indian tribes were to be considered as having put themselves beyond the pale of the ordinary law of nations. Arbuthnot and Ambrister were both, after a few days' confinement, tried at St. Mark's by court martial; when Arbuthnot was sentenced to suffer death, and Ambrister to be whipped and further confined; but General Jackson annulled the latter sentence, and Arbuthnot was hung and Ambrister shot. There is no doubt that these persons were acting in concert with the Indians; and, that being the case, it would perhaps be difficult to show that they were entitled to other treatment than those with whom they had associated themselves. But even to take the lives of Indian prisoners of war was an extreme proceeding, and one of very doubtful propriety; the charge upon which the two Englishmen were tried was only the very vague one of 'inciting the Indians to war;' in these circumstances it was certainly a startling exercise of military power for a general, under the most popular of all governments, to set aside the sentence of a court martial, as was done in the case of Ambrister. Besides, the principle upon which General Jackson took his stand was even less tenable than the one we have just stated; he himself vindicated what he had done, on the ground that Arbuthnot and Ambrister, by assisting in war against the United States while they were at peace with Great Britain, became outlaws and pirates; thus resting their liability to suffer death, when taken prisoners of war, not on the ground of their having united their fates with savages, but on that of their having been the subjects of a power with which the United States were at peace; a principle altogether unknown to the law of nations. However, although a stout fight was made in Congress by the opposite party, Jackson's friends, supported by the feeling out of doors, where his military reputation and his ultra-democratic professions bore down everything, carried a succession of votes in his exculpation by large majorities.

General Jackson afterwards acted as commissioner on the part of the United States in the negociation with Spain for the transference of Florida: and after the arrangement of the treaty to that effect, he was, in 1821, appointed the first governor of the province. He held this post for a year, and was then again elected a member of the Senate for the State of Tennessee.

When the election of a new president came on at the end of 1824, General Jackson was a candidate along with Mr. Adams, Mr. Clay, and Mr. Crawford; and on the first vote he had a large majority over the nearest of his competitors: the numbers being for Jackson 101, Adams 82, Crawford 41, Clay 37. No candidate, however, having the majority required by the Constitution, the election devolved upon the House of Representatives; and Adams and Clay having united their strength, the former obtained the votes of thirteen states against seven who voted for Jackson and four who voted for Crawford, and became president. Jackson, however, was triumphantly elected in 1828, and again in 1832; so that he was at the head of the government of his native country for the eight years from 1829 to 1837. His presidency was distinguished by the rapid growth and extension of democratic tendencies of all kinds: and, at the same time, of both the spirit of territorial extension, with its near consequences, conquest and war, and of the influence of the southern states and the slaveholding interest; but the subject in regard to which the president personally came forward in the most conspicuous manner was in the affair of the United States Bank. This bank, the renewal of the charter of which was the ostensible matter in dispute, was a powerful instrument in the hands of the general government; and hence the renewal of its charter, though supported by both Houses of Congress, was resisted, and successfully, both by the popular voice and by the president whom that voice had placed in office, and who had been one of the most ardent and resolute of the democratic leaders throughout his life.

General Jackson survived his presidency about eight years, and died at his seat called the Hermitage, near Nashville, in Tennessee, on Sunday the 8th of June, 1845. He was married, but had no issue.

(*Biographical Notice in* (*New York*) *Weekly Herald*, of 21st of June, 1845; *Funeral Oration delivered by* Mr. Bancroft *at Washington; Histories of the Time.*)

JACQUARD, JOSEPH-MARIE, was born at Lyon, on the 7th of July, 1752, of humble parents, both of whom were employed in operations connected with weaving. He is said to have been left to teach himself even to read and write; but at a very early age he displayed a taste for mechanics, by constructing neat models of buildings, furniture, &c. for amusement. At the age of twelve his father placed him with a bookbinder for a time, and he was subsequently engaged in type-founding and the manufacture of cutlery, in both of which occupations he gave evidence of talent. Owing to the death of his mother, young Jacquard returned to the house and occupation of his father, who also died some years after, leaving him a small property, which he employed in the attempt to establish a business in the weaving of figured fabrics. The undertaking failed, and he was compelled to sell his looms in order to pay his debts. He subsequently married, and hoped to receive a portion with his wife which might assist him out of his pecuniary difficulties; but this expectation proved delusive, and he was compelled to sell his paternal residence. His wife, to whom he is said to have been tenderly attached, is described as a model of patience, kindness, and activity; while he appears, without fortune, ambition, or foresight, to have occupied himself with ingenious schemes for improvements in weaving, cutlery, and type-founding, which produced nothing for the support of his family. Necessity at length compelled him to enter the service of a lime-maker in Bresse, while his wife remained at Lyon to attend to a small straw-hat business. In 1792 he ardently embraced the revolutionary cause, and in the following year he returned to Lyon, and assisted in the memorable defence of that place against the army of the Convention; his only son, then a youth of fifteen, fought by his side. Being denounced after the reduction of Lyon, they were both compelled to fly, and they then joined the army of the Rhine. His son was killed in battle, and upon this Jacquard returned to Lyon, where he found his wife, whom he had been unable to inform of his flight, earning her bread by plaiting straw, in which humble occupation he was compelled by poverty to assist. Lyon at length began to rise from its ruins, and its artisans returned from Switzerland, Germany, and England, where they had taken refuge. Under these circumstances, Jacquard applied himself with renewed energy to the perfection of the beautiful apparatus for figured weaving which bears his name, and which is described under WEAVING, P. C., pp. 178, 179. He had conceived the idea of such an apparatus as early as 1790, and he now succeeded, though but imperfectly, in accomplishing his end. His machine was presented, in September, 1801, to the national exposition of the products of industry, the jury of which awarded him a bronze medal for its invention. In the same year he obtained a patent, or 'brevet d'invention,' for a term of ten years. He set up a loom on his new principle at Lyon, which was visited by Carnot and several other of the statesmen who were assembled at that city in 1802 to arrange the affairs of the Cisalpine republic.

About this time the attention of Jacquard appears to have been directed, by the accidental perusal of a paragraph from an English newspaper, stating that a reward was offered by a society in this country for the invention of such an apparatus, to the construction of a machine for weaving nets for fishing and maritime purposes. From the account given by Dr. Bowring, who had conversed on the subject with Jacquard himself, before a Select Committee of the House of Commons on the silk trade, in 1832, and which is made the subject of an article in No. 50 of the 'Penny Magazine,' published in 1833, this would appear to have been Jacquard's first mechanical invention; but the more circumstantial account in the 'Supplément' to the 'Biographie Universelle,' to which we are chiefly indebted for the materials of this article, shows that such was not the case. He accomplished the desired object, but, having amused himself and his friends with his contrivance, he threw it aside. His machine-made net, however, fell into the hands of the préfet at Lyon, and the result was that, according to the arbitrary fashion of the time, he and his machine were placed under arrest and conveyed to Paris, where the invention was submitted to inspectors, upon whose report a gold medal was awarded to him in February, 1804. On occasion of this forced visit to Paris, Jacquard was introduced to Napoleon and Carnot, when the latter, not understanding his mechanism, roughly asked him if he were the man who pretended to do that impossibility—to tie a knot in a stretched string. Jacquard, not disconcerted at such a reception, explained the action of his machinery with simplicity, and convinced the incredulous minister that the supposed impossibility was accomplished by it. He was then employed for a time in repairing and putting in order the models and machines in the Conservatoire des Arts et Métiers, and while there he produced some ingenious improvements in weaving machinery, one of which was for producing ribbons with a velvet face on each side. He also contrived some improvements upon a loom invented by Vaucanson, which improvements have been stated to be the origin of the Jacquard machine. According to the French authority above referred to, however, this improvement upon Vaucanson's loom was not connected with his great invention; and, as its mechanism is very complex, its application limited to very small patterns, its action slow, and its cost very great, it is considered to belong rather to the class of curious than of useful machines.

In 1804 Jacquard returned to Lyon, where he was long engaged in superintending the introduction of his inventions for figured weaving and for making nets, in which he was powerfully aided by Camille Pernon, a rich manufacturer. Through his assistance, a commission of manufacturers was appointed to report upon the first-named invention, and eventually an imperial decree, dated Berlin, October 27, 1806, was issued to authorize the municipal administration of Lyon to purchase his invention for the use of the public. In the same year the Academy of Sciences and Arts at that city presented him with the prize medal founded by the consul Lebrun. For some years Jacquard had to struggle against much opposition and prejudice on the part of the Lyonese weavers, who conspired to discourage the use of his machinery, wilfully spoiled their work to bring it into discredit, and, through the Conseil des Prud'hommes, who were appointed to watch over the commercial interests of the city, had it publicly broken up and sold as old materials. Even his personal safety was at times endangered. At length, however, under the effect of foreign competition, the value of the invention was acknowledged, and it was brought very extensively into use, not only in France, but in Switzerland, Germany, Italy, America, and, according to the 'Biographie Universelle,' it has been introduced even into China.

Jacquard was solicited by the manufacturers of Rouen and St. Quentin to organize their factories of cotton and batiste, and he received a tempting offer of a similar nature from England; but he preferred remaining at Lyon, where he continued to exert himself in promoting the use of his great invention until, having lost his wife, he retired to Oullins, a village near Lyon, where he spent his latter years in retirement, and died on the 7th of August, 1834, at the age of eighty-two. During his life he received the cross of the Legion of Honour, and in 1840 a public statue was raised to his memory at Lyon. His 'Eloge Historique' has been published by M. de Fortis.

'The name of Jacquard,' observe the writers of his memoir in the 'Biographie Universelle,' 'has become, so to speak, technical in both the old and new world.' 'The happy continuator of the efforts of Vaucanson, who, like him, was engaged at Lyon in the improvement of weaving machinery, Jacquard has invented a simple and cheap machine, coming within the reach of the humble weaver, the introduction of which forms a memorable epoch—a new era—in the textile art.' By its agency the richest and most complex designs are produced with facility at the most moderate price; and, so far from diminishing employment, as some feared on its first introduction, it has, according to the writers just quoted, increased the number of workmen in the manufacture in which it is used tenfold.

JALNA (*Jâlnapoor*), a town of Hindustan, capital of the district of Jalna, is included in the province of Aurungabad. The district of Jalna is comprised chiefly of two large valleys, one of which is watered by the Pourna and the other by the Doudna. The town is situated about forty miles east from the city of Aurungabad, on the east bank of the Coundolga, an affluent of the Doudna, in 19° 52′ N. lat., 76° E. long. Jalnapoor is a fortified town of considerable size. It was taken from the Mahrattas by Colonel Stephenson in September, 1803, in the course of the military operations which immediately preceded the battle of Assaye, and was afterwards ceded to the Nizam.

JAMESONE, GEORGE, called by Walpole the Vandyck of Scotland, was the son of Andrew Jamesone, an architect, and was born at Aberdeen in 1586. Jamesone and Vandyck were about 1616 fellow-pupils of Rubens at Antwerp. When Charles I. visited Edinburgh in 1633, he sat to Jamesone, and presented him with a diamond ring from his own finger. His career is not exactly known, but it must have been a successful one, for he left his wife and family well provided for at his death in 1644; and he bequeathed also much in other directions. He was probably in Italy, for his portrait is in the painter's portrait gallery at Florence; he travelled in company with Sir Colin Campbell of Glenorchy. Many of the considerable families of Scotland possess portraits by Jamesone, but the greatest collection is at Taymouth, the seat of the Earl of Breadalbane. Sir Colin Campbell, the earl's ancestor, was Jamesone's first and chief patron. In a manuscript containing the genealogy of the house of Glenorchy, there is mention of several portraits painted by Jamesone for Sir Colin, with memoranda of the prices paid. For portraits of the kings David and Robert Bruce, Charles I. and his queen, and for nine queens of Scotland, painted in 1635, Jamesone received only 260 Scotch pounds, or 20 pounds per portrait, which is equal to 1*l.* 13*s.* 4*d.* sterling; the Scotch pound was twenty pence. All other portraits painted for Sir Colin, which were many, were paid for at the same rate. There are several of Jamesone's pictures also in the two colleges of Aberdeen. There is a portrait of Jamesone by himself at Cullen House; he appears to have often painted his own portrait, and he always painted himself with his hat on, which he may have done either in imitation of Rubens, or on having been granted that privilege by Charles I. when he sat to him.

Though the pupil of Rubens and the companion of Vandyck, Jamesone's works have neither the fulness nor richness of the former, nor the vigour of the latter; they are however painted very thinly and with much nature, but there is a sharpness in his outline which reminds of a very different school from that of Rubens. 'His excellence,' says Walpole, 'is said to consist in delicacy and softness, with a clear and beautiful colouring, his shades not charged but helped by varnish (*glazing?*), with little appearance of the pencil.' So far Walpole: Jamesone's countryman Cunningham in quoting this passage has added the following words to it as coming also from Walpole—"He had much of Vandyck's second manner, and to Sir Antony some of his works have been occasionally imputed.' These words are not in Walpole, at least not in the edition of 1782.

Jamesone's earliest works are painted on pannel; he used afterwards fine canvas, smoothly primed, and prepared in a shade tint. He painted occasionally history, miniature, and landscape. Walpole mentions a view of Edinburgh by him.

Cunningham has ascribed to Jamesone the illuminations of a manuscript of two hundred leaves of parchment, illustrating the Life of Christ, which belonged only to Jamesone, and which he valued at 200*l.* sterling. Jamesone himself describes it as a manuscript in his possession 'containing two hundred leaves of parchment of excellent write adorned with diverse histories of our Saviour curiously limned.' This memorandum was in the possession of his descendant, Mr. John Jamesone, a wine-merchant of Leith, from whom Walpole (or rather Vertue) obtained the particulars of his account of Jamesone. It is not known what has become of this manuscript.

Cunningham speaks of Jamesone as without a native rival in Great Britain; he appears to have overlooked Dobson, some of whose heads not only approach but equal Vandyck's.

Jamesone's daughter Mary excelled in embroidery, in textile paintings; some of her works are still preserved in the church of St. Nicolas, at Aberdeen.

(Walpole, *Anecdotes of Painting*, &c.; Cunningham, *Lives of British Painters*, &c.)

JAMIESON, JOHN, D.D., is best known as the author of the Scottish Dictionary, but he published many other literary works, and was a person of very considerable ability and acquirement in various departments. He left also, it seems, an autobiography, entitled 'Recollections of my past Life,' a manuscript of upwards of two hundred closely written folio pages, the composition of his later years, which, from the account that has been given of it, we should infer would well deserve to be sent to the press. We are indebted for the materials of the present short notice to a memoir abstracted from this manuscript in Tait's Magazine, No. 92 (for August, 1841), pp. 514-528.

Jamieson (so he himself spelt the name, though he made his children drop the *i*) was born in Glasgow, 3rd March, 1759. His father, the Rev. John Jameson, was pastor of one of the two congregations of Seceders (that is, Presbyterian dissenters from the Established Church), which then comprised all the persons of their denomination in that city: this office he held for many years, struggling with ill health and an income of less than a hundred a year. The Seceder minister's family connections, however, were very good; and the course of his son's life was much influenced and coloured by that circumstance. Mrs. Jameson had been a Miss Cleland, whose mother was a daughter of the Rev. Robert Bruce of Garlet, son of a younger brother of Bruce of Kennet, in Clackmannanshire, a family allied to many of the highest of the old gentry, and which disputes the chieftainship of the line of Bruce with the earls of Elgin. These Bruces of Kennet had always been staunch Presbyterians; but it is remarkable that the father of the Seceder clergyman, a respectable farmer of West Lothian, had been a zealous Episcopalian. His son was so ashamed of this fact, that young Jamieson never could learn from him of what religion his grandfather had been, and it only came accidentally to his knowledge late in life. In those days especially the Seceders were distinguished even among other Presbyterians for their rigid and exclusive Presbyterianism.

The subject of the present notice remained throughout his life a steady, but by no means a narrow-minded Seceder. His mother's relations, taking him by the hand, early introduced him extensively into general society, and his literary tastes and associations further helped to liberalize him. Yet even long after he numbered among his intimate acquaintances and friends many persons of great eminence and influence, and had become known in literature, his worldly circumstances continued extremely narrow. He was in fact kept back rather than brought forward by the governing bodies in his sect, in which, under a professedly more popular constitution, the authority of the clergy in their courts is, or at least was, nearly as absolute over individuals of their number as is that of the Conference among the Wesleyan Methodists.

The chronology of his life may be given in a few sentences. He was sent to the university of Glasgow when he was only nine years old, an unusually early age for the commencement of academic education even in Scotland. The urgent motive in this case seems to have been not any extraordinary precocity, or appearance of precocity, in the boy, so much as the anxiety of his father, who had no other son surviving and nothing to leave to his family, to see him established as a clergyman before he should be himself, and he was in very broken health, removed from the world. Among his teachers at Glasgow were Professor Muirhead, an enthusiastic Virgilian; Dr. Moor, the author of the Greek Grammar, an accomplished scholar and a man of talent, but indolent and dissipated; and Dr. Reid, the metaphysician. He commenced the study of theology at the age of fourteen, under the Rev. William Moncrieff, who lectured on that subject to the young men intended for the Secession ministry at Alloa. After having been a session at Alloa, however, he attended the lectures of Dugald Stewart in the university of Edinburgh. In July, 1779, having just completed his twentieth year, he was licensed as a preacher by the Seceder Presbytery of Glasgow. For some time he was employed, as the practice in his communion is or was, to do duty without any pastoral appointment; first at Clonmell in Ayrshire, then in the Isle of Bute, then at Cowal in Argyleshire, then at various places in Perthshire. At last he received at the same time calls, or popular invitations, from congregations in Forfar, Dundee, and Perth; upon which the synod, or governing body, appointed him to that at Forfar, the poorest and in all other respects the least desirable of the three. Here he managed to exist upon an uncertain stipend of fifty pounds a year, for a dozen years or more. About a year after settling at Forfar, he married, and he soon had a numerous family; his wife was the daughter of a country gentleman of Angusshire, but it is not stated that she brought him any money. It is intimated indeed that he got into debt; and it is quite clear that he must have either borrowed money or procured some beyond his regular professional income in some other way. While thus situated he made several journeys to London, and both there and in Scotland formed many literary acquaintanceships. He had when very young contributed some verses to Ruddiman's 'Weekly Magazine,' and he had also communicated some papers on the antiquities of Forfarshire to the Literary and Antiquarian Society of Perth, of which he was a member; but he first properly came out as an author in 1786, when he published, under the title of 'Socinianism Unmasked,' an examination of certain opinions deemed heretical which had been promulgated through the press by Dr. Macgill, one of the established ministers of Ayr. This work procured him considerable reputation in the religious world, and it was followed in 1789 by 'The Sorrows of Slavery, a poem;' in 1790 by two octavo volumes of 'Sermons on the Heart;' and in 1791 by 'Congal and Fenella,' a metrical tale, in two parts. The memoir before us is deficient in dates; but it would appear to have been after he had been ten or twelve years at Forfar that he received a call to be their pastor from the Seceder congregation of Nicolson-street, Edinburgh, which, however, the synod would not allow him to accept. But when, a few years after, he was again unanimously invited by the same congregation, it was not deemed decent or prudent by the reverend body to make any further opposition; and he accordingly removed to the metropolis with its literary society and other advantages of position, and exchanged his fifty pounds a year for an income of perhaps four times the amount. In this situation Jamieson remained for the rest of his life. To the last much of his time continued to be given to literature; and in addition to the works already mentioned, he published, among others of a slighter nature, in 1795, a 'Reply to Dr. Priestley,' in 2 vols. 8vo.; in 1798, 'Eternity: a poem;' in 1799, 'Remarks on Rowland Hill's Journal;' in 1802, 'The Use of Sacred History,' in 2 vols. 8vo.; in 1806, 'An important Trial in the Court of Conscience;' in 1808, his 'Etymological Dictionary of the Scottish Language,' in 2 vols. 4to.; in 1818, 'An Abridgment of the Scottish Dictionary,' in 1 vol. 8vo.; in 1811, 'An Historical Account of the Ancient Culdees of Iona;' in 1814, 'Hermes Scythicus, or the Radical Affinities of the Greek and Latin Languages to the Gothic,' 8vo.; in 1825, a Supplement to his Scottish Dictionary, in 2 vols. 4to.; and subsequently 'An historical Account of the Royal Palaces of Scotland.' He also produced, in 1820, an edition of Barbour's poem of 'The Bruce,' and Harry the Minstrel's 'Sir William Wallace,' in 2 vols. 4to. Here then was at any rate no want of industry. Neither Jamieson's learning, however, nor his critical acuteness, was of a high order; and scarcely anything that he has done, with the exception of his Scottish Dictionary, retains much value. His 'Hermes Scythicus' is founded upon a mere examination of the vocabularies of some of the northern languages, and has been long superseded. Nor has his Dictionary (of which a second edition has been lately published) any merit as a critical performance; but it is valuable as by far the most extensive collection that has been formed, both of old words and phrases, and of notices of old customs, peculiar to Scotland, a large portion of the matter it contains being derived from the people themselves, their conversation and traditions, and being thus rescued from the probably imminent danger of irrecoverable oblivion. Jamieson wrote verse apparently with facility, but not with much felicity. A favourable specimen of his style of performance in this line may be seen in his poem in the antient Scottish dialect (or language, as he considers it), called 'Water-Kelpie,' which he contributed to Scott's 'Minstrelsy of the Scottish Border.'

Jamieson early in life received the diploma of a doctor in divinity from the college of New Jersey in the United States; he was for many years secretary to the Society of Scottish Antiquaries; and he received a pension of 100*l.* a year as an associate of the Royal Society of Literature from its institution till the general withdrawal of the allowances on the accession of William IV. In 1833 a pension to the same amount was assigned to him from the Civil List. He died at Edinburgh, on the 12th of July, 1838, leaving only one son, Mr. Farquhar Jameson, a banker in Paris, of five that had reached the years of manhood. His second son, Mr. Robert Jameson, had died a few years before, after rising to considerable distinction at the Scottish bar.

JAN MAYEN ISLAND is an island in the Arctic Polar

Sea, lying between 70° 49′ and 71° 9′ N. lat., and between 7° 26′ and 8° 44′ W. long. It extends from south-west to north-east about thirty miles, and is in no place above nine in breadth; at some places it is less than two miles. On the northern extremity, where the island is widest, stands the mountain called Beerenberg or Bear Mountain, a peak rising to 6870 feet above the sea-level. It frequently shows its snow-capped summit above the clouds, and rests on a rocky mass 1500 feet high. In other parts the rocky masses appear to attain an elevation of between 1500 and 2000 feet. A large portion of the island is composed of lava and other volcanic matter, and two craters have been discovered on the eastern side; smoke and fire have been observed in these parts.

Even in the beginning of August all the high lands are found covered with snow and ice, and the low lands in those valleys and deep cavities where large beds of snow have been collected, retain part of their covering to the very border of the sea. At the foot of the Beerenberg are three very singular glaciers: they occupy recesses in the cliff where it is more than 1200 feet high, and nearly perpendicular. They are very rough on the surface, and of a greenish grey colour. They present the appearance of immense cataracts suddenly arrested in their progress and congealed by the power of an intense frost. Like cascades, their prominent greenish colour is variegated with snow-white patches resembling foam, which deeply contrast with the jet-black points of the most prominent rocks peeping through their surfaces.

The coast has several roadsteads with good anchorage in five to ten fathoms water, black sandy ground, but no harbour for a ship, all the anchorages being open to the sea in an angle of at least ten points of the compass. The soundings about the island are very irregular, and the bottom generally consists of rocks or black sand. The western navigation of Jan Mayen is preferred to the eastern, as being less encumbered with ice and less subject to calms, squalls, and whirlwinds, which are often encountered in passing to the east of Beerenberg. The whole island is generally surrounded in the spring of the year; but in autumn, and even in summer, the ice sometimes sets so far to the westward that it is not visible from any part of the land.

There are foxes and white bears, and perhaps also reindeer. Water-fowl are numerous, especially burgomasters, fulmars, puffins, guillemots, little auks, kittywakes, and terns. Several cetaceous animals abound, principally of the species Balæna Physalis. The vegetation is very scanty, and limited to a few species scattered widely about among the volcanic minerals. Iron has been observed at several places.

The island was discovered in 1611 by a Dutch navigator called Jan Mayen, and was much visited up to about 1640 on account of the great number of whales, which, however, afterwards retreated to other parts of the Arctic Sea. In this time (1633-1634) seven Dutch seamen wintered here, probably for the purpose of establishing a permanent colony, and they kept a regular journal. But on the arrival of the Dutch fleet in the following June all were found dead in their huts. From the journal, however, it appeared that they had not been killed by the frost but by the scurvy, which had attacked them for want of fresh provisions. Their journal terminated on the 31st of April.

(Scoresby, *Account of the Arctic Regions.*)

JARDYN, KAREL DE, one of the best of the Dutch landscape, pastoral, and *genre* painters, and the most distinguished of N. Berghem's scholars. He was a native of Amsterdam, and lived some time in Rome, where the Flemish painters gave him the nickname of Bokkebaart (goat-beard). He died at Venice in 1678, aged about forty. There are many spirited etchings by his hand.

(Houbraken, *Groote Schouburg*, &c.; Bartsch, *Peintre-Graveur.*)

JASIONE, a genus of plants belonging to the natural order Campanulaceae. It has a 5-leaved rotate calyx, anthers cohering at the base, a hairy trifid style, 2-celled capsules opening by a large and somewhat valvular pore at the base. There is but one British species of this genus.

J. montana has a simple root, bluntish oblong wavy leaves, and stalked flowers. The stems are from six inches to two feet long, pilose, simple, or branched: leafy below, bare and glabrous above, and ascend from the crown of the root. The flowers are small, in terminal bracteated heads, having a light blue corolla.

(Babington, *Manual of British Botany.*)

JAVOLENUS PRISCUS, a Roman jurist, from whom there are a few excerpts in the Digest. His period is not quite certain. He is mentioned by Pomponius (Dig. 1, tit. 2, s. 2, §47) as a successor of Caelius Sabinus, and he accordingly belonged to the Sabiniani; and some writers place him in the time of Nerva and Hadrian. He was the master of Salvius Julianus. It may be inferred from a passage of Julianus (Dig. 40, tit. 2, s. 5), that Javolenus some time held the offices of governor of Syria and Africa. He is probably the Javolenus Priscus mentioned by the younger Pliny (*Ep.* vi. 15), who stopped by a timely answer Passienus Paulus from inflicting his poetry on him. Javolenus is mentioned by Capitolinus in his Life of Antoninus Pius as one of the jurists who were the advisers of the emperor. But this would extend his life beyond probable limits; he who was the master of Julianus who drew up the Edictum Perpetuum under Hadrian, could not have been one of the advisers of Antoninus Pius. According to the Florentine Index, Javolenus wrote fifteen books 'ex Cassio,' that is, Caius Cassius Longinus, fourteen books of Epistolæ, and five books to Plautius. He was also the author of an Epitome of the Libri Posteriores of Labeo; and made notes on them (*Dig.* 40, tit. 12, s. 42).

JENKINSON, ANTHONY. [KIVA, P. C. S.]

JEREMIE, SIR JOHN, was born in Guernsey, August 19, 1795, and was the eldest son of the late John Jeremie, a distinguished advocate of the Royal Court of that island. At an early age he was sent to the Blundell grammar school, Tiverton, but his studies were soon interrupted by the premature death of his father. Upon his return to Guernsey he devoted himself to the study of the law, which he completed during a residence at Dijon, in France. As early as 1815, at the commencement of his public life, he distinguished himself before the royal commissioners, sent over to Guernsey to correct certain abuses in the laws and administration of justice in that island. He was afterwards retained in many difficult cases, both civil and criminal, and soon acquired a high character for independence and energetic zeal in the discharge of his professional duties. On more than one occasion he was chosen to plead cases of appeal before the Privy Council, where his talents and eloquence found a larger sphere for their action, and brought him before the notice of government.

In October, 1824, he was appointed to the office of Chief Justice of S. Lucia, in the West Indies. 'At the time the tender of an appointment was made to him,' he observes, in his Essays on Colonial Slavery, 'he was unacquainted with a single individual in the service of the colonial department, and his political opinions were rather opposed to the then existing government. On the question of slavery he was thoroughly indifferent; indeed, it was so remote from his usual pursuits, that he may fairly say he had never given it a thought. In the interval between the first proposal and his accepting office, his professional avocations brought him to England, and on this occasion, probably owing to this proposal, his curiosity prompted him to attend an anti-slavery meeting. The impression made upon his mind was rather unfavourable than otherwise to the abolitionists. He heard much declamation, much angry and eloquent declamation; but accustomed from early life to sift evidence, it struck him that there was a deficiency of facts and of evidence on which to found that declamation.' It was under this impression that he went to the colonies, and the candid expression of his feelings on the subject of slavery, which we have quoted, must acquit him of any bias in favour of its abolition, and proves that his subsequent devotedness to the great cause of emancipation was the entire result of a conviction pressed upon him by an actual knowledge of the evils of the system. No sooner, indeed, was the slave law of 1825 promulgated, and the slave enjoyed the liberty of freely communicating with his protectors, than numerous examples of revolting cruelty, brought before him in his official capacity, produced a rapid but lasting change in his opinions. In proportion to the extent of his inquiries was the depth of his conviction that the only remedy to the evil of slavery was the gradual emancipation of the slave. His views on this important subject are fully put forth in 'Four Essays on Colonial Slavery,' which he published on his return to Europe in 1831; in them he describes the general features of the slave communities, and the beneficial effect of the ameliorations already adopted, and he proceeds to show what he considers to be the further measures required for the entire annihilation of the system. The principle by which he was actuated in publishing these essays will be seen from the following extract. 'Such then,' he observes, 'is the unfavourable estimate reluctantly formed of the West Indian communities; nor can they complain that they are anonymously maligned, that they are maligned on rumour or insufficient evidence, or that sentiments are now expressed different from those which he was known to entertain when among them. Such as they are, he has urged them in the warmth and confidence of friendship; he has repeated them from the judgment-seat in the sternness of duty, with the still sterner proof before him. They are now published, neither vindictively nor in anger, but because, having tried every other method, be has acquired the painful conviction that publicity alone can lead to a thorough reformation.'

In the year 1832, he was appointed to the office of Procureur and Advocate-General of the Mauritius. He had there to contend not only against objections of a personal nature, arising from his known opinions on the slave question, but against national and deep-rooted antipathies of a population almost entirely of French origin, and strongly attached to French institutions. The office, moreover, which be held presented peculiar difficulties to one who was determined conscientiously to perform the duties it imposed. It were an error to assimilate it to that of an English attorney-general; they are only so far similar that they both fulfil the duties of a public prosecutor. The procureur-general, among the French, is an executive magistrate, and has to enforce the decrees of the courts, and he has under bis control the police force of the country. When the disaffected party at the Mauritius heard of Mr. Jeremie's appointment to an office which, we believe, had hitherto been held by members of their own community, they broke out into an almost open rebellion. On bis arrival before Port Louis, so great was the fear entertained for bis personal safety by the British authorities, that all access to the shore was, for a time, forbidden bim. The colonial assembly had petitioned the governor altogether to prevent bis landing; their request being refused, after a detention of two days he went on shore, under the protection of the whole naval and military force in the island, and on the same day was sworn into office, at a meeting of the legislative council.

The many scenes of violence which ensued are fully detailed in a pamphlet entitled 'Recent Events at the Mauritius,' which he published in vindication of his conduct. It will be sufficient to mention that the governor thought it advisable, for the security of the public peace, to order him to return to England, be having previously declined to do so, except a written command were given him to that effect. On his arrival in London he immediately reported bimself to the colonial office, adding, that he was ready to resume bis journey back to the Mauritius at an hour's notice. His request, though delayed, was granted, and his return to that island preceded by an additional military force. The feelings, however, originally excited against him did not easily subside, and his residence there, which terminated in 1835, was embittered by a series of painful events, arising from the fearless advocacy of his opinions. 'Within three years,' to use his own words, 'he had traversed fifty thousand miles, encountered the assassin on shore and the pirate at sea; for ten years had it been his fate to face, in the service of the crown, every peril to which life is subject, whether from the ocean, from climate, or from tho hand of man.'

In the year 1836, he was appointed to the office of puisne justice of the Supreme Court of Ceylon, and during the same year he received a gratifying proof that his devoted zeal in behalf of emancipation had been fully estimated by the British public. A valuable piece of plate was presented to him by the Anti-Slavery Society; the inscription upon it testifying that 'by bis disinterested, ablo, and energetic exertions in most critical and painful situations, both at home and abroad, negro freedom had been largely advanced, and the negro character raised to its just standard in public estimation.'

His residence during four years at Ceylon was the only tranquil period of his eventful life. Early in the year 1840, he published a 'Letter on Negro Emancipation, and African Civilization,' addressed to Sir T. F. Buxton. In it he describes the present, and shows what he considers will be the future effects of emancipation in the colonies, and gives a short outline of the practical steps which might be taken in order to advance the civilization of Western Africa. He looks upon the emigration of the emancipated negro of the West Indies to the land of his origin as one of the most likely means of attaining that important end. 'To the sons of Africa,' be says, 'we must look for the regeneration of Africa. To a reflux of the west upon the east, in moderate numbers, and managed with caution, must we look for the civilization of the east.'

It was to carry into effect the measures which had been suggested for ameliorating the condition of the liberated slaves that, undeterred by the perils of a pestilential climate, he accepted, in October, 1840, the important office of Governor and Captain-general of Sierra Leone and its dependencies, and be received at the same time the honour of knighthood. On the 23rd of April, 1841, only four months after his arrival at Sierra Leone, he fell a victim to the prevalent disease of the climate, while engaged in a government mission at Port Lago. His only son, John Robert Jeremie, a young man whose talents promised high success in a career of honourable utility, which had been opened to him in Europe, had, at his own earnest request, accompanied his father as private secretary, which appointment he held under the succeeding Governor until 1843, when he likewise fell a victim to the climate. Of Sir J. Jeremie's family, originally consisting of three children, his widow, the constant sharer of his perils, alone survives. The inhabitants of St. Lucia, when the news of his death reached them, marked their regret for his loss by a general mourning. But perhaps the most gratifying tribute to his memory is to be found in an address made on that occasion to the Royal Court of St. Lucia by his friend Dr. Reddie, who had succeeded him as chief justice of that colony. The following passages are contained in it:—'To say that Sir J. Jeremie was the ablest judge, was the most useful judge, who ever presided at St. Lucia, is saying little indeed. For the laws which he enforced, and the reforms which he introduced into the legal system of the colony, giving stability to commerce and security to the investment of capital, the planters and merchants recognise to him a deep debt of gratitude. Wherever you turn your eyes you meet the proofs of his activity in the discharge of the administrative duties which, at one timo, devolved on the first president;—the high roads opened up and levelled, the paving and drains for the salubrity of the town, the erection of the Protestant church, all attest his unwearied and zealous labours. His memory will long be cherished by that class of the colonists whose equal rights he secured, and whose social position he upheld and vindicated, both by precept and example, when, to use his own striking language, after having submitted to the minister of the crown (Sir George Murray) an argument on the grave colonial question, the distinction of colour, that eminent statesman recognised the policy and justice of a change, and the "curse of Heaven disappeared from the face of the Western world."'

JERVAS, CHARLES, the portrait painter, was born in Ireland about 1675; the exact date is not known. He studied a year with Kneller in London, copied the cartoons of Raphael at Hampton Court, in small, and studied also in Paris and at Rome. He returned to London about 1708, where, through the intimate friendship of Pope, and a fortune of 20,000*l.* which he acquired with his wife, a widow, he was enabled to overcome all the usual difficulties attendant upon a professional life in its up-hill career. His sole ability as a painter seems to have been bis power of copying: some of his copies after Carlo Maratta are, according to Walpole, equal to the originals. He appears to have been inordinately conceited, due no doubt in a great measure to the silly flattery of his friend and pupil Pope, in his 'Epistle to Jervas.' There are several anecdotes related of his vanity: on one occasion, when be had finisbed a copy after Titian, he said, looking with tho utmost satisfaction from one to the other, 'Poor little Tit, bow he would stare.' Jervas seems to have set up a coach rather early, and when Kneller was informed of it, the veteran exclaimed, 'Ach! mein Gott, if his horses do not draw better than he does, be will never get to his journey's end!' Jervas affected to be a free-thinker, and when he was once talking irreverently of tbe Scriptures, in the presence of Dr. Arbuthnot, the doctor observed to him, that he was notwithstanding both a speculative and a practical believer, for, said he, 'you strictly observe the second commandment—in your pictures you make not the likeness of anything that is in the heavens above, or in the earth beneath, or in the waters under the earth.' This deserved lash contains a better account of Jervas's style than the extravagant encomium of Pope. Jervas died Nov. 2, 1739.

(Walpole, *Anecdotes of Painting*, &c.)

JESIRA, AL. [MESOPOTAMIA, P. C.]

JOA'NES, or JUA'NES, VICENTE, a celebrated Spanish painter, was borne at Fuente la Higuera in Valencia, in 1523. Palomino's account, therefore, that he was the scholar of Raphael, is an error. He studied in Italy, and, as we may infer from his style, chiefly the works of the Roman school. He died December 21st, 1579, whilst engaged in finishing the altar-piece of the church of Bocairente, and was buried in that town, but his body was removed to Valencia and deposited in the church of Santa Cruz in 1581.

Joánes was one of the best of the Spanish painters: he is acknowledged as the head of the school of Valencia, and is sometimes termed the Spanish Raphael. His drawing is correct, and displays many successful examples of foreshortening; his draperies are well cast, his colouring is sombre (he was particularly fond of mulberry colour), and his expression is mostly in perfect accordance with his subject, which is generally devotion or impassioned resignation, as in the Baptism of Christ in the cathedral of Valencia. Joánes' subjects are exclusively religious, and if, says Cean Bermudez, Morales on this account deserved the title of El Divino, Joánes is equally entitled to it. Like his countryman Vargas and D'Amato of Naples, he is said to have always taken the sacrament before he commenced an altar-piece. His best works are in the cathedral of Valencia, and there are several good specimens in the Prado at Madrid. To mention a minor quality of his works, he excelled in painting hair.

Juánes had many scholars, among whom his son Juan Vicente was not undistinguished: his daughters also, Dorotea and Margarita, were well known for their ability in painting.

(Cean Bermudez, *Diccionario Historico*, &c.)

JODE, DE, PIETER, the name of two celebrated engravers of Antwerp, father and son.

The elder, the son of Gerard de Jode, likewise an engraver, was born in 1570. He was the pupil of Golzius, studied and worked in Italy and at Paris, and died at Antwerp in 1634.

De Jode engraved many plates in a good style, among them the remarkable picture of the Last Judgment, by Cousin, in twelve sheets, making altogether about sixteen square feet, four each way: it is one of the largest prints in existence.

The younger de Jode, or Petrus de Jode, Junior, as he signed himself on his prints, was born at Antwerp in 1606, and was instructed in engraving by his father, whom he soon surpassed in execution, especially in the nude, and equalled in correctness of drawing. He worked with his father in Paris. His numerous portraits after Vandyck are his best works; among them are his own, and those of Jordaens, Poelemburg, Suellina, De Coster, and others, painters of Antwerp. He executed also some good prints after Rubens. The date of his death is not known.

Arnold de Jode was the son of the younger Pieter, and was born at Antwerp about 1636. He is said to have been in London in 1667, and then to have engraved a print after the picture by Correggio, which belonged to Charles I., of Mercury instructing Cupid, which is now in the National Gallery. Scarcely anything is known of him personally: as an engraver he was inferior to his father and grandfather.

(Basan, *Dictionnaire des Graveurs*; Hubert, *Manuel des Amateurs*, &c.)

JOHN, KING OF SWEDEN. [Charles XIV., P. C. S.]

JOHNSTON, DR. ARTHUR, the fifth son of an ancient family possessing estates in Aberdeenshire, was born in that county in 1587. At an early age he went abroad for medical education: and the degree of Doctor in Medicine was conferred on him at Padua in 1610. He travelled in various parts of the continent, and resided for twenty years in France, marrying twice in the course of that period. He returned to his native country before the year 1625, and was soon afterwards appointed physician to King Charles I., probably through the influence of Laud. After this appointment he must have resided chiefly in the neighbourhood of the court. In 1641 he died at Oxford, while on a visit to a daughter married there. Johnston's name is preserved in the memory of scholars by his Latin verses. He was the most extensive contributor, and is not unusually called the editor, of Sir John Scot's collection of Latin poems, the 'Delitiæ Poetarum Scotorum hujus Ævi Illustrium,' Amsterdam, 1637, 2 vols. 12mo.; and besides several other volumes of compositions in Latin verse, he was bold enough to measure lances with Buchanan in a version of the Psalms, 'Paraphrasis Poetica Psalmorum Davidis, Auctore Arturo Jonstono, Scoto,' Aberdeen, 1637, 8vo. This ambitious attempt led, many years afterwards, to a protracted controversy on the merits of the rival versions. The history of the dispute is related, and Johnston's works fully described and justly estimated, in Dr. Irving's 'Lives of Scottish Writers,' 1839, 2 vols. 8vo. It is enough here to say, that Johnston's high rank among modern writers of Latin poetry is universally admitted; and that, although in Scotland his psalms have usually been estimated much below Buchanan's, the justice of this sentence has been questioned by critics of authority, of whom Mr. Hallam is one

JOINERY (French, *Menuiserie*) is the art of joining pieces of wood together for the interior fittings of buildings, for making articles of furniture, and for numerous purposes requiring greater neatness of workmanship than the operations of the carpenter. [Carpentry, P. C. S., p. 292.] As carpentry and joinery are in many cases carried on in the same establishment, and even by the same workmen, it would be difficult accurately to define the limits of these two kindred arts; but a good general distinction is drawn between them in Tredgold's article 'Joinery,' in the seventh edition of the 'Encyclopædia Britannica,' where it is stated that the art of carpentry is directed almost wholly to the support of weight or pressure, owing to which circumstance its leading principles belong to the mechanical sciences. The proper object of carpenter's work in a building is to give firmness and stability to the structure; and within its proper range may be embraced all the rough timber-work necessary for the support, division, or connection of the several parts of a building. Carpentry thus includes the construction of the framing of floors, partitions, and roofs. Joinery, according to the same authority, has for its object the addition of all the fixed wood-work necessary for convenience or ornament; and while it does not call for the application of much mechanical science, it requires, as Tredgold observes, much skill in that department of geometrical science which relates to the projection and description of lines, surfaces, and solids, as well as an intimate knowledge of the structure and properties of wood. The principal items of joiner's work in a building, as enumerated by Nicholson in his treatise on 'Carpentry,' in the 'Encyclopædia Metropolitana,' are the doors, windows, margins round plaster to protect it from injury at angles, &c.; decorations generally, such as architraves, bases, columns, and pilasters; boarding, skirting, and wainscoting. The boarding of floors, which is treated of under House, P. C. S., p. 52, and the construction of staircases [Staircase, P. C., p. 423], are considered as falling into the department of the joiner rather than the carpenter; and the construction of the hand-railing of staircases is a department of joinery which requires much ingenuity, and is treated at great length in many works on the subject. Tredgold observes that cabinet-making, or that department of wood-work which relates to the making of furniture, has little affinity with joinery, although the same materials and tools are employed in both descriptions of work. The line of demarcation, however, between joinery and cabinet-making would seem to be even more difficult to define than that between carpentry and joinery; and, with the exception of such matters as veneering and polishing, which relate only to the use of the harder and more valuable woods, the operations of the cabinet-maker and the joiner are nearly identical, the same means being adopted by both for the production of neat and strong joints, and for evading the injurious effect of shrinkage, warping, and hygrometric changes in the material operated upon. It is, indeed, remarked by the author of 'The Joiner and Cabinet-Maker,' in Knight's series of Industrial Guide-Books, that 'the same man will call himself a joiner when he is working in deal, or oak, or ash, and making a strong kitchen table, or a door, or a corn-chest, and a cabinet-maker when he is working in mahogany or rose-wood, and making a writing-desk or a cabinet.'

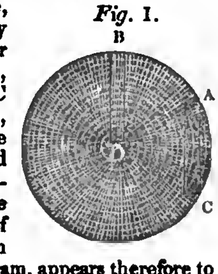
Tredgold, in the article above referred to, has collected numerous notices relative to the progressive improvement of the art of joinery, and the principal works which have been published on the subject. He traces the origin of the art in the thrones, stalls, pulpits, and screens of cathedrals and churches, in which, however, the joinery is of the most simple kind, and is indebted to the carver for its ornament. The earliest writer on joinery to whom he alludes is Joseph Moxon, in whose 'Mechanick Exercises,' published in 1677, the tools and ordinary operations of the joiner, and the technical terms then in use, are explained. He attributes the credit of establishing the principles of joinery, in this country, on the sound basis of geometrical science, to the valuable practical works of the late Peter Nicholson, who appears to have been the first English writer on the subject who derived assistance from the works of continental writers. The French, especially, have produced many valuable works on joinery, which show that some things given as new by English writers have long been known on the continent; bu Tredgold observes that in practice the French joiners are very inferior to our own. 'Their work,' he says, 'is rough, slovenly, and often clumsy, and at the best is confined to external effect. The neatness, soundness, and accuracy which is so common to every part of the works of an English joiner, is scarcely to be found in the works of a French one.' 'The little correspondence,' he adds, 'in point of excellence, between their theory and practice, leads us to think that their theoretical knowledge is confined to architects, engineers, &c., instead of being diffused among workmen, as it is in this country.'

In all the operations of the joiner it is of primary importance to know the peculiar properties of the material that is used. This subject is briefly noticed under Carpentry, P. C. S., p. 292, and some information bearing upon it is given under Wood, P. C., p. 518; while in Exogens, P. C., p. 120, is an explanation, illustrated by sectional diagrams, of the manner in which woody matter is formed, and of the arrangement of the component parts of the trunk of a tree. Tredgold gives much information relative to various kinds of wood in his 'Elementary Principles of Carpentry;' and, in his treatise on joinery in the 'Encyclopædia Britannica,' he gives the results of some important experiments on those peculiar properties of wood which lead to its warping and cracking. Of these the first in order was made by T. A. Knight, Esq., and communicated by him to the Royal Society in 1801 and 1817; and they appear to be opposed to some generally received opinions. In his first paper on the subject, printed in the ninety-first volume of the 'Philosophical Transactions' (p. 344, &c.), Mr. Knight observes 'that there is in every kind of wood what workmen call its grain, consisting of two kinds, the false or bastard, aud the true or silver grain.' 'The former,' he explains, 'consists of those concentric circles which mark the annual increase of the tree; and the latter is composed of very thin laminæ, diverging in every direction from the medulla (or pith) to the bark, having little adhesion to each other at any time, and less during the spring and summer than in the autumn and winter, whence the greater brittleness of wood in the former seasons.' His observations in this paper refer to English oak, but they are, he says, more or less applicable to every other kind of wood, the wood of exogenous plants only, of course, being included in this remark. The truth of his observations is illustrated by the fact that in drying whole trunks it is impossible to prevent the wood from splitting more or less, the cracks being in all cases directed towards the centre, thus indicating that the wood shrinks in a greater ratio in the direction of the circumference of the trunk than in the direction of its diameter, and that the radiating or diverging laminæ of what Knight styles the true or silver grain will readily separate from each other. In sawing the English oak into boards, Knight observes, 'it is usual to cut it, as much as possible, into what are called quarter-boards, which are so named because the tree is first cut into quarters.' 'In a perfect board of this kind,' he adds, 'the saw exactly follows the direction in which the tree most readily divides when cloven; in this case the laminæ of the silver grain lie parallel with the surface of the board, and a board thus cut, when properly laid in the floor, is rarely or never seen to deviate from its true horizontal position.' An American machine for cutting up trunks so that all the boards produced may possess this quality is noticed under Saw-Mill, P. C., p. 481. 'If, on the contrary,' to resume Mr. Knight's observations, 'one be sawed across the silver grain, it will, during many years, be incapable of bearing changes of temperature and of moisture without becoming warped; nor will the strength of numerous nails be sufficient entirely to prevent the inconvenience thence arising. That surface of a board of this kind which grew nearest the centre of the tree will always show a tendency to become convex, and the opposite one concave, if placed in a situation where both sides are equally exposed to heat and moisture.'

In the second paper of Mr. Knight on this subject, in the 'Philosophical Transactions,' vol. cvii. p. 269, &c., he states the result of similar experiments upon ash and beech. Some thin boards of these woods were, to quote his own words, 'cut in opposite directions relative to their medulla, so that the convergent cellular processes crossed the centre of the surfaces of some of them at right angles, and lay parallel with the surfaces of others; by which means I became enabled to mark the comparative extent of their expansion and contraction when they were subjected to various degrees of heat and moisture.' 'Both were placed under perfectly similar circumstances in a warm room, when those which had been formed by cutting across the convergent cellular processes soon changed their form very considerably, the one side becoming hollow and the other raised: and in drying these contracted nearly 14 per cent. relative to their breadth. The others retained, with very little variation, their primary form, and did not contract more than $3\frac{1}{2}$ per cent. in drying.'

Tredgold, after briefly noticing the above experiments, gives the result of another, conducted apparently by himself, which completes the application of the same important principles to the more ordinary materials of the joiner. 'As Mr. Knight,' he observes, 'had not tried resinous woods, two specimens were cut from a piece of Memel timber; and to render the result of our observation more clear, conceive *Fig.* 1 to represent the section of a tree, the annual rings being shown by circles. BD represents the manner in which one of our pieces was cut, and AC the other. The board AC contracted 3·75 per cent. in width, and became hollow on the side marked *b*. The board BD retained its original straightness and contracted only 0·7 per cent.' The difference in the relative amount of contraction between boards cut in the two ways indicated in the diagram, appears therefore to be even greater than in hard woods. 'From these experiments,' Tredgold observes, 'the advantages to be obtained merely by a proper attention in cutting out boards for pannels, &c. will be obvious; and it will also be found that pannels cut so that the septa are nearly parallel to their faces will appear of a finer and more even grain, and require less labour to make their surface even and smooth.' He considers that their results will be no less interesting to cabinet-makers, especially in connection with the making of tables. 'For such purposes,' he says, 'the planks should be cut so as to cross the rings as nearly in the direction BD as possible;' and he expresses his opinion that the great superiority of the billiard-tables of some makers to those of others is attributable to a knowledge of this property of wood. As affecting ornamental woods he remarks that where the transverse septa are large, a plank cut like BD will be figured, while one cut as AC will be plain.

Fig. I.



Reasonable and self-evident as the results of the experiments above detailed may appear, when the physiological structure of exogenous wood is taken into consideration, they are almost diametrically opposed to an opinion prevalent among joiners, that a plank or board cut as AC, which would be termed *mild*, is preferable to one cut in the plane of the axis of the trunk, like BD, which would be termed *strong*, not with reference to its actual strength in the ordinary sense of the word, but rather as a correlative to mild, as indicative of rankness, hardness, or coarseness, and its presumed tendency to warping.

Another kind of warping or irregular shrinkage, which often affects joists, door-posts or jambs, and other thick pieces of wood which are cut from one side of a trunk, is thus explained by Mr. Knight. (*Phil. Trans.* vol. cvii., p. 274.) 'The interior and older layers of wood,' he states, 'are much more solid and specifically heavy than the external layers in the same tree; and the latter consequently contract more longitudinally in drying than the former, and the edge of every board (that has been cut with surfaces nearly parallel with the line of the converging cellular processes) which lay nearest the medulla in the tree will therefore in drying become convex, whilst the opposite edge will become concave.' From these remarks it may be presumed that while, where flatness of surface is the principal object, a piece of wood cut like BD, *Fig.* 1, is preferable te one cut like AC, the latter would be preferable where the permanent straightness of the edges is of the greatest importance, because the fibres near its two edges, being equidistant from the pith or medulla, will shrink equally, while in BD those at the edge B will contract more than those at the edge D.

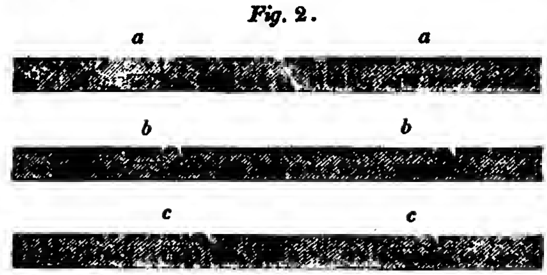
By paying due regard to such circumstances in the selection of wood, the joiner may, in a great degree, evade the inconvenience arising from irregular variations in the dimensions of his material. As an illustration of the application of such knowledge, we may refer to the method described in Dodd's 'British Manufactures,' series iv., p. 211, in Knight's 'Weekly Volume,' as occasionally adopted in the formation of large deal table-tops, for veneering with mahogany or rosewood. Owing to their great width and various other circumstances, such boards or slabs are peculiarly liable to warping; but the tendency is guarded against by selecting deals as free as possible from knots, and sawing them longitudinally into pieces four inches or four inches and a half wide. These are glued together side by side, an edge which has been nearest the heart of the tree being joined to an outside edge. When the glue is thoroughly set, the wide compound board thus produced is again cut up into slips, by sawing it longitudinally midway between the joints, and these slips are rejoined, with a further change in the order of placing the pieces. The table-top thus consists of pieces of wood not more than two inches wide, so arranged as mutually to counteract any inclination to warping. A due regard to the laws of warping and shrinkage is also very necessary in the construction of large mouldings and decorations, which are built up, as it were, of several distinct pieces of wood. In making wooden columns, for example, several pieces must be fitted together to form a hollow cylinder, in preference to using one large post; or, where large posts are used, they must, if appearance is to be regarded, be surrounded by a number of narrow pieces. Small columns may be made of a single piece, and prevented from splitting by boring a large hole down their axis.

The original shrinkage of wood in drying is not however the only change of dimension to be provided for, since, from its hygrometric properties, changes in the state of the atmosphere occasion even old and seasoned wood to vary in size from time to time. Of this we have a familiar illustration in the fact that doors, especially garden doors, which open and shut with facility in dry weather, frequently swell so as to become almost immoveable in a humid state of the atmosphere. From experiments made by M. Rondelet, quoted by Tredgold, it appears that in wood of a mean degree of dryness the extent of contraction and expansion produced by the usual changes in the state of the atmosphere was, in fir-wood, from $\frac{1}{550}$th to $\frac{1}{75}$th part of its width, and in oak, from $\frac{1}{412}$th to $\frac{1}{81}$th part of its width, showing a mean variation equal to $\frac{1}{131}$th part of the width in fir, and $\frac{1}{166}$th part of the width in oak. At this mean rate of variation the difference of width produced by the above cause alone in a fir board about $12\frac{1}{4}$ inches wide would be $\frac{1}{10}$th of an inch, an amount abundantly sufficient to cause the board to split or crack, if it were fixed immoveably at both edges.

For the above reasons it is always necessary to insert pannels in the framework in which they are mounted, in such a manner as to allow free motion at one or both edges. An ordinary framed door, such as that represented under Door, P. C., p. 86, affords a good example of pannelled work, and one in which this peculiarity may be readily observed. In this kind of door the styles, marked 2, 2, in the cut referred to, the rails, marked 5, 5, and the munions (or, as they are frequently called by workmen, the *muntins*), marked 6, 6, 6, constitute a strong framing of thick but comparatively narrow pieces of wood, the rectangular openings of which, marked 1, 1, 1, 1, are filled with thin boards called pannels, usually cut to one-third of the thickness of the framing. The pannels are slid, before the framing is completely put together, into grooves, ploughed or cut, about half an inch deep, in the inner edges of the framing, into which grooves they are made to fit with sufficient accuracy to prevent shaking or rattling, yet not so tight as to prevent their sliding a little in the grooves, as the pannel shrinks or expands. The usual practice is to fit them just so tight that a little force applied to the edge of the pannel with the palm of the hand, is sufficient to drive it into its place. In new houses it may often be perceived, by the appearance of the paint towards the sides, or rather edges, of the pannels of doors and window-shutters, that, even when not more than nine or ten inches wide, they have shrunk at least one-eighth of an inch since the completion of the painting, notwithstanding the care taken to season them previously; and if observations were made with sufficient accuracy, it would be found that the amount of shrinkage appears to be greater or less according to the state of the atmosphere. The addition of glue or nails to hold the pannel in its place would occasion the pannels to crack or split, which they occasionally do with a noise sufficiently indicative of the irresistible force with which the change of dimension takes place. In superior doors the angle formed between the inner edge of the framing and the face of the pannel is occupied by a moulding, put in with *mitred* joints, which are explained below; in such a case care must be taken so to insert the nails by which the moulding is held in its place, that they may enter *the framing only*, without touching the pannels. In bad work they are often driven carelessly into both, and the almost inevitable consequence is that the pannels crack, in consequence of their freedom of motion being interfered with.

In some cases partitions, wainscotings, and other pieces of joiner's work are framed and pannelled in the same way as ordinary doors, the pannels themselves being, when too wide to be cut out of a single board, composed of two or more pieces united with glue at their edges. Tredgold advises, however, that such pannels should never be made more than fifteen inches wide and four feet deep, and not so large if it can be avoided. A similar construction is also adopted in superior furniture for the backs of chests of drawers, book-cases, &c., as the plan is more effectual than any other for the exclusion of dust. By dividing the width of the back into two or more portions, it reduces the amount of possible shrinkage at any one point; and if the pannels be made to enter the grooves of the framing only a quarter of an inch at each side, each pannel may shrink nearly half an inch without producing any aperture between the pannel and the framing. A simpler but less effectual mode of attaining the same object, which is often adopted for the backs of furniture, and for some other purposes in which an extended surface of boarding is required at less cost than is involved in framing and pannelling, is to fix a series of narrow boards side by side, securing them with a few nails only, without glue, in order that they may retain as much freedom of motion as possible, and *rebating* the adjoining edges, as shown at *a*, *a*, *Fig.* 2. By this arrangement a considerable amount of shrinkage may take place without producing any opening between the adjoining boards, and, if the nails be not fixed too near their edges, sufficient play may be allowed to prevent the wood from cracking.

Fig. 2.



The appearance of such boarding may be improved by forming a bead with a moulding-plane along one edge of each board on the visible side, as at *b*, *b*, *Fig.* 2, because by that means the open joint is in some degree masked by the *quirk* or wide groove on the opposite side of the beading. The same means of avoiding the disagreeable appearance of the opening joint is adopted in some doors and shutters which are framed and pannelled in the usual manner, but in which the pannels are made two-thirds instead of one-third of the thickness of the framing. In this case the edges are rebated to the thickness of an ordinary pannel, and the rebated portion alone is inserted in the grooves of the framing, while the unreduced portion of the pannel is brought *flush* or even with the surface of the framing. This mode of construction is often adopted for external doors, as it allows them to be made strong without any great thickness of framing. At *c*, *c*, *Fig.* 2, is shown another mode of joining boards side by side, which is called *match-boarding*, and is applicable to wood, or *stuff*, of or exceeding half an inch in thickness. This plan is frequently adopted for the kind of inferior doors called *ledged doors*, which, to avoid the expense of framing, are made of narrow boards placed side by side, and held together by transverse pieces called ledges or battens, to which each of the boards is nailed. The joint, as shown in the cut, where it is represented as masked by a bead, consists of a groove cut in the edge of one board, receiving a projecting tongue formed on the edge of the adjoining one. Planes called *match-planes*, made in pairs, one for forming the groove and the other for forming the tongue, are made to facilitate the fitting of match-boarding; but where the joiner does not possess these the groove may be formed with the kind of grooving-plane called a *plough*, and the tongue by cutting away each side with a *rebate-plane*, which is more commonly, though incorrectly, termed a *rabbit-plane*. Similar to this kind of joint is that called *ploughing and tongueing*, in which both edges of every board are grooved, and a separate slip of wood is inserted between them to fill up the grooves. This plan, which involves no waste of material, is often employed in floors.

As indicated by its name, a very important department of the art of joinery is the formation of strong and accurate *joints.* The joints hitherto noticed are not intended so much for holding together the pieces of wood united by them, that object being effected by other means (by the framing, for example, in the case of a framed door or piece of pannelling, and by the ledges or cross-pieces in the case of a ledged door), as for evading the effect of changes of dimension; but we have yet to notice such as are intended to unite the several parts of a framing or other construction. On this branch of the art Tredgold well observes that while in carpentry framing owes its strength principally to the form and position of its several members, the strength of the framings in works of joinery depends wholly upon the joints.

The simplest mode of uniting two pieces of wood is to cut the meeting surfaces so as to fit each other accurately, and to cement them together with glue. [GLUE, P. C., p. 278.] When the glue is good and properly applied a glued joint is surprisingly strong—stronger indeed, in some cases, than the wood itself: if, for example, two boards be glued edge to edge, as for forming a pannel, the wood will break, if sufficient force be applied, without the joint giving way. In forming such a joint the adjoining edges must be planed perfectly straight and smooth, which may be readily done by the use of the simple contrivance called a *shooting-board*, which is a flat board with a perfectly straight edge, and with a cross piece fitted on near one end at right angles with that edge. This board being laid on the bench, the pannel is laid down upon it, with its end against the cross-piece or stop, and the plane, which is laid on its side on the bench, is rapidly slid or *shot* along, being guided by the edge of the shooting-board, and taking a shaving off that of the pannel. Both edges, being thus made true, are smeared with hot glue, and one is rubbed backwards and forwards a few times over the other, to distribute the fluid glue equally, to force it into the pores of the wood, and to squeeze all that is superfluous out of the joint. This done, the boards should be set aside until the glue is perfectly set. To prevent the possibility of any strain which might tend to open the joint while the glue is soft, it is well in such cases to fix the board up edge-ways, so that the weight of the uppermost piece may tend to keep the joint close.

In many other kinds of joint the hold of glue is less perfect in consequence of the impossibility of applying the *rubbing-down* necessary for the purpose above mentioned; and in such cases it is necessary to secure the parts united by it in their places by screwing the article up in an iron cramp, by weighting, or by wedging. From a carefully conducted experiment by Mr. B. Bevan, of which, as well as of his experiments on nails, which are referred to below, an account is given in the article 'Adhesion' in Hebert's 'Engineer's and Mechanic's Encyclopædia,' apparently on the authority of the 'Mechanics' Magazine,' it appears that the adhesion of glue, under favourable circumstances, is equal to a force of at least 715 lbs. per square inch. In the experiment referred to a force of 1260 lbs., applied gradually, was found necessary to separate two cylinders of dry ash-wood, the ends of which presented a surface equal to 1·76 square inch, and which were glued together end to end, and allowed twenty-four hours to set. Even this weight was sustained for two or three minutes before the joint gave way; and it was found, on examining the separated surfaces, that the glue was very thin, and had not entirely covered the surface. The cohesive strength of the glue appears therefore in this experiment to have been rather more than 715 lbs. per square inch, while the cohesive strength of the wood thus united, in a lateral direction, was found to be only 562 lbs., thus showing that, if the joint had been between the sides instead of the ends of the pieces of wood, the wood would have given way before the glue. In this case, however, the glue was newly made, and the season very dry; while in some former experiments, made in the winter season, with glue which had been frequently made, with occasional additions of glue and water, the cohesive force indicated was only from 350 lbs. to 500 lbs. per square inch. On the other hand, Mr. Bevan found the cohesive force of solid glue to be equal to 4000 lbs. per square inch, from which it may be inferred that its application as a cement is capable of such improvement as to show a more satisfactory result than even in the first mentioned experiment. Glue that has been made a long time and kept in store is found to possess greater tenacity than newly-made glue; and for the use of the joiner pale-coloured glue is preferred to that of a dark tint, as it produces neater and less apparent joints. Owing to the use of a darker material, and the less frequent employment of glue in joints exposed to the eye, the colour of his glue is a matter of less importance to the cabinet-maker.

Next to the formation of joints by the simple interposition of glue between the meeting surfaces, we may notice the use of nails or pins of metal, so inserted as to enter both pieces, and to bind them together with a force equal to that required for their extraction. Mr. Bevan's experiments on the adhesion of nails, and of screws, which are often used in superior work instead of nails, and of the manufacture of which an account is given under SCREW, P. C., p. 109, are briefly referred to under ADHESION, P. C., p. 119; but as their results are highly important to the joiner, we here subjoin a tabular view of the results obtained by his experiments on various kinds of nails, driven into dry Christiana deal, at right angles with the grain of the wood:—

Description of nails.	Number to the lb.	Length. Inches.	Depth forced into the wood. Inches.	Power required to extract. lbs.
Fine sprigs .	4560	0·44	0·40	22
Ditto . .	3200	0·53	0·44	37
Threepenny brads	618	1·25	0·50	58
Cast-iron nails .	380	1·00	0·50	72
Sixpenny nails .	73	2·50	1·00	187
Ditto . .	. .	. .	1·50	327
Ditto . .	. .	. .	2·00	530
Fivepenny nails .	139	2·00	1·50	320

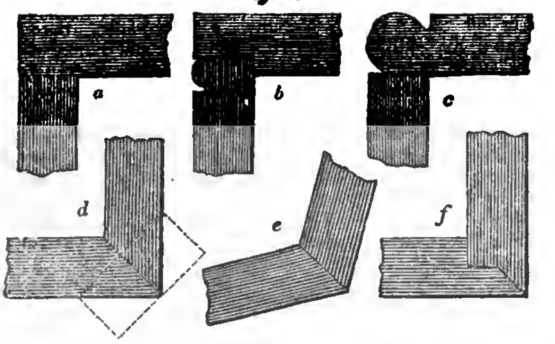
The amount of power required to force a sixpenny nail, of the dimensions above given, into Christiana deal, *by simple pressure*, which affords the most accurate test of the resistance to be overcome, was, for a depth of

One quarter of an inch, a pressure of .	24 lbs.
Half an inch	76 ,,
One inch	235 ,,
One inch and a half	400 ,,
Two inches	610 ,,

In the above experiments, it must be remembered, the nails were driven transversely, or across the grain. The same nails, driven endways, or longitudinally, into the same wood, required a force of only 87 lbs. to extract them from a depth of one inch, and 257 lbs. from a depth of two inches; showing that a nail driven endways into deal has rather less than one-half the adhesion that it has when driven across the grain. In dry elm the hold of the same kind of nail was found to be greater than in deal in both directions, but especially when driven along the grain; the force required to extract it from a depth of one inch, when driven transversely, being 327 lbs., and when driven longitudinally 257 lbs., the relative adhesion in the two directions being in this case rather less than as 4 to 3, whereas in deal it was more than 2 to 1. Experiments with the same kind of nail, driven also to the depth of one inch (transversely, we presume) into dry oak, showed that the force required for extraction was 507 lbs.; in dry beech, 667 lbs.; and in green sycamore, 312 lbs. Mr. Bevan's experiments on nails, of which his own account was published in the 'Philosophical Magazine,' vol. lxiii., p. 168, appear to have been made with *wrought* nails, which, for the ordinary purposes of the carpenter and joiner, have been in a great measure superseded of late years by nails *cut* cold by pressure from thin sheet metal, and subsequently headed by a separate machine. Such nails are cheaper than wrought nails, and, owing to their greater accuracy of form, their sectional form being a perfect rectangle, with sharp defined angles, they have a firmer hold in the wood. They are tougher than wrought nails; but, being softer and more easily bent, they are not adapted for using with hard woods.

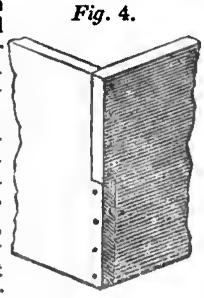
The simplest method of forming an angular joint, to be held together either by glue, or by nails or screws, or by a combination of glueing with nailing or screwing, is by the arrangement shown at *a*, *Fig.* 3, which, however, if nailed, can only be nailed in one direction. For rough work such a joint may do very well, although it is unsightly in consequence of showing the end of the grain of one of the members of the joint, and of the liability of the joint to open a little with shrinkage and warping. The appearance of such a joint may be in some measure improved by the introduction of a small bead on the abutting piece, as at *b*, *Fig.* 3, or, by converting the whole thickness of the end of the overlapping piece into what is termed a *staff-bead*, as at *c*, *Fig.* 3, a plan which is often adopted, with very good effect, in the interior fittings of a house. The kind of joint marked *d*, *Fig.* 3, which is called a *mitred* joint, is neater than the simple joint at *a*, as the end of the grain is nowhere exposed to view, and it allows nailing in both directions; but it is not so secure, and, owing to the

Fig. 3.



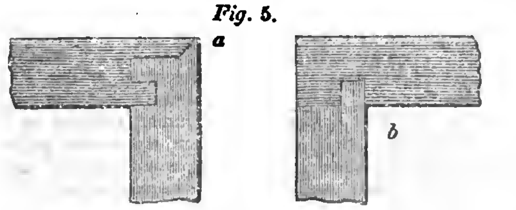
tendency of the inclined faces to slip upon each other, it is difficult to form it with accuracy. It is the joint used for the angles of picture-frames, and for many other purposes in which the joint is exposed to view in the same manner; and in such cases the strength of the joint is often increased by inserting, in a saw-cut made for the purpose in a sloping direction, a thin slip or key of hard wood in the direction indicated by the dotted lines. This key is inserted with glue, and when that is dry, the superfluous corners are cut off. At *e*, *Fig.* 3, is shown a mitred joint at an obtuse angle, to show that this form of joint is applicable to any angle, the plane of the joint being in all cases made to bisect the angle. To facilitate the accurate formation of mitred joints, joiners employ a contrivance called a *mitre-box*, by which they are enabled to saw and plane, or *shoot*, the inclined faces exactly to the required angle. The last joint represented in *Fig.* 3, that marked *f*, is a combination of the overlapping with the mitred joint, much neater, where the angle alone is visible, than the former, and stronger than the latter, like which it may be nailed both ways. *Fig.* 4 illustrates an arrangement almost too simple to need explanation, by which the strength of a nailed joint of the over-lap kind may, with very little extra trouble or waste of stuff, be greatly increased. Simple as it is, however, it is very rarely practised in this country, and, indeed, has never been seen by the writer excepting in tobacco-chests or packing-cases from America. For neater purposes it might be worth while to divide each joint into four or more portions, instead of two only, as in the cut, by which means the tendency of the joint to open by the warping of the wood, or in consequence of external violence, would be still further resisted, owing to the more frequent changes in the direction of the nails.

Fig. 4.



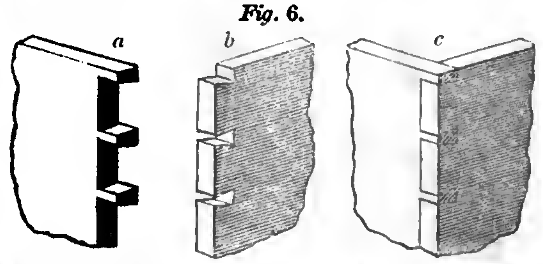
In all the angular joints above noticed, the two pieces of wood which form the members of the joint are held together by the glue, nails, or screws applied to connect them; but in the higher operations of the joiner and cabinet maker, the wood is so cut as in some degree to hold the construction together independently of such aid. In the joints shown in *Fig.* 5, for example, where *a* represents a joint adapted for external angles, and *b* a joint for internal angles, such as those of the skirtings of a room, the form of the joint alone would hold it together, irrespective of any fastenings. The same

Fig. 5.



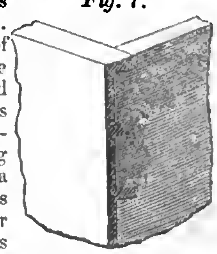
object is attained far more perfectly by the various modes of *dovetailing*, the simplest of which is illustrated by *Fig.* 6, in which *a* and *b* represent, in isometrical perspective, a portion of two boards, such as two sides of a box, or the back and one side of a drawer, cut ready for fixing together by an ordinary dovetailed joint, and *c* shows the joint as it appears when fitted together. It will be evident that, when thus united, the wedge-shaped projections from the end of the piece *a* (from the transverse sectional form of which, somewhat resembling that of a dove's tail, the joint takes its name) must powerfully resist any strain tending to separate the joint, unless that strain happen to be exerted precisely in one direction; while the accu-

Fig. 6.



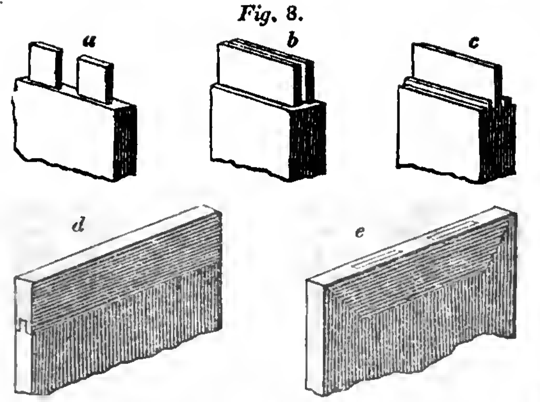
rate fit of the parts, aided by the glue, and in some cases by nails or screws, renders the joint so strong even in that direction that, if properly made, the wood will sooner break than separate at the joint. The small dovetail-shaped projections in the piece *a* are called *pins*, and the openings cut in the end of *b* to receive them, *holes*. When the boards which constitute the members of a long dovetailed joint are composed of two or more pieces glued together at the edges, it is well so to arrange the dovetailing that the glued joint, if in the piece corresponding with *a* in the cut, shall fall in one of the pins, and not in an interval between them, and if in the piece *b* in one of the intervening solid spaces between the holes, and not in the hole itself; because by such an arrangement the driving up of the dovetail tends to hold the glued joint together, while it might otherwise tend to split it open. In connecting the front of a drawer with its sides, it is desirable to conceal the joint entirely on the front face. This is done by the kind of joint shown in *Fig.* 7, which is termed a dovetail blind of one eye. In it the piece forming the front of the drawer is made thicker than the side, and the pins, which are formed on the front piece, are made only as large as if it were of the same thickness as the side, and the intervening spaces are not cut through the extra thickness of the wood. Similar to this is the dovetail *blind of both eyes*, or *mitred dovetail*, in which both pieces are of equal thickness, and the pin-holes, as well as the pins, are stopped about one-eighth or three-sixteenths of an inch from the outer or visible surface of the wood, the extra thickness of the wood thus left uncut being mitred; so that the joint is very secure, but the means by which it is rendered so are completely invisible. Such a joint of course requires very accurate workmanship, to enable all the parts to fit closely without being so tight in any part as to need injurious force in knocking up into its proper position.

Fig. 7.



The only other kind of joint that claims notice here is the *mortise and tenon*, which is the kind of joint usually employed for connecting the several members of the framing of a door or similar piece of pannelled work, as well as for many other purposes. A *mortise* is a deep and narrow groove cut in one member of the framing to receive a corresponding projection called a *tenon*, or, improperly, a *tenant*, formed on the end of another member of the framing which abuts upon it, usually at right angles. Tredgold recommends that the thickness of a tenon, and consequently the width of the mortise to receive it, should be about one-fourth of the thickness of the framing, and that the width of the tenon should never be greater than five times its thickness. A more general rule, however, is to make the tenon one-third the thickness of that part of the framing which it is to enter. When the members of the framing are wide, the tenon is divided by an intervening space into two parts, by which the necessity for weakening the frame by very long mortises is avoided. In *Fig.* 8, *a* represents a divided tenon of this kind, and *b* is what is termed a *double tenon*, which is sometimes used in very thick framing, especially in the framing of doors which are to receive mortise locks, or locks inserted in the thickness of the door, in which case the lock is placed in the interval between the two tenons. In some cases, where a single tenon is used in thick framing, a small projection called a *cross* or *feather-tongue* is formed on each side of it like a very short tenon, as in *c*, *Fig.* 8 shallow grooves or mortises being cut on each side of the principal mortise to receive them.

Fig. 8.



Clamping is an expedient resorted to by the joiner when he wishes to secure a broad board, whether formed of a single piece, or of two or more glued together at their edges (in which case, if the wood be thick, *dowels*, or pins inserted halfway into each of the adjoining pieces, may be used to aid the glue), from liability to warping. It consists in fitting on to each end a transverse piece. as at *d. Fig.* 8, the grain of which runs at right angles with that of the board. The connection between the board and the clamps is effected by a tongue formed on the end of the hoard, visible at the edge in the cut, and entering a groove ploughed in the edge of the clamp. In addition to this tongue, which extends across the whole width of the board, two or three tenons, which may or may not pass completely through to the external edge of the clamp, are frequently formed on the end of the board, in which case the joint is termed a *mortise clamp;* and in some cases where special neatness is required the ends of the clamp are mitred into the board, as at *e, Fig.* 8, which is called a *mitre clamp*, and in which both the tongue and the tenons, if tenons are used, may be made invisible.

Where it is necessary to curve boards by softening them, by boiling or steaming, and forcing them into the required shape (in which they are retained by glueing blocks underneath them and by other means), upon a saddle or mould, Tredgold observes that the process may be improved by saturating the convex side, while the wood is still confined to the mould, with strong glue, which may dry and harden in the extended pores, and thereby tend to keep the wood in the required shape when it is removed from the mould.

The plan of this article does not admit of more than a passing reference to the large subject of geometry as applied to the joiner's art; a subject which is treated at great length in the practical treatises of Nicholson and Tredgold; nor does it allow of any detailed explanation of the modes of executing the various departments of his work, which, together with a full account of the tools employed, may be found in Nicholson's 'Architectural Dictionary.' The tract entitled 'The Joiner and Cabinet-maker,' alluded to near the commencement of this article, will be found an admirable preparative for more expensive works: explaining, as it does by a few familiar examples, in terms easy to be understood, most of the ordinary operations of the joiner, and some of those of the cabinet-maker. Of some of the principal tools used in joinery accounts are given under SAW, P. C., p. 476; BORING INSTRUMENTS, P. C. S., p. 225; and BEVEL, P. C. S., p. 192. Of the other tools commonly employed, *planes*, of which a great number adapted for different uses are required, are the most important. An ordinary plane may be described as a broad and very sharp chisel mounted in a large block of wood in such a manner that it is always kept at a certain angle (varying according to the purpose to which it is to be applied, but commonly about 45°) with the face of the stock, which, by sliding along the board to which the plane is applied, keeps the blade always in the right position for cutting, and prevents it from digging too deep into the wood. The weight and size of the stock also enable the workman to apply the tool with greater effect and steadiness than he could a chisel held in the hand. The degree of projection of the blade from the face of the plane is capable of regulation, and the blade is held in its required position, by a wedge, which may be loosened and the blade caused to rise a little into the stock in case it should become too prominent, or technically, too *proud*, by striking the *heel* or hinder end of the stock with a hammer, or by striking in like manner on the upper surface of the front end of the stock. In planing a board to a smooth surface the workman commonly uses three planes: first, a coarse one, which takes off thick shavings, called a *jack-plane;* then one adapted for taking off very thin shavings and having a very long stock, called a *trying-plane.* The author of the 'Joiner and Cabinet-maker' thinks that this name means *true-ing* plane: the object of the instrument being to make the surface perfectly flat or *true;* but the ordinary name is still more applicable, since the workman in using this plane is continually *trying* where, by any undue prominence in the wood, he can take off a shaving; the length and straightness of the stock, with the angle of which he frequently tests his work as with a straight-edge, prevent the plane from *biting* or cutting where the board is hollow. So soon as the workman finds that he can take a continuous shaving off the whole length of the board with the trying-plane he knows that the surface is rendered sufficiently flat. The third plane used for ordinary work is a small short-stocked plane, called a *smoothing plane*, adapted for application in various directions to parts in which the grain may run irregularly, and for planing up small parts of the work for which the other planes are unsuitable owing to their large size. For such operations as rebating, grooving, or ploughing, and cutting beads and mouldings, other kinds of planes are used, in which both the cutting edges of the blades and the faces of the stocks are so formed as to be exact counterparts of the shape of the rebate, groove, bead or moulding required. In many planes of this character, which save an immense amount of work, besides enabling an ordinary joiner to perform work which even a skilful carpenter could not do so well by hand in ten times the time required with the use of the plane, the blade or *iron* is so fixed as to cross the face of the stock obliquely, that it may the better clear itself of shavings.

In planing a piece of deal or any similar soft wood, it is necessary to avoid meeting the grain, which would cause the plane to stick fast; and when this inconvenience is felt, it may almost always be avoided by turning the wood, and planing in the opposite direction. In planing mahogany and some other hard woods, it is more difficult to avoid meeting the grain, as it will often be found running one way in one part of the board and another way in another. 'To remedy this inconvenience,' observes the author of 'The Joiner and Cabinet-maker,' 'the cabinet-makers' planes are furnished with a double iron: that is, an iron with a flat dull edge is screwed on the face of the cutting-iron so as to prevent the shavings chipping up against the grain.' 'The more cross-grained the wood is,' he adds, 'the closer does the cabinet-maker bring down the dull iron towards the edge of the sharp one, and the finer are his shavings in consequence. The joiner's trying-plane and smoothing-plane, if not his jack also, are likewise furnished with these double irons to be ready to use with hard and cross-grained woods; but when he is planing straight-grained deal, he keeps the dull iron at a good distance, perhaps an eighth of an inch, from the cutting edge, so that the shaving comes off without touching it.' The cabinet-makers' planes are made of a steeper or more upright pitch than those of the joiner; and among the planes peculiar to his business is the *toothing-plane*, which has a nearly vertical blade with a notched or serrated edge, produced by furrows on the face of the iron. It is used principally for roughening the surfaces of veneers and of the wood upon which they are laid, to give a better hold to the glue.

Of turning, which though a totally distinct occupation is an essential adjunct to the art of cabinet-making, an account is given under TURNING, P. C., p. 418; and veneering, which is an important branch of the cabinet-maker's business, is briefly noticed under VENEERING, P. C., p. 206. The last-mentioned process, as applied to the large surface of the top of a chest of drawers, is minutely described in the 'Joiner and Cabinet-maker,' in which work, as well as in the fourth volume of Dodd's 'British Manufactures,' referred to in a previous column, details are also given respecting polishing with linseed oil (called *furniture oil*, when coloured dark to match the mahogany, to which it imparts a darker hue); bees'-wax and turpentine; and especially French polish, which is usually made of gum-shellac, gum-seedlac, and Venice turpentine, mixed in various proportions and dissolved in spirits of wine; but as those matters do not, strictly speaking, belong to the art of joinery, an incidental reference to them in this place is sufficient.

JONES, JOHN, LL.D., was born in the parish of Llandingat, in Caermarthenshire, where his father was a respectable farmer. He was educated at a grammar-school at Brecon, and afterwards became a student at the Unitarian New College, Hackney, where he was a favourite pupil of Gilbert Wakefield.

In 1792 Mr. Jones was appointed classical and mathematical teacher in the Welsh Academy, Swansea, which situation he held about three years, and then settled at Plymouth Dock as minister of the Unitarian congregation at that place, where he remained two years. He then became minister of the Unitarian congregation at Halifax in Yorkshire. In about three years he removed to London, where he resided during the remainder of his life, chiefly occupied as a classical teacher, and preaching only occasionally in the place of others: he never took charge of a congregation. Soon after he came to London he married the daughter of Dr. Abraham Rees; she died without issue in 1815. In 1817 he married again, and had two children, who survived him. He died January 10, 1827, in Great Coram Street, London, and was interred in the burying-ground of St. George's Bloomsbury. A few years before his death he received the diploma of LL.D. from the University of Aberdeen, and was soon afterwards elected a member of the Royal Society of Literature.

Dr. Jones was the author of several works, some of which are religious, chiefly in support or defence of the evidences of Christianity. Of these one of the most important was, 'Illustrations of the Four Gospels, founded on circumstances peculiar to our Lord and the Evangelists,' Lond., 1808, 8vo. In 1803 he published a short Latin Grammar for the use of schools; in 1804, a Greek Grammar, which has been frequently reprinted, but the year before his death he remodelled it, and changed the title to that of 'Etymologia Græca.' In 1812 he published a Latin and English Vocabulary, which he republished in 1825 as 'Anthologiæ Latinæ, or a Development of the Analogies by which the Parts of Speech are derived from each other.'

Dr. Jones's chief work, to which he devoted a great many years of his life, was his 'Greek and English Lexicon,' which was published in 1823, in one volume, 8vo., and again in 1826. Dr. Jones was one of the first to introduce into this country the practice of teaching Greek through the medium of English instead of Latin; and the first Greek and English Lexicon for general use was Dr. Jones's. He afterwards published an abbreviated edition for the use of schools, 'The Tyro's Greek and English Lexicon.'

There have since been several Greek and English Lexicons, not only in England, but in America. Soon after Dr. Jones's came out, Schrevelius's Lexicon was translated into English, and published by Valpy, a new edition of which came out in 1831. In 1826 Dr. Donnegan's Greek Lexicon appeared, and since that those of Groves, Ewing, Dunbar and Barker, Hincks's small School Lexicon, and lastly the Lexicon of Liddell and Scott, which is in one volume 4to., in small type, with many thousands of references, and has already (1845) reached a second edition. It is based on the German work of Passow.

The success of Dr. Jones's Lexicon was very great, and a large impression was soon disposed of. The work, as might be expected, was not without its faults, and was roughly treated in the second number of the 'Westminster Review.'

(*Gent.'s Mag.* 1827; *Journal of Education*, vol. iii., 1823.)

JOSQUIN, DEPREZ—the name which it appears to us, after having collated various authorities, is the true one of this celebrated composer of the most ancient school of part-music —was, there seems little reason to doubt, a native of the Low Countries, though the honour of his birth is indirectly claimed by many Italian writers, while its date still remains a matter of inference; M. Fayolle thinks that the year 1450 may be assumed as the period at which he was born, and we are not inclined to differ from this opinion.

Josquin was a disciple of Johann Ockenheim, 'the oldest composer in parts on the continent,' says Dr. Burney, 'of whose works I have been able to find any remains,' and much of whose reputation arises from his having been the instructor of one who became so eminent. The master and scholar were relatively to each other as Blow and Purcell. On the monument of the former, in Westminster Abbey, it is recorded that he was 'master to the famous Mr. Purcell.' It is probable that Josquin went into Italy when young, and there improved himself in the knowledge of his art; and this may have led to his having been thought a native of that country, a supposition to which the frequent addition to his name of Pratensis, or del Prato (a town in Tuscany), may be attributed. It is certain that he was a singer in the pontifical chapel in the time of Sixtus IV., who sat in the papal chair from 1471 to 1484, for Adami speaks of him, in that capacity, in high terms, as well as of his compositions, calling him 'uomo insigne per l' invenzione.' Quitting Italy, he was, according to Glareanus, appointed Maître de Chapelle to Louis XII., for whom he composed much music (concerning which some amusing stories are told), and a motet or two so contrived that the monarch was enabled to take a part in the performance. Louis had made him a promise of a benefice, but neglected to redeem it. To remind the king the composer produced a motet beginning 'Memor esto verbi tui,' &c. This not producing the intended result, Josquin wrote another, upon the words, 'Portio mea non est in terrâ viventium.' Louis then took the hint, bestowed a benefice, and the composer expressed his gratitude in a third motet, commencing, 'Bonitatem fecisti cum servo tuo, Domine.' But Glareanus remarks that desire proved more inspiring than gratitude, for the two first works very much surpassed the last.

The time of Josquin's decease is not known. He was buried in the church of St. Gudule, at Brussels, where his effigy and epitaph are, we believe, still to be seen. He was a very voluminous composer, and many of his works remain to attest his learning and genius. Hawkins gives a good specimen of them; Burney more than one example; and several are to be found in the British Museum. 'He may,' says Dr. Burney, 'be justly called the father of modern harmony, and the inventor of almost every ingenious contexture of its constituent parts, nearly a hundred years before Palestrina, Orlando di Lasso, Tallis, or Bird, the great musical luminaries of the sixteenth century, whose names and works are still held in the highest reverence, by all true judges and lovers of what appears to me the true and genuine style of choral compositions.'

JOUVENET, JEAN, a celebrated French painter during the reign of Louis XIV., was born at Rouen in 1644. He was first instructed by his father Laurent Jouvenet, but completed his studies in Paris, where he soon attracted the notice of Lebrun, who in 1675 procured him his election into the Academy of Painting for a picture of Esther before Ahasuerus, which is one of the best paintings of the Academy collection. Jouvenet had obtained considerable distinction two years previously by his picture of the Lame Man healed, which was the so-called May Picture (Le Tableau du Mai) of 1673. The May Picture is a painting which was formerly presented on the 1st of May of every year to the Virgin, in the cathedral of Notre Dame, by the Goldsmiths of Paris: the practice ceased in 1708. Jouvenet became successively professor, director, and perpetual rector of the Academy, and he was granted a small pension by Louis XIV. He died in 1717.

The French boast of Jouvenet, as of Le Sueur, because he never visited Italy; and it is for the same reason, according to some, that he is censured by Count Algarotti, who, they say, had no faith in an excellence that could be acquired out of Italy. The works of Jouvenet are not brilliant in any respect or even attractive, yet they possess all the greater merits of a picture in more than an ordinary degree. His style resembles that of Nicolas Poussin, especially in composition and colour; and he excelled in light and shade, but in expression he was never great.

Jouvenet's last work, the Visitation of the Virgin, or Le Magnificat, in the cathedral of Notre Dame, was painted with his left hand in 1717. He had a paralytic stroke in 1713 and lost the use of his right hand, but upon the first trial he found his left as obedient to his will as his right had been; one of the many proofs that, in art, it is not the hand but the mind that requires the education.

There are ten of Jouvenet's pictures in the Louvre, some of which are his best works, as the Miraculous Draught of Fishes, the Resurrection of Lazarus, the Sellers driven from the Temple, Christ in the House of Simon the Pharisee, and the Descent from the Cross. The first four have been worked in tapestry of the Gobelins, and they have all been engraved, as have also nearly all Jouvenet's best works, by some of the best French engravers—by H. S. Thomassin, J. Audran, E. Picard, L. Desplaces, A. Loir, A. Trouvain, and others. There are works by Jouvenet in many of the churches of Paris, mural and easel pictures. Of his mural paintings the principal are the colossal frescoes of the Apostles painted on the dome of the church Des Invalides.

(D'Argenville, *Abrégé de la Vie des plus fameux Peintres*; Watelet et Levesque, *Dictionnaire des Arts*, &c.; Gault de Saint-Germain, *Les Trois Siècles de la Peinture en France.*)

JOUVENCY, PIERRE, was born at Paris in 1643: he studied at Caen and afterwards at La Flèche, with considerable success, and was at an early age admitted a member of the Society of the Jesuits. He devoted himself chiefly to history, and is the author of the fifth part of the History of the Jesuits from 1591 to 1616, which was published at Rome in 1710. Though an agreeable writer, from the purity and elegance of his style, his facts are not to be implicitly relied on. So bigotedly was he attached to his order, that he has written an apology of the Jesuit Guignard, who was executed in the reign of Henry IV. of France, on account of his participation in the attempt made against the life of that monarch by Jean Châtel, who had been incited to commit the crime by the seditious writings of Guignard. An abridgment of his history was published at Liege in 1716, which is now rarely to be met with. The other works of Jouvency are—1, A Collecection of Latin Harangues, pronounced by him on different occasions; his Latinity, though it has been blamed by Vallart, is generally admired. 2, A treatise 'De Arte Docendi et Discendi,' which is in some esteem, but considered too superficial. 4, 'Appendix de Diis et Heröibus Poëticis,' a useful abridgment of mythology. 5, A Collection of Notes on Horace, Persius, Juvenal, Martial, and the 'Metamorphoses' of Ovid, which is considered his most valuable production. He died at Rome in 1719, while engaged in the continuation of the History of the Jesuits. His name is mentioned in the art. JESUITS, P. C., among the distinguished members of that Society.

JUDGE (from the French *juge*, which is from the Latin *judex*). [JUDEX, P. C.] A judge in England and Wales is a man who presides in a court duly constituted, declares the law in all matters that are tried before him, and pronounces sentence or judgment according to law. There are judges of the three Superior Courts of Law at Westminster, judges in the Courts of Equity, a judge in the Court of Bankruptcy, judges of the Insolvent Court, judges in the Ecclesiastical and Admiralty Courts, and some others. Some judges are called Recorders, and there are other names, but the name does not alter the nature of the offence. When the judges simply are spoken of, the judges of the superior courts of common law are meant. There are fifteen judges of these courts: five in the Court of Queen's Bench, five in the Court of Common Pleas, and five in the Court of Exchequer. There are at present five judges in Equity. [COURTS, P. C.; EQUITY, P. C.]

The judges of the superior courts of law are appointed by the crown. They hold their office during good behaviour, but they can be removed by the crown on the address of both houses of parliament (13 Wm. III. c. 2). Formerly their commissions ceased upon the demise of the crown, but by the 1 Geo. III. c. 23, they continue to hold their office during good behaviour notwithstanding any demise of the crown, and their salaries are secured to them so long as they hold their office. The judges of the courts of Equity are also appointed by the crown. [CHANCELLOR, P. C.; CHANCERY, P. C.]

By various acts of Parliament retiring pensions of a determinate amount may be granted to the fifteen judges of the three superior courts of law, and to the judges in Equity. The lowest retiring pension is 3500*l.*, and this amount may be given to all puisne judges of the three courts. The highest retiring pension is 5000*l.*, which may be granted by the crown to the lord chancellor upon his resignation. But to be entitled to these pensions all the judges of the superior courts of law, and the judges in Equity, except the lord chancellor, must have held the office for fifteen years, unless bad health has prevented them from holding office so long.

Judges of Courts of Record [COURTS, P. C.] are not liable to prosecution for anything done by them as judges, but they may be prosecuted in parliament. Nor are they liable to an action for any error in judgment or for wrongful imprisonment, at least when they are acting within their jurisdiction. Judges are punishable for bribery, by loss of office, fine, and imprisonment.

The powers and duties of judges would form the subject of an elaborate treatise. It may be sufficient to observe that in England the judges of the superior courts are so well protected in the discharge of their duty and so sure in their office, as to make them entirely independent of all political and private influence, and they are paid well enough to secure them against all temptation of lucre. Accordingly an instance of misconduct in any judge of the superior courts of law, or any judge who holds a high office, is now seldom or never heard of. The only question that can be raised is, whether the most competent persons are always appointed, and whether persons are not sometimes appointed who, though not absolutely incompetent, are much less competent than others, and sometimes hardly competent. The danger is somewhat limited by public opinion, and particularly by the opinion of the members of the bar, so that the risk of a totally incompetent person being appointed is not great. But as the appointment of the judges in the superior courts of law, and the judges in Equity, is really made by those who for the time act as the ministers of the crown, the appointments of judges are, like other appointments made by the ministers, nearly always conferred on those who belong to the political party which for the time is in power. This evil, so far as it is an evil, is inseparable from the practical working of the constitution, and is probably a much less evil than any other mode of appointment that could be suggested.

JUDGMENT is the sentence of the law pronounced by the court upon the matter in the record, and the remedy prescribed by law for the redress or punishment of injuries; the suit or prosecution being the vehicle by which the injury is brought before the court. Judgments are given under four heads of issues: on Demurrer, where the facts are confessed by the parties, and the law determined by the court; on Verdict, where the law is admitted and the fact disputed; by Confession or Default, where the defendant admits both the law and the fact; and on Nonsuit or Retraxit, where the plaintiff acknowledges that neither the law nor the facts are sufficient to support his case, and therefore abandons the prosecution.

Judgments are either interlocutory or final. Interlocutory judgments include all those which are given on account of the incomplete state of the case as brought before the court, and which do not go to the absolute merits of the case: such as judgments on pleas of abatement. But the largest class to which this term is applied are judgments which, although they decide the right between the parties, require some other proceeding to determine the amount to be recovered. This proceeding is commonly a writ of inquiry, directed to the sheriff, who therefore impannels a jury, and proceeds to assess the amount of damages to which the party in whose favour the interlocutory judgment has been given is entitled. If, however, the suit is for a specific thing or sum, the decision of the court determining whether the plaintiff is or is not entitled to recover the remedy he sues for, the judgment is final.

In cases of trial at Nisi Prius or at bar, after the expiration of four days from return of the writ of distringas in the former case, and of the delivery of the verdict in the latter, the party obtaining the verdict may sign judgment. During the lapse of these four days the opposite party may prevent judgment from being signed by moving the court for a new trial in case of any objection to the proceedings; for arrest of judgment, if anything bad appears on the record; for judgment *non obstante veredicto*, that is, that judgment may be given in his favour, notwithstanding the verdict, when the plaintiff conceives that a plea of confession and avoidance in which a verdict has been given for the defendant is improper; for repleader, when the pleading failed to raise the material question; or for a writ of *venire facias de novo*, when some form, as by improperly choosing the jury, has been violated. After the expiration of these four days, the plaintiff or defendant may obtain the signature or allowance of the proper officer of the court, stating that the judgment is in his favour. This is called signing judgment. By the statute 1 Wm. IV. c. 7, it is enacted, that if after any action or suit a judge certifies that execution should issue forthwith or at some time named in the certificate, judgment may be signed immediately, and entered upon the records as of the day on which judgment is signed.

The nature or form of the judgment varies according to the nature of the action, the plea, the issue, and the manner and result of the decision:

1st. If the issue be for the plaintiff.

If it be an issue at law arising upon a dilatory plea, the judgment is, that the defendant answer over, and is called a *respondeat ouster*. Upon all other issues in law, and generally in fact, the judgment is that the plaintiff do recover, which is called *quod recuperet*.

2nd. If the issue be for the defendant.

The issue being on a dilatory plea, whether of law or fact, the judgment is, that the writ or declaration be quashed or the suit be abated; if the issue be on a peremptory plea, the judgment is that the plaintiff take nothing, which is called a judgment *nil capiat*. When judgments are given by default, or confession without issue, if for the plaintiff, they are *quod recuperet*, if for the defendant, *nil capiat*.

Besides the question at issue being decided by the judgment, the costs of the suit are generally directed to be taxed and paid by the party against whom the judgment is delivered. In addition to this, the judgment, when given for the plaintiff, orders that the defendant 'be in mercy,' that is, amerced or fined for his delay of justice; and when for the defendant, that the plaintiff 'be in mercy' for his false claim.

Judgment being signed, the party in whose favour it is given may sue out execution thereon, directed to the sheriff of the county where the property to be taken is situated. At common law, the goods and chattels of a debtor under a writ of fieri facias, and the growing profits of the land under a levari facias, could alone be taken in execution by a judgment creditor for debt or damages. The remedy was extended by the 13 Edw. I. stat. 1, c. 18 (West. 2), to the creditor over a moiety of the real property of the debtor; for which purpose a writ called an elegit was created, including all freehold estates and interests which the debtor held in severalty, coparcenary, or in common, and all rent charges; but copyholds were held not to be liable to be taken in execution under this writ. By a fiction of the law, judgments were considered to take effect from the first day of the term in which they were signed, and therefore a purchaser might have his estate encumbered by a judgment acknowledged subsequently to the purchase. To remedy this injustice it was enacted by the Statute of Frauds (29 Car. II. c. 3), that any judge who should sign judgments, should at the time of signing set down the exact date thereof, which date should be also written on the margin of the record when the judgment was entered, and such judgments should operate from the date appearing on the margin. As, however, this did not compel the plaintiff to bring in the judgment roll, it was almost impossible for purchasers to discover what judgments existed against the lands about to be conveyed. An act, therefore, was passed (4 & 5 Wm. & Mary, c. 20), afterwards made perpetual by the 7 & 8 Wm. III. c. 36, which directed that the clerk of the Court of C. B., the clerk of the Dockets of the Court of B. R., and the master of the office of pleas in the Court of Exchequer, should keep an alphabetical list or docket of all judgments in their respective courts, entered according to the names of the defendants; and that no judgments should affect lands in the hands of bonâ fide purchasers, unless so docketed according to the act. How this law has been altered by recent statutes will be hereafter considered. For the purpose of discharging a judgment the proper mode is to enter up satisfaction on the court rolls, but a deed of release will have the same effect although the judgment be allowed to remain; and it has been held that a release of all suits is a complete discharge of all unsatisfied judgments. If execution be not sued out within a year and a day of signing the judgment, it must be revived by a writ of *scire facias*, and a judgment was presumed to be satisfied after a lapse of twenty years from the signing or the last revival, which is now confirmed by the statute of the 3 & 4 Wm. IV. c. 27.

The entering the judgment on record, except in the cases specified by the act, where the lands in the hands of purchasers are to be affected, is not absolutely necessary. But to support a writ even brought for the purpose of reversing the judgment, the judgment must be entered on the records of the court.

Recent statutes have introduced great changes in the law of judgments as they affect real property, but as the same rules which existed before those enactments are still under certain circumstances capable of application, it may be useful first to consider how judgments then stood.

A judgment at the time of entering up became a general lien upon all property, real and personal, which the debtor then held or subsequently acquired, and gave the creditor a legal right, so long as the judgment remained on the records of the court and unsatisfied, to enter upon and reduce into possession any such property, by suing out the writ of fieri facias, if the goods and chattels of the debtor were to be taken in execution, or the writ of elegit as to his real estate, thereby changing that which was before a naked right into an absolute interest, limited nevertheless to the amount of the debt or damages for which judgment was originally entered up.

As to personal estate, it was enacted by the 16th section of the Statute of Frauds, that the goods of the debtor should be bound by a judgment only from the time of taking out execution. And on the interpretation of this clause it was held that chattel interests in land were included under the term goods. This clause still remains in full effect, although in the case of a fraudulent assignment after entering up judgment and before execution, a court of equity would assist the judgment creditor to follow the goods into the hands of the assignee.

The rights of the judgment creditor existing only at law over the personal property of the debtor, which was afterwards extended to a moiety of the real estate, at law the legal estate was only affected, and therefore, by the subsequent creation of trusts, the judgment creditor was frequently prevented from obtaining that remedy at law against the debtor to which he otherwise would have been entitled. To remedy this inconvenience, and enable the judgment creditor to obtain execution on the beneficial interest in any portion of the property of the debtor, it was enacted by the Statute of Frauds that execution should be delivered of all such lands, tenements, rectories, tithes, and hereditaments, as any other person or persons should be seised or possessed of, in trust for him against whom execution was so sued, like as if the debtor had been seised of such lands and of such estate as they be seised of in trust for him at the time of the execution sued. On the interpretation of this statute, it was held that an equitable interest in a term of years was not included within its limits, and only such trust estate as the debtor was interested in at the time the execution was sued out, and in which he had the sole beneficial interest. In this case the judgment creditor had no execution at law, but he might come into a court of equity and claim the same satisfaction out of the equitable interest as he would have been entitled to at law if it were legal. As however the sole right of coming into a court of equity was based on the failure of the law, it was necessary that the judgment creditor should forfeit his title to the utmost by suing out his writ of elegit before the court would listen to any application to remove the legal impediment. Upon the same principle that it assisted the creditor who had no relief at law, the court of equity did not permit a judgment against a trustee, though at law a lien upon the estate to affect the beneficial interest of the cestui que trust.

As under the last mentioned clause of the Statute of Frauds a judgment did not affect the legal estate in the hands of the trustee, until the writ was absolutely deposited in the hands of the sheriff, a purchaser of the equitable estate without notice might by getting in the legal estate protect himself against prior judgments; but if the purchaser bought with notice of the judgment, no acquisition of the legal estate would protect him. Equities of redemption were decided to be not such trust estates as to be included by the Statute of Frauds, the debtor not having the sole beneficial interest.

In the case of lands contracted to be sold, the purchaser is relieved in equity against judgments entered up subsequently to the contract; and also where land is conveyed to trustees for sale, whose receipts are to be sufficient discharge, the purchaser will not be bound by any subsequent judgments of which he has even express notice.

Until the passing the acts of the 1 & 2 Vict. c. 110, 2 & 3 Vict. c. 11, and 3 & 4 Vict. c. 82, the law of judgments remained in the main unchanged. By them decrees and orders of Courts of Equity and rules of Courts of Common Law, and orders of the Lord Chancellor in matters of bankruptcy and lunacy, are given the effect of judgments, and the security of the creditor has been extended from a moiety to the whole of the debtor's lands, including copyholds, making leaseholds bound in the same manner as freeholds. And as all lands are included by the acts, over which the debtor may have a disposing power, judgments against a tenant in tail are binding on his issue; for the tenant might at any time have barred the entail. So also were equities of redemption and trust estates, in which the debtor had only a partial interest. After passing this act a question was raised whether stock was comprised, in which the debtor had only a partial interest, but this was set to rest by a clause of the second act, mentioned above, which distinctly declares that the interest of the judgment debtor, whether in possession, remainder, or reversion, in any stocks, funds, or shares, as also in the dividends and annual proceeds of such stocks, &c., is to be liable to the judgment, and that stock standing in the name of the accountant-general is to be in the same position. Money and securities for money (except where deposited in the hands of a third person as a trustee) can also be taken in execution. But the greatest alteration which recent statutes have worked is changing the effect of judgment before execution is sued out, from a general lien to a specific charge upon the 'lands, tenements, rectories, advowsons, tithes, rents, and hereditaments' of which the judgment debtor may, at the time of entering up judgment, or at any time afterwards be possessed, of any estate whatsoever, at law or in equity, or over which he may have any disposing power. All judgments are made binding on the persons against whom they are entered up, and against all persons claiming through them, the judgment creditor being entitled to the same remedies in a court of equity as if the debtor had by writing agreed to charge the lands, &c. The creditor is not however to proceed in equity to obtain the benefit of such a charge until the expiration of one year from the time of entering up such judgment; and in case of bankruptcy, the judgment, unless entered up one year, is to give no preference to the judgment creditor beyond creditors for simple contract. A special proviso excepts purchasers, mortgagors, or creditors previous to the time when the act came into operation; and with respect to purchasers for valuable consideration without notice, the rules of equity remain unaltered.

A judgment creditor, applying now for remedy to the Court of Chancery, will not be obliged to sue out the writ of elegit, for that which is agreed to be done is considered by a Court of Equity as actually performed, and the judgment creditor has therefore, by virtue of his judgment alone, an equitable estate. If however a judgment creditor, having obtained any charge, or being entitled to the benefit of any security, should, before the property so charged or secured is converted into money and applied towards the payment of the judgment debt, cause the judgment debtor to be arrested, the benefit of such charge or security is deemed relinquished. The extent of such charge goes now to the interest at the rate of four per cent. on the judgment debt, as well as to the debt itself.

The dockets which existed since the 4 & 5 W. &. M. are now finally closed, and no judgment, decree, or order, by virtue of the 1 & 2 Vict. c. 110, can affect purchasers, mortgagors, or creditors, unless and until a memorandum or minute of the judgment, &c., with the person's name against whom and the date when it was recovered, is left with the senior master of the Common Pleas at Westminster, who is to enter the same in a book kept for the purpose, in an alphabetical order by the name of the person whose estate is to be affected. In order to keep alive old docketed judgments, it was made necessary to register them according to this provision before a certain time fixed by the act, or they would be deemed satisfied.

Under the old law a purchaser was bound by undocketed judgments of which he had notice, and it would seem that an unregistered judgment is now entitled to the same consideration as an undocketed judgment was, it being expressly provided by the late acts that the judgment creditor shall not take advantage of the extended remedies unless the judgment be duly registered according to their provisions. [NOTICE, P. C.] The necessity for searching for judgments on the transfer of property is also greatly reduced, for the 2 & 3 Vict. c. 11 requires all judgments to be re-registered every five years from the date of the last registry, otherwise they are to be considered as void against purchasers, mortgagors, and creditors. But here again it may be presumed a purchaser with notice of a registered judgment more than five years old will be bound by all the remedies to which recourse might have been had by the judgment creditor previous to the passing of the late statutes. The provisions for registration, it must however be remembered, refer to the remedies which the judgment creditor may have against purchasers for valuable consideration with notice; but as between the creditor and the debtor, or his representatives or volunteers, the judgment remains in full effect until twenty years from the time of entering up or last revival. The position in general of judgment creditors among themselves before the late acts depended on the time when they respectively sued out execution; but in a suit for the general administration of assets the judgment creditors took priority according to time of the entering up their judgments. Now as they are entitled to such remedies in equity as if the debtor had by writing charged his land, they take priority in respect of their judgments from the times of registration. It has been questioned whether a subsequent judgment creditor without notice having sued out his writ of elegit is not entitled to priority over an equitable mortgagee, but the point has been decided in favour of the latter, upon the principle, that although the judgment creditor by his writ of elegit obtained possession of the legal estate, and thereby in equity, under the ordinary rules, could claim a priority to a prior equitable incumbrance of which he had no notice, yet that the legal estate which the creditor obtains under an elegit is only such a one as the debtor himself had power to grant, and therefore liable to all prior equities. (Whitworth *v.* Gaugain, 3 Hare, 461.)

By these statutes judgments of the courts of the counties Palatine of Lancaster and Durham are to have the same effect as judgments of the superior courts of Westminster. But no judgment of those courts is to affect lands in the hands of purchasers, mortgagors, or creditors, unless a memorandum of such judgment be left with the prothonotary or proper officer, who is to register the same in a book kept for the purpose.

Judgments or rules or orders of inferior courts of record, in which a barrister of not less than seven years' standing shall preside, may receive the same effect as those of a superior court by a judge's order to remove them into a superior court. But until execution be actually sued out, they will not affect lands in the hands of purchasers, mortgagors, or creditors, except so far as they would affect them as judgments of an inferior court.

In criminal proceedings, after trial the defendant can move in arrest of judgment at any time before judgment is pronounced, but this can only be done upon error appearing on the face of the record, and no motion of this sort can be made in the defendant's absence unless a verdict is found in which the jury reserve a point for the consideration of the court. After the judgment is recorded, a writ of error is necessary before it can either be reversed or altered. Formerly no judgment affecting the liberty of the individual could be pronounced in his absence, but this has been altered by the 11 Geo. IV. & 1 Wm. IV. c. 70, which enacts that upon trials for felonies or misdemeanors judgment may be pronounced whether the person affected be present or absent, except only in such cases of information filed by leave of the Court of King's Bench or in cases of information filed by the attorney-general where he prays that judgment may be postponed. The judgment of the court extends to the life and liberty of the offender according to punishment decreed to the offence against which the judgment is delivered. In some cases it extends to the compensation by forfeiture of the lands or goods, or both, of the offender; others induce a disability of holding offices or fix a lasting stigma on the offender; and a large proportion are merely pecuniary by stated or discretionary fines.

On the subject of judgments see Chitty's *General Practice*; Stephen, *On the Principles of Pleading in Civil Actions*; Sugden's *Vendors and Purchasers*; Prideaux, *On the Law of Judgments as they affect Real Property*.

JUGGURNAUTH, TEMPLE OF, in Hindustan, is situated in the province of Orissa and district of Cuttack, in 19° 47′ N. lat., 85° 53′ E. long., about 45 miles south from the city of Cuttack, and 311 south-west from Calcutta, direct distances. The temple, which is named after the Hindu idol Juggernauth (properly *Jagannatha*, 'lord of the world'), placed within it, stands on the coast of the bay of Bengal, and is a huge architectural mass, a sort of pyramidal tower, 200 feet high, built of coarse red granite, and covered with a rough coating of chunam. It stands in the centre of a quadrangle enclosed by a high stone-wall, each side of which is 650 feet long. It is a very conspicuous land-mark, and is of considerable importance to navigators on the flat and uniform coast where it is situated. The country, to the distance of about a mile from the sea, is a waste of deep loose sand; farther inland it consists of low sand-hills covered by a thick forest of dwarf trees. The quadrangular inclosure is at the end of the principal street of the sea port town of Pooree, or Jagannathpoor, a place of considerable size, but ill-built and dirty. The temple has no claim to very high antiquity, and Rennell supposes that it succeeded the Temple of Somnaut, in Guzerat, which was destroyed by Mahmood in the 11th century. All the authorities agree in stating that it was erected in the 12th century.

The festival of Jagannath takes place every year, and the number of pilgrims is still very great, though much less than formerly, when Dr. Carey estimated them at 1,200,000. Three idols, gigantic busts, hideously ugly, mounted on pedestals which are concealed by drapery, are placed on thrones on a lofty platform, which rests on sixteen wheels, each 6½ feet in diameter; and it forms altogether a monstrous car, or rath, 43 feet high and 35 feet square. Cables are attached to the car, and by these the pilgrims drag it about a mile and a half to its destination, and then back again, the whole procession occupying three days. The principal idol is a representation of Krishna; the others are Bala Rama his brother, and Soobhadra his sister.

Mill, in his 'History of British India' (b. ii. c. 6), says, 'It is customary for numbers of congregated persons to throw themselves under the wheels, and even fathers and mothers with their children in their arms. The chariot passes on, as if no impediment existed, and crushing them to death is supposed to convey them immediately to heaven.' On this passage Professor H. H. Wilson, in his new edition of Mill's work, has the following note (vol. i., p. 416):—'It is no little exaggeration to say that numbers of the congregated people throw themselves under the chariot wheels. Mr. Stirling, who was resident in Orissa for four years, mentions, that during that period there were no more than three such immolations; and of these one was possibly unintentional, whilst the other two were cases of painful and incurable disease. But this practice is modern: Jagannath himself is modern, and has no place in the Vaishnava Puranas. It is not improbable that the present shrine attained reputation as a place of pilgrimage no longer ago than a century' (that is, in 1740).

(Hamilton, *East India Gazetteer;* Emma Roberts, *Scenes and Characteristics of Hindustan;* Rennell, *Memoir of a Map of Hindustan*; Mill, *History of British India*, by Wilson; Wilson, *Sanscrit Dictionary*.)

JULIA'NUS, SALVIUS, was probably a native of Milan. He was the great-grandfather of the Emperor Didius Julianus. (Aelianus Spartianus, *Didius Julianus*.) Julianus was twice consul, and also Praefectus Urbi. He mentions his own consulship and office of Praetor Urbanus; and he also speaks of having been in Egypt (*Dig.* xlii. tit. 2, s. 5; xlvi. tit. 3, s. 36). Julianus was a distinguished jurisconsult, and one of the Consiliarii of Hadrian; and he may probably have attained the honour of the consulship under this emperor. Lampridius (*Commodus*, c. 3) speaks of the Emperor Commodus soliciting the chastity of a son of Salvius Julianus, and of his putting the father to death; but this cannot be the jurisconsult Julianus, who probably died in the reign of Antoninus Pius. The sepulchre of the Jurisconsult was on the Via Lavicana, five miles from Rome, according to Spartianus; and his descendant the Emperor Didius Julianus was buried in the same tomb. (*Didius Julianus*, c. 8.)

Salvius Julianus was a pupil of Javolenus Priscus, and therefore one of the Sabiniani. His authority was very great among the Roman jurists, and he is oftener cited than any other writer by the Roman jurists, even more frequently than Labeo. The great work with which his name is connected was the 'Edictum Perpetuum,' which was compiled in the time of Hadrian. [EDICTAL LAW, P. C. S.] His principal legal work was Ninety Books of Digesta. There are 457 excerpts from Julianus in the Digest of Justinian, and chiefly from the work just mentioned. There are also mentioned, in the Florentine Index, Six Books Ad Minucium, Four Books Ad Urseinm, and One Book On Ambiguities (De Ambiguitatibus).

JURIEU, PIERRE, was born in 1637, and was the son of a Protestant minister at Mer, in the diocese of Blois, and nephew of the celebrated Rivet and Du Moulin. When of age to enter the ministry, he succeeded his father in his pastoral office. His reputation for learning afterwards obtained for him the situation of Professor of Theology and the Hebrew language at Sedan. When in 1681 the Protestants were deprived of the permission to give public instruction in that town, he retired to Rouen, and from thence went to Rotterdam, where he was appointed Professor of Theology. In that city the ardour of his zeal soon drew him into controversy with Bayle, Basnage, and Saurin; in the heat of which he manifested the same rancour which unfortunately disgraces most of his polemical writings. He allowed himself likewise to fall into various errors by too much indulging a naturally lively imagination in the interpretation of prophecy. In his Commentary on the Apocalypse he even predicted the establishment of Protestantism in France during the year 1686. Those who differed from him in opinion, however high their character for learning and piety, he treated with a most unbecoming severity. Grotius and Hammond, perhaps the two greatest theologians of their age, because they differed from him on the subject of the Antichrist predicted in the Book of Revelations, he styles 'the disgrace of the Reformed Church, and even of Christianity.' The same spirit is manifested in his well-known controversy with Bossuet, Bishop of Meaux, whom he does not scruple to accuse of falsehood and dishonesty, though, on the other hand, it must be allowed that the recriminations of this celebrated defender of the Church of Rome, if more politely expressed, are equally severe and destitute of truth; the great object of Bossuet being, it would appear, to charge his antagonist with holding the heretical opinions of Socinus. (Bossuet, *Hist. des Variations*, vol. iv. p. 64; vol. v. p. 236-238.) With all these defects Jurieu stands deservedly high as a controversialist: his learning was most profound, he is generally exact in the citation of his authorities, and he had a special talent in discovering the weak point in the cause of his antagonists. In respect of style and eloquence he is immeasurably behind Bossuet, but he is at least his equal in polemical talent, and by some is considered his superior in erudition. Jurieu's private life was becoming that of a Christian minister: he was charitable to the poor almost beyond his means, and he employed the great influence he possessed with the foreign courts in alleviating the sufferings of his exiled brethren. He died at Rotterdam on the 11th of January, 1713. His works, which are very numerous, were extremely popular in their day, and many of them are still held in high estimation by theologians of every school, on account of the great learning which they display. The principal of them are—1, 'A Treatise on Devotion.' 2, 'Defence of the Morality of the Reformed Church,' Hague, 1685, in answer to a work by Arnauld, entitled 'Morality destroyed by the Calvinists.' 3, 'A Preservative against Change in Religion;' which was written to refute Bossuet's 'Exposition of the Catholic Faith.' 4, 'Letters against the History of Calvinism by De Maimbourg,' 2 vols. 5, Another collection of controversial letters, entitled 'The last Efforts of oppressed Innocence.' 6, 'A Treatise on the Church.' He considers it composed of all Christian societies who hold the common principles of the Christian faith. This treatise is sometimes accompanied by a Reply to Nicolle, who had written a work in refutation of it. 7, 'A History of the Doctrines and Worship of the Jews,' Amsterdam, 1704, with a Supplement published in 1705. 8, 'A Treatise on Mystical Theology,' composed on the occasion of the well-known controversy between Fénelon and Bossuet.

JURISDICTION. This term is the Latin word Jurisdictio, which simply signifies the 'declaration of jus or law.' He who had jurisdictio was said 'jus dicere,' to 'declare the law.' The whole office (officium) of him who declared the law was accordingly expressed by the word Jurisdictio. (*Dig.* 2, tit. *De Jurisdictione*.) Jurisdictio was either voluntary (voluntaria) or litigant (contentiosa). The jurisdictio voluntaria related to certain acts, such for instance as those forms of manumission and adoption which must be done before a magistratus in order to be valid. The jurisdictio contentiosa related to litigation, and such legal proceedings were said to be 'in jure,' before the magistratus, as opposed to the proceedings before a judex, which were said to be 'in judicio.' The magistratus was said 'jus dicere' or 'reddere,' when he exercised his functions; and 'magistratus' and 'qui Romae jus dicit' are accordingly convertible terms. Jurisdiction in England means an authority which a court of law or equity has to decide matters that are litigated before it or questions that are tried before it. The courts at Westminster have jurisdiction all over England and Wales; but the jurisdiction of other courts is limited by being confined to certain limits of space and to certain kinds of causes or matters in dispute. When the jurisdiction of a court extends all over England, it may still be limited as to the kind of causes which it tries. Thus the superior courts of law and the courts of equity have their several jurisdictions as to matters which they hear and determine. [EQUITY, P. C.] The ecclesiastical courts also have their separate jurisdiction; and other courts, such as the Court of Insolvency, Borough Courts, and others, have their several jurisdictions. It follows, that if proceedings are commenced against a man before a court which has no jurisdiction in the matter brought before it, the defendant may answer by alleging that the court has no jurisdiction; which is called pleading to the jurisdiction. When a party is convicted by a court that has no jurisdiction in the matter, the proceedings may be moved into the Court of King's Bench by the writ of Certiorari and quashed. [CERTIORARI, P. C.] Those who have limited jurisdiction are liable, it is said, to an action, if they assume a jurisdiction which they have not.

JUSTICES, LORDS. Our kings have been, ever since the Conquest, in the habit of appointing, as occasion required, one or more persons to act for a time as their substitutes in the supreme government either of the whole kingdom or of a part of it. When William I. returned to Normandy the year after the Conquest, he left his half-brother Odo, Bishop of Bayeux, and William Fitzherbert, to be *Custodes Regni*, or guardians of the realm, during his absence; and similar appointments were very frequent under the early Norman and Plantagenet kings. There is a commission of a Custos Regni in Rymer of the reign of John. One by Edward I. to the Earl of Pembroke describes the powers of the office in terms which imply that it had long been familiar, as extending over all those things which pertain to the said custody (quae ad dictam custodiam pertinent); and the same words are common in subsequent commissions. And down to the present time similar officers have been appointed under various names, and with more or less extensive powers according to circumstances. Protector, lieutenant, or locum tenens, and regent, have been among the other names by which they have been known. Regents and councils of regency, during the nonage of the king or queen, have been sometimes named by the preceding possessor of the crown; but in modern times such arrangements have been usually made by statute. Coke remarks (4 *Inst.* 58) that the methods of appointing a guardian or regent have been so various, that 'the surest way is to have him made by authority of the great council in parliament.'

The most familiar case of the appointment by the crown of a representative to exercise the supreme executive power, not in a colony or dependency, is that of the appointment of a governor for Ireland, who has commonly borne the name of the Lord Lieutenant or the Lord Deputy; or of a council of government composed of Lords Justices.

The governor-general of Ireland under the crown has been styled at different times custos (keeper or guardian), justiciary, warden, procurator, seneschal, constable, justice, deputy, and lieutenant. Viceroy is a popular name of modern introduction. Formerly, upon the avoidance of the king's lieutenant for Ireland by death or otherwise, the privy council there was authorised to elect a successor, with the restriction that he should be an Englishman and no spiritual person, who held office till the king appointed another. The antient powers of this officer were almost regal; he performed every act of government without any previous communication with England; and when he left the country he even appointed his own deputy. From about the time of the Revolution, however, till after the commencement of the reign of George III., the lord-lieutenant resided very little in Ireland; in several instances the person appointed to the office never went over; in other cases he went over once in two years to hold the session of parliament; and the government was very often left in the hands of lords justices, without a lord-lieutenant at all. In modern times the appointment of lords justices for Ireland has only taken place on the occasional absences of the lord-lieutenant, and during the interval which has sometimes occurred between the demise of one lord-lieutenant and the appointment of another. The lords justices have usually been the lord primate, the lord chancellor, and the commander of the forces.

In England lords justices and regencies have been repeatedly appointed since the Revolution, on occasion of the king going abroad; and the appointment has usually, if not always, been made by royal letters patent under the great seal, in the same manner as the lords-lieutenant or lords justices of Ireland have always been appointed. In some cases, however, the aid of parliament has been called in for certain purposes. When King William went over to Ireland, in 1689, he of his own authority appointed the administration of the government to be in the hands of the queen during his absence out of the kingdom, not, however, we suppose, by letters patent, but merely by declaration at the council-table; and at the same time an act of parliament was passed, 1 & 2 Wm. and Mary, sess. 2, in the preamble of which that declaration of his majesty's pleasure was recited, and it was enacted, that whensoever and as often as his majesty should be absent out of this realm of England, it should and might be lawful for the queen to exercise and administer the regal power and government in the names of both their majesties, for such time only, during their joint lives, as his majesty should be absent. This act was considered to be necessary or expedient, in consequence of the peculiar circumstances in which the queen was placed by the Act of Settlement, which had declared that the entire, perfect, and full exercise of the regal power and government should be only in and executed by his majesty in the names of both their majesties during their joint lives. It was at the same time provided, 'That as often as his majesty shall return into this kingdom of England, the sole administration of the regal power and government thereof, and all the dominions, territories, and plantations thereunto belonging or annexed, shall be in his majesty only, as if this act had never been made.' After the queen's death lords justices were repeatedly appointed by King William, on occasion of his going abroad, under the great seal, namely, 5th May, 1695; May, 1696; 22nd April, 1697; 16th July, 1698; and 31st May, 1699.

One of the provisions of the statute of 12 & 13 Wm. III (passed in 1700) for settling the succession in the House of Hanover, was, 'That no person who shall hereafter come to the possession of this crown shall go out of the dominions of England, Scotland, or Ireland, without consent of parliament.' This clause, however, was repealed in 1716, by 1 Geo. I. stat. 2, c. 51. The repealing act was passed to gratify the king, whose 'impatience to visit his German dominions,' says Coxe in his 'Life of Walpole,' i. 77, 'now became so great as totally to overcome every restraint of prudence and suggestion of propriety, and imperiously to demand indulgence.' 'The ministry,' continues the historian, 'were considerably embarrassed on this occasion; and drew up a strong remonstrance, representing the inconvenience which would result from the projected journey. The remonstrance, however, not only failed of success, but so far exasperated the king, that he declared he would not endure a longer confinement in this kingdom.' It was thought more respectful to his majesty to obtain a repeal of the restraining clause at once, than to ask parliament merely for the leave of absence; and the bill passed through all its stages in both Houses without a dissenting voice, the Tories being favourably disposed to the principle, and the Whigs averse or frightened to offend the king. His majesty, who was at variance with his eldest son, now interposed another difficulty, refusing to intrust the government during his absence to the prince, without joining other persons with him in the commission, and also limiting his authority by the most rigorous restrictions. Upon this point, however, he yielded at last to the representations of the ministers, who concluded a long exposition of reasons against his leaving the kingdom at all at that crisis by stating that, 'upon a careful perusal of the precedents, finding no instance of persons being joined in commission with the Prince of Wales' in the appointment of a regency, 'and few, if any, restrictions upon such commissions,' they were of opinion that the constant tenor of antient practice could not conveniently be receded from. (See the paper in Coxe, ii. 51-54.) Upon this the king submitted to give the prince the sole direction of affairs; 'yet,' says Coxe, quoting from the work called 'The Political State of Great Britain,' 'he appointed him *Guardian of the Realm and Lieutenant*, an office unknown in England since it was enjoyed by Edward the Black Prince.' In point of fact the title given to the prince in the original Latin commission was *Custos Regni nostri et Locum tenens*, which were the same words that had been commonly used in all such commissions down to the reign of Henry VIII., with this difference only, that one of the two titles (more frequently *Custos Regni*) was alone employed. The earliest use of the term *regent* appears to have been in the commission from Henry VIII. to Queen Katherine Parr, when he went over to Boulogne in 1544, in which she is styled *Rectrix et Gubernatrix Regni nostri*. Queen Mary, the wife of William III., whose case is the next that occurs, seems, as already stated, to have had no commission; and, being queen regnant in her own right, she was not even popularly styled regent.

When George I. went abroad the next time, in May, 1719, he intrusted the government during his absence not to a regent, or any single person, but to thirteen lords justices, namely, the Archbishop of Canterbury and the principal officers of the state. A translation of the commission issued on this occasion, or rather, of the warrant to the attorney-general to prepare the commission, has been printed in the report of a committee of the House of Commons which sat in December, 1788, and affords as probably the most complete information to be found, in a printed form, on the subject of the present article. The committee state that they had found no entry of any earlier commission, except of the one issued in 1695, and that that was nearly the same with this of 1719, which appears to have been also closely followed in others subsequently issued. The commission begins by reciting that his majesty had 'determined, for divers weighty reasons, speedily to go in person beyond the seas.' The persons commissioned are appointed to be 'our guardians and justices (*Justiciarii* must be the Latin term) of our said kingdom of Great Britain, and our lieutenants in the same, during our absence out of our said kingdom, or till further signification of our pleasure;' and they were authorized, four being made a quorum, 'to execute the office and place of guardians, &c., and to order, do, and perform all and every act and acts of government and administration of government, and all other matters and things whatsoever, which, by virtue or by reason of the aforesaid office or place, have been usual, or may be lawfully ordered, done, or performed.' Power is afterwards specially given to keep the king's peace, to cause the laws and customs of the kingdom to be specially observed by all, to punish criminals and offenders, to hold the parliament then existing, and to continue, prorogue, and dissolve it, and likewise to summon and hold another parliament and other parliaments, and the same to continue, prorogue, and dissolve; also to direct and grant authority to the lieutenant, or justices and general governors, of the kingdom of Ireland for the time being, to summon, hold, prorogue, and dissolve the parliament and parliaments in the said kingdom, and likewise to prepare and transmit the bills which may be proposed to be enacted in such parliaments, according to the laws and statutes of the kingdom of Ireland; to summon and hold the Privy Council, and to appoint committees of the same; with the advice of the Privy Council, to issue proclamations, 'and to do and perform all other things which have been usually done, or may be done, by us, by or with the advice of the same;' to appoint and authorize persons to treat with the ambassadors, commissaries, and ministers of emperors, kings, princes, republics, or states, and to make and conclude treaties, conventions, and leagues thereupon; to confer, grant, and present to all benefices, dignities, and ecclesiastical promotions, where the presentation is in the crown; to issue commands, authorities, orders, and warrants, under the privy seal or otherwise, to the treasurer, or commissioners of the treasury, and other officers, for and concerning the collection, levying, application, payment, and disposal of the royal treasure and revenue; to command the army; to suppress invasions and insurrections; to execute and employ martial law in time of war, if that should happen; in like manner to command and employ the naval forces of the kingdom; to appoint to and discharge from all offices at the disposal of the crown; to grant pardons for high treason and all other crimes and offences; and finally, to do all these things in Ireland as well as in Great Britain.

This enumeration is probably the most authentic compendium that has been published of the powers of government ordinarily exercised by the crown. It does not, however, profess to be an enumeration of all the powers resident in the crown; and it will be especially observed, that (besides, perhaps, some appertaining to the office of supreme head of the church) the power of creating peers and conferring honours is not made over to the lords justices. That is a power which, we believe, never has been delegated, or attempted to be delegated, if we except only the case of the patent granted by Charles I., in 1644, to Lord Herbert (better known as the Earl of Glamorgan), which, after the Restoration, he was compelled to resign by the interference of the House of Lords.

The Lords Justices are further required in the commission of 1719, in the execution of their powers, punctually to observe his majesty's will and pleasure, as it might be from time to time more clearly and distinctly expressed in instructions signed by the royal hand; and the commission was accompanied by a set of instructions, also printed in the Report of the Committee of 1788, and stated to be nearly the same that had been issued, as far as was known, on similar occasions before and since. The rules prescribed are twenty-one in number, the most important things directed in which are, that no livings or benefices in the gift of the crown which may become vacant shall be disposed of without his majesty's directions as to the persons, to be signified from beyond the seas under the sign manual; that no orders or directions concerning the disposition of money at the treasury shall be given before his majesty's pleasure shall have been signified thereupon; and that there must be no exercise of the power of dissolving the parliament, or calling a new one, without special signification of the royal pleasure. The same restriction is put upon the exercise of the power of pardoning, and some of the other powers. In case however they should hold it necessary or expedient for the public service, the Lords Justices are authorized to fill offices immediately, and also to reprieve criminals; and they are permitted to continue the existing parliament by short prorogations, until they should be otherwise directed under the royal sign manual, and to summon the privy council to meet as often as they shall see occasion.

The government was in the same manner intrusted by George I. to Lords Justices when he again went abroad in 1720, 1723, 1725, and 1727. It is strange that the Report of 1788 should notice only the second of the several regencies of Queen Caroline, in the earlier portion of the reign of George II. Her majesty so long as she lived was always intrusted with the administration of the government when the king went abroad; which he did in 1729, in 1732, in 1735, and in 1736. An act, the 2 Geo. II. chap. 27, was passed in 1729, 'To enable her majesty to be regent of this kingdom, during his majesty's absence, without taking the oaths;' on the 15th of May thereafter, according to Salmon's 'Chronological Historian,' a commission passed the great seal constituting her guardian and lieutenant of the kingdom during the king's absence; and the same authority states her to have been appointed guardian in 1732, and regent on the two other occasions. According to the Report of the committee of 1788, a patent, with the like powers as that issued to the Prince of Wales in 1716, passed in 1732, appointing Queen Caroline guardian and lieutenant of the kingdom in the king's absence. Most probably all the four appointments were made in the same manner and in the same terms. After the death of Queen Caroline, the government was always left during this reign in the hands of Lords Justices when the king went abroad; as he did in 1740, 1741, 1743, 1745, 1748, 1750, 1752, and 1755. On all these occasions the commissions and the accompanying instructions were nearly the same with those issued in 1719.

George III. during his long reign never left England. When George IV. went to Hanover in September, 1821, nineteen guardians and Lords Justices were appointed, the Duke of York being the first. In an important article which appeared in the 'Morning Chronicle' for August 11th, 1845, the writer, after stating that Lord Eldon considered it indispensably necessary that Lords Justices should be appointed on that occasion, adds:—'One good effect arose from their appointment, that the Lords Justices during his (the king's) absence signed an immense number of military commissions and other documents, which had been accumulating since his accession to the throne.' This writer contends that 'the royal authority of an English monarch cannot be personally exercised in a foreign country.' 'We take it,' he adds, 'to be quite clear, that a patent sealed with the great seal in a foreign country would be void. To guard against any such irregularity, the law requires that the patent shall state the place where it is signed and sealed as *apud Westmonasterium*.'

Nevertheless, no provision such as had been customary on such occasions was made for the exercise of the royal authority, either when her present majesty made her short excursion to the French coast in 1843, or when she made her late more extended visit to Germany (in August and September, 1845). On the latter occasion the subject was brought forward in the House of Lords by Lord Campbell, who, on the 7th of August (two days before the prorogation of Parliament), after stating at some length the course which he maintained had been uniformly taken down to the year 1843, asked if it was the intention that Lords Justices should be now appointed? The lord chancellor, however, replied that the government had no such intention. 'On the occasion of her majesty visiting the king of the French,' his lordship is reported to have said, 'the then law officers of the crown, the present lord chief baron and the late Sir William Follett, had been consulted. . . . And after mature deliberation, these learned persons gave it as their decided opinion that it was not at all necessary in point of law that such an appointment should take place. . . . In the present instance also, the law-officers of the crown had been consulted as to whether it was necessary in point of law for her majesty to appoint a regency during her absence, and their reply was that it was in no degree necessary; an opinion in which he entirely concurred.' Both the speech with which Lord Campbell prefaced his question, and the subsequent article in the 'Morning Chronicle,' well deserve to be consulted.

It ought to be mentioned that the seven persons appointed in 1705 by the 4 & 5 Anne, c. 8, and again in 1707, by the 6 Anne, c. 7, to administer the government along with other persons whom the new king or queen should have named, in case of his or her absence at the time from the kingdom, are styled Lords Justices in the act, although called regents by Burnet, and in the common accounts. These Lords Justices (twenty-six in all), who actually came into office on the death of Queen Anne, 1st August, 1714, and continued till the arrival of the king on the 18th of September, enjoyed more extensive powers than any others that have been appointed, at least in modern times. They were authorized, in the name of the successor, and in his or her stead, to use, exercise, and execute all powers, authorities, matters, and acts of government, and administration of government, in as full and ample manner as such next successor could use or execute the same if she or he were present in person within this kingdom of Great Britain,' until such successor should arrive, or otherwise determine their authority. The only restrictions laid upon them were, that they were not, without direction from the 'queen or king,' to dissolve the parliament; and that they would subject themselves to the pains of high treason if they gave the royal assent to any bill or bills for repealing or altering the Act of Uniformity, or the Act for the Establishment and Maintenance of the Presbyterian Church Government in Scotland.

We are not aware that these facts have ever before been put together. The most important of them have been derived from the Report of the Committee appointed by the House of Commons in 1788, 'to examine and report precedents of such proceedings as may have been had in the case of the personal exercise of the royal authority being prevented or interrupted by infancy, sickness, infirmity, or otherwise,' which is printed in the Journals of the House, vol. xliv. pp. 11-42. See also, besides the other sources that have been already referred to, an article 'On the Regency Question,' in the Edinburgh Review, No. XXXV. (for May, 1811), pp. 46-80. And some particulars may be gleaned from the accounts of the proceedings in the two Houses of Parliament on occasion of the king's illness in 1788, as reported in the 'Parliamentary History,' vol. xxvii. pp. 653-1297; and from the discussions on the Regency Bill from the beginning of November, 1810, to the middle of February, 1811, which nearly fill the 18th volume of the 'Parliamentary Debates.' One of the speeches which attracted most attention on the latter occasion for its argument and research was afterwards published in an authentic form; that delivered on the 31st of December, 1810, by John Leach, Esq. (afterwards Vice-Chancellor).

JUSTICIARY COURT in Scotland. To render the historical article on this subject under the head of JUSTICIAR [P. C.] fully intelligible, it may be mentioned that the High Court of Justiciary is the supreme criminal court in Scotland. It consists of the Lord Justice General, Lord Justice Clerk, and five other judges of the Conrt of Session. It sits at Edinburgh, from time to time during the year, according to the extent of business to be transacted. Offences committed in Edinburgh and within the district of the Lothians are tried before this court, and in cases where in other parts of the country waiting for the next Circuit Court would create too much delay, or where there is any other ground of expediency, the trial may proceed before the Central Court. Other trials in the provinces proceed before the circuit courts. These are held in spring and autumn, each by two judges deputed by the High Court of Justiciary. The southern circuit is held at Jedburgh, Ayr, and Dumfries; the western, at Glasgow, Inverary, and Stirling; and the northern at Perth, Aberdeen, and Inverness. An additional circuit is held at Glasgow in winter. Questions may be *certified* from the circuit courts to the High Court of Justiciary, that is to say, before being decided the matter may be reserved for the consideration of that court. But it is a peculiarity both of the central and circuit courts of Justiciary, that no decision once given can be reconsidered either by the court pronouncing it or a Court of Review. This principle is liable to many objections, but it is productive of one benefit, that no trial is thrown away by the subsequent discovery of flaws in initial procedure. Before the case goes to a jury, a judgment is pronounced 'finding the indictment relevant,' and virtually declaring that the initial procedure is regular; that the charge is properly laid, and that the offence if proved is punishable. If there be any objections to the regularity of the proceedings, they must be stated before this judgment, which when once pronounced is final. All cases before the Court of Justiciary are tried by a jury of fifteen, a majority returning the verdict where they are not unanimous. It has jurisdiction in all the more serious offences except high treason, which is adjudicated in the English manner by a Court of Oyer and Terminer.

JUSTIFIABLE HOMICIDE. [MURDER, P. C.]

JUVENTIUS CELSUS. [CELSUS, P. C. S.]

INDEX TO THE LETTER J.

VOLUME II.

K.

KAFFA, a country in the eastern parts of Africa, of which we have only lately got some information, and which hitherto has not been visited by any European traveller, so far as is known. It is said to be of considerable extent, larger than Shoa [Abyssinia, P. C. S.], and appears to occupy the space between 3° and 5° N. lat. and 30° and 34° E. long. It contains several high mountains, which are separated from one another by wide valleys. Numerous watercourses drain the country, and all of them join the Goshop, a large river originating in several branches to the south and west of Kaffa, which probably falls into one of the rivers whose embouchures have been recognised on the coast of Zanguebar. On the north of Kaffa is Enarea, and on the west a wilderness, in which numerous herds of large quadrupeds (elephants, giraffes, &c.) are found. The country is fertile, and partly well cultivated. Cotton is grown to a great extent. The coffee-tree is there, as well as in the neighbouring country of Enarea, indigenous and a forest-tree. It is not stated that coffee is an article of export, but it is thought that the coffee called in these parts *yava* has derived its name from this country, as the Arabs assert that it has been transplanted to Yemen from that part of Africa.

The capital is Soonec, a town which, according to the accounts of African travellers, has between 6000 and 7000 inhabitants. This place and some others are visited by the merchants of Enarea, who exchange their goods (rock-salt, copper, horses, cattle, and some India stuffs, brought from Gondar), for cotton, cotton-cloth, which is made in the country, and slaves; this is the only way by which the inhabitants dispose of their produce and obtain foreign goods. The inhabitants, it is said, call themselves Christians, but none of tho practices by which the Abyssinian church is distinguished are in use among them.

(Krapf, *Bericht von dem Flusse Goshop und den Ländern Enarea, Kaffa, und Doko*, in the *Monatsberichte der Berliner Gesellschaft für Erdkunde.*)

KAIN, LE, HENRI-LOUIS, a French actor, so often spoken of in tho memoirs of French literature in the middle of the eighteenth century, that some account of him may be useful. He was born in 1728, and died in 1778. He was a protégé of Voltaire, who observed the natural strength of his histrionic genius, and removed him from an humble operative profession. He acquired his chief celebrity in the characters of Voltaire's plays; yet, owing to a singular series of events, that author never saw him on the stage. He was unable to make his début until seventeen months after Voltaire's departure for Prussia, in 1750, and on the author's return, after an absence from Paris of twenty-eight years, he found the actor about to be buried. Louis XV. stamped the reputation of Le Kain, by saying, '*Il m'a fait pleurer; moi qui ne pleure guère.*' Like the English actor to whose name that of Le Kain bears a great resemblance, he was small in person, and his success arose from his power of representing deep passion and vehement emotion. The character of his acting was novel, and while it fascinated the audience, it did not at first satisfy the critics, who termed him *le convulsionnaire*. He was critical and accurate in costume, and attended minutely to its topical and chronological applicability.

(*Biographie Universelle.*)

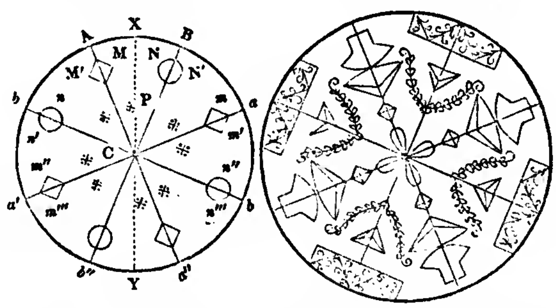
KALEIDOSCOPE, a name compounded of two Greek words (καλὸς and σκόπος), and denoting the exhibition of beautiful forms, is the designation of an optical instrument which was invented by Dr. (Sir David) Brewster, and made public in 1817.

About three years before that time Sir David Brewster, being engaged in making experiments on the polarization of light by reflexion from plates of glass, observed that when two plates were inclined to one another, and the eye of the spectator was nearly in the produced line of the common section of their planes, the farther extremities of the plates were multiplied by successive reflexions so as to exhibit the appearance of a circle divided into sectors, also that the several images of a candle near those extremities were circularly disposed about the centre; and these circumstances suggested to him the construction of an instrument of the kind above named.

It may be observed, however, that the multiplication of the image of an object by successive reflexions from mirrors inclined to one another had long before been a subject of investigation in treatises on optics; and both Baptista Porta and Kircher had given descriptions of instruments consisting of mirrors united at two of their edges, which, being opened like two leaves of a book, were capable of multiplying the images of objects. Bradley also, about the year 1717, constructed an instrument consisting of two plates of glass inclined to one another, which being placed on a drawing, with the line of section perpendicular to the paper, exhibited to the eye several images of the figures, disposed by successive reflexions about a centre. But the optical investigations alluded to are very remotely connected with the properties of the kaleidoscope; and the application of the latter to objects which may be moveable and situated at any distances from the observer, render Sir David Brewster's instrument very different from and far superior to the simple contrivances of Porta, Kircher, and Bradley.

The essential parts of the instrument consist of two plane mirrors of glass, having their posterior surfaces blackened in order to prevent any reflexion of light from thence; mirrors of polished metal would, however, be preferable: each mirror is from six to ten inches long, and of a trapezoidal form; the larger end about an inch and a half long, and the shorter end about three-quarters of an inch; and the two are placed in contact with one another at a long end of each, so as to form a dihedral angle, the like ends being placed together: the object to be viewed is disposed contiguously to the larger ends, and the eye should be near the opposite extremity, but a little above the line of contact. The effects produced by the reflexions of the light may be understood from the following considerations:—

Let A C, B C, in the first of the figures, be the two ex-



tremities of the mirrors on the side farthest from the eye of the observer, which is supposed to be near the opposite extremity of the line of section passing through C perpendicularly to the plane of the paper. These lines A C, B C, and the sectoral space between them (which in the figure is one-eighth part of a circle), will be visible by rays coming directly to the eye; and, at the same time, rays from the line A C falling on the mirror B C at a certain angle of incidence will, on being reflected from thence to the eye, give rise to the image C a of that line; in like manner rays from the line B C falling on the mirror A C at an equal angle of incidence will, after reflexion, give rise to the image C b of the line. These, with the intermediate rays, produce the first reflected sectors B C a and A C b. Other rays from the sector A C b at the surface of the mirror A C will fall on the mirror B C; and, while a portion of them arrive at such angles of incidence as to be reflected to the eye and produce the perception of the sector a C b', another portion of them will be reflected back to the mirror A C at such angles of incidence as to be re-reflected to the eye and cause tho perception of the sector a' C b''. In a similar manner the rays first reflected from B C a will, by subsequent reflexions, give rise to the perceptions of the sectors b C a', b' C a''.

Thus it is easy to perceive that an object, as M, on A C, with its immediately reflected image M', will give rise to the appearances of similar figures at $m\,m'$, $m''\,m'''$; and an object, as N, on A B, with its immediately reflected image N', will give rise to the appearances of similar figures at $n\,n'$, $n''\,n'''$: also an object, as P, between A C and B C, will appear by reflexion similarly situated in all the other sectors.

If the angle A C B be $\frac{1}{m}$th of four right angles, in which m is any term in the series of even numbers 4, 6, 8, 10, &c., the number of sectors will be m, and each of them will be equal to A C B, while C Y, the appearance of the line in which the mirrors meet each other, will, as in the figure, bisect the angle which is opposite to A C B; also if m be any term in the series of odd numbers 5, 7, 9, &c., the number of sectors will be m, and each of them will be equal to A C B, while C Y will coincide with the line in which the two lowest sectors join one another. It may hence be easily understood that if a flat object placed in the sector A C B, with its plane perpendicular to the mirrors, have its bounding-lines similarly situated with respect to A C and B C, the reflected images will be similar and equal to the original object; and the whole will constitute one symmetrical pattern, whether the value of m be odd or even: but if the bounding-lines are not similarly situated with respect to A C and B C, the reflected images will not, in the two lowest sectors, unite so as to correspond to the images in the other sectors, unless m be an even number. The second figure represents a pattern produced by the objects represented in the sector corresponding to A C B in the first figure.

In order that the whole pattern in the field of view might possess perfect symmetry about the centre C, it would be necessary that the eye should be exactly in the direction of the line in which the glass plates meet one another; but in such a situation the reflected images would not be visible: if the eye were far above the line of meeting, the visible field of view would be sensibly elliptical, and the brightness of the field would be diminished; it follows, therefore, that the eye should be near the smaller ends of the mirrors, and very little above the line of their junction. Again, it may be readily understood that, in order to permit the reflected images of objects to be symmetrically disposed about the centre of the field of view, the object should be exactly in a plane contiguous to the mirrors at the extremities which are farthest from the eye; for the line in which the planes of glass meet each other appearing to pass through the common centre of the visible sectors, if the object were placed on that line of junction, and either between the eye and those extremities or beyond the latter, it is evident, the eye being above the line of meeting, that the apparent or projected place of the object would not coincide with that common centre, but in the former case would appear below, and in the latter above, that centre. The length of the mirrors should be such that the object in the sector A C B may be distinctly visible; the eye may, however, if necessary, be assisted by a concave or a convex lens.

The first kaleidoscopes constructed by Sir David Brewster consisted simply of the two mirrors, which were fixed in a cylindrical tube; the objects were pieces of variously coloured glass attached to the farther ends of the mirrors and projecting on the sectoral space A C B between them; or the objects were placed between two plates of very thin glass, and held by the hand or fixed in a cell at the end of the tube. In some cases these plates were moved across the field of view, and in others they were made to turn round upon the axis of the tube. The pieces of coloured glass or other objects which were situated in the sector A C B were, by the different reflexions, made to appear in all the other sectors; and thus the field of view presented the appearance of an entire object or pattern, all the parts of which were disposed with the most perfect symmetry. By moving the glass plates between which the objects were contained, the pattern was made to vary in form; and pleasing variations in the tints were produced by moving the instrument so that the light of the sky or of a lamp might fall on the objects in different directions. When the objects in the sector A C B are confined near its upper part, the images evidently form an annular pattern; and, on placing the two mirrors parallel to one another, the successive reflexions of the objects produce one which is rectilinear.

Sir David Brewster subsequently found means to obtain multiplied images of such objects as flowers, trees, and even persons or things in motion: and thus the importance of the instrument was greatly increased. For this purpose he caused the two mirrors to be fixed in a tube as before, but this tube was contained in another from which, like the eye-tube of a telescope, it could be drawn at pleasure towards the eye: at the opposite end of the exterior tube was fixed a glass lens of convenient focal length, by which there were formed images of distant objects at the place of the sector A C B. These images thus became objects which, being multiplied by successive reflexions from the mirrors, produced in the field of view symmetrical patterns of great beauty.

Some kaleidoscopes have been executed in such a manner that the two mirrors may be placed at any required angle with one another, by which means the images in the visible field of view may be varied at pleasure. The instrument is capable also of being constructed so that the multiplied image may be projected on a screen, and thus made visible at one time to many spectators. In order to obtain this end, the rays of light from a powerful lamp are, by means of a lens, made to fall upon the object in A C B at the farther extremities of the two mirrors; and at the eye-end of the instrument is placed a lens of such focal length that the rays in each of the emergent pencils may converge at the screen: there will thus be formed on the latter a magnified image of the whole pattern. The tube containing the glass plates is frequently mounted on a stand having a ball-and-socket joint, on which it may be turned in any convenient direction; and the instrument being thus supported, the figures in its field may be easily sketched by a skilful artist, who by means of such an apparatus may be greatly assisted in designing beautiful patterns.

Sir David Brewster's account of his invention is contained in his 'Treatise on the Kaleidoscope' (Edinburgh, 1819): but Dr. Roget has shown ('Annals of Philosophy,' vol. xi.) that the properties of the instrument may be greatly extended by employing, instead of two, three and even four plane mirrors, united together at their edges so as to form a hollow prism, or a frustum of a pyramid, the reflecting surfaces being towards the interior. Of these, which are called Polycentral Kaleidoscopes, the instruments constructed with three plane mirrors appear to produce the most pleasing effects; the mirrors may be disposed so that a section perpendicular to the axis shall be an equilateral triangle, a right-angled isosceles triangle, or a right-angled triangle having its two acute angles equal to 30° and 60°. The first disposition of the mirrors affords regular combinations of images in three different directions which cross each other at angles of 60° and 120°; and to instruments of this kind Dr. Roget gave the name of Triascope. With the second disposition the field is divided into square compartments having the hypotenuse of the triangle for their sides: this is called a Tetrascope. The third disposition exhibits a field of view divided into hexagonal compartments; and hence the instrument is designated a Hexascope.

Sir David Brewster obtained a patent for the kaleidoscope, and several opticians of London and other places were duly authorized by him to execute and sell them: but the refinements of taste are too often disregarded in the purchase of works of art; and, apparently, the public did not adequately encourage the manufacture of the instruments of a superior kind; while, in violation of the patent, imitations of the kaleidoscope, rudely and inaccurately constructed, were sold at low prices, by unprincipled persons, in such numbers that it is doubtful whether the distinguished philosopher to whom optical science is on many accounts so highly indebted derived any pecuniary benefit from his invention.

KALENDAR, REVOLUTIONARY. It has been pointed out that there is a mistake in the commencement of the French revolutionary years as given in YEAR, P. C. On examination we find that not only the article cited, but many other works give an account of this kalendar which is more or less incorrect. The decrees of the National Convention, which fixed the new mode of reckoning, were both vague and insufficient, so that it is no wonder that many detailed accounts neither agree with each other nor with the truth. To learn what the truth was, we have recourse to a French work, in its sixth edition: 'Concordance des Calendriers Républicain et Grégorien,' par L. Rondonneau, Paris (6ième édition), 1812, 8vo. This work puts every day of every year, from An II. to An XXII. both inclusive, opposite to its day of the Gregorian calendar: it also gives the decrees of the National Convention.

By these decrees it appears that the year is to begin at the midnight of Paris Observatory which precedes the true autumnal equinox. It is to consist of 365 days, with 12 months of 30 days each (the 30 days being 3 decades of 10 days each), and 5 complementary days, which were tastefully called *sansculotides* (a name afterwards repealed). A sixth complementary day was to be added, not according to any rule, but *selon que la position de l'équinoxe le comporte:* and although it was stated that it would be *ordinairement nécessaire* to add this 366th day once in four years, yet it is not even stated in what particular coming years the necessity would arise. The first decree, dated October 5, 1793 (the new month not having been introduced), declares the year then current to be the second year of the French republic, and enacts that An I. began with September 22, 1792, and An II. with September 22, 1793. The second decree, fixing the months, is dated the 4th of Frimaire, An II. (November 24th, 1793). The Gregorian reckoning was restored from and after January 1, 1806, by an imperial ordonnance, dated 22 Fructidor, An XIII. (September 9, 1805).

It is to actual usage then that we must appeal to know what the decrees do not prescribe, namely, the position of the leap-years. For though every period of four years was a *Franciad*, and the last year of the Franciad was called *Sextile* (having six complementary days,) yet in fact An IV., An VIII., &c., are not leap-years. The following list, actually made from the work above mentioned, must be used as a correction of that in YEAR, P. C. For various matters connected with the public debt, &c., it was necessary to construct the table up to An XXII.

			Sept.				Sept.
An	I.	begins	22, 1792	An	XII.	begins	24, 1803
	II.	,,	22, 1793		XIII.	,,	23, 1804
Sext.	III.	,,	22, 1794		XIV.	,,	23, 1805
	IV.	,,	23, 1795	Sext.	XV.	,,	23, 1806
	V.	,,	22, 1796		XVI.	,,	24, 1807
	VI.	,,	22, 1797		XVII.	,,	23, 1808
Sext.	VII.	,,	22, 1798		XVIII.	,,	23, 1809
	VIII.	,,	23, 1799	Sext.	XIX.	,,	23, 1810
	IX.	,,	23, 1800		XX.	,,	24, 1811
	X.	,,	23, 1801		XXI.	,,	23, 1812
Sext.	XI.	,,	23, 1802		XXII.	,,	23, 1813

When the Gregorian year is not leap-year the beginnings of the months are as follows, according as the republican year begins on September 22, 23, or 24:—

1 Vendémiaire	is	Sept.	22,	23,	24
1 Brumaire	is	Oct.	22,	23,	24
1 Frimaire	is	Nov.	21,	22,	23
1 Nivose	is	Dec.	21,	22,	23
1 Pluviose	is	Jan.	20,	21,	22
1 Ventose	is	Feb.	19,	20,	21
1 Germinal	is	March	21,	22,	23
1 Floréal	is	April	20,	21,	22
1 Prairial	is	May	20,	21,	22
1 Messidor	is	June	19,	20,	21
1 Thermidor	is	July	19,	20,	21
1 Fructidor	is	Aug.	18,	19,	20

1 Jan.	is	Niv.	12,	11,	10
1 Feb.	is	Pluv.	13,	12,	11
1 March	is	Vent.	11,	10,	9
1 April	is	Germ.	12,	11,	10
1 May	is	Flor.	12,	11,	10
1 June	is	Prair.	13,	12,	11
1 July	is	Messid.	13,	12,	11
1 Aug.	is	Thermid.	14,	13,	12
1 Sept.	is	Fructid.	15,	14,	13
1 Oct.	is	Vendém.	10,	9,	8
1 Nov.	is	Brum.	11,	10,	9
1 Dec.	is	Frim.	11,	10,	9

But when the Gregorian year is leap-year the beginnings of the months are as follows, according as the republican year begins on September 22, 23, or 24:—

1 Vendém.	is	Sept.	22,	23,	24
1 Brum.	is	Oct.	22,	23,	24
1 Frim.	is	Nov.	21,	22,	23
1 Niv.	is	Dec.	21,	22,	23
1 Pluv.	is	Jan.	20,	21,	22
1 Vent.	is	Feb.	19,	20,	21
1 Germ.	is	March	20,	21,	22
1 Flor.	is	April	19,	20,	21
1 Prair.	is	May	19,	20,	21
1 Messid.	is	June	18,	19,	20
1 Thermid.	is	July	18,	19,	20
1 Fructid.	is	Aug.	17,	18,	19

1 Jan.	is	Niv.	12,	11,	10
1 Feb.	is	Pluv.	13,	12,	11
1 March	is	Vent.	12,	11,	10
1 April	is	Germ.	13,	12,	11
1 May	is	Flor.	13,	12,	11
1 June	is	Prair.	14,	13,	12
1 July	is	Messid.	14,	13,	12
1 Aug.	is	Thermid.	15,	14,	13
1 Sept.	is	Fructid.	16,	15,	14
1 Oct.	is	Vendém.	11,	10,	9
1 Nov.	is	Brum.	12,	11,	10
1 Dec.	is	Frim.	12,	11,	10

For instance, what is 14 Floréal, An XII. The republican year begins Sept. 24, 1803, so Floréal falls in 1804, which is Gregorian leap-year. Look at the third Table, and when the year begins Sept. 24, the first of Floréal is April 21; consequently the 14th is May 4, 1804. Again, what is June 17, 1800, in the French calendar? The year is not Gregorian leap-year; and An VIII. contains it, which begins Sept. 23. Look in the second Table, and in such a year it appears that June 1 is the 12th of Prairial; therefore June 17 is Prairial 28.

KALGUJEW is a considerable island in the circle of Mesen, in the Russian government of Archangel, and situated to the north of the peninsula of Schemonkonski. It lies between 68° and 69° 40′ N. lat., and 47° 30′ and 48° 10′ E. long., and is about 66 miles in diameter. The surface is undulating; it has some low mountains, which rise in the centre, two small rivers, and several brooks of fresh water. The surface is covered, as in Mesen, with mosses; there are extensive morasses; the ground bears nothing but berries, some anti-scorbutic plants, and stunted bushes. The surrounding sea is shallow, but swarms with fish; the coast abounds in seals, walrusses, and other such animals. The cliffs are covered with an incredible number of sea-birds; the interior is full of polar bears, foxes, &c. Except a few Samoides there are no settled inhabitants. A colony of Raskolnicks established themselves here in the 18th century: but soon left the island. At present it is only frequented by fishermen and seal-hunters from Mesen and Archangel. The little island of Plokti-Kockti and some others are near to Kalgujew.

(Hassel, *Handbuch*, vol. xi.; Cannabich, *Lehrbuch*.)

KALMIA, a genus of plants named by Linnaeus in honour of Peter Kalm, professor at Abo in Sweden. It has a small five-leaved calyx, a cyathiform corolla, with an angular very open limb having ten niches in its sides. The capsules five-celled and many-seeded. The species are evergreen shrubs with alternate or verticillate leaves.

K. latifolia has its leaves on long petioles, scattered or three in a whorl, smooth and green on each side. It is a native of N. America from Canada to North Carolina, on the sides of stony hills. It has various names in the United States, Laurel Ivy, Spoonwood, Calico-bush, &c. The flowers are red, and when in blossom have a very elegant appearance. The leaves of this species are said by Barton to be poisonous to man and beast, but their action can be but feeble and unimportant, for animals are known to feed on the plant without any evident effect. Bigelow however states that the flesh of pheasants having eaten this plant has produced some cases of severe disease attributable to this cause alone. The flowers of the *K. latifolia* exude a large quantity of sweet nectarous juice, which is greedily collected by bees and wasps, but the honey formed from it is injurious to man, and the juice, if swallowed itself, will produce an intoxication of an alarming kind. A brown powder which adheres to the shoots and branches is used as a sternutatory by the Americans.

K. angustifolia, Haulm-leaved Kalmia, has petiolate leaves, scattered or three in a whorl, oblong, obtuse, rather rusty beneath; corymbs lateral, bracts linear; peduncles and calyxes clothed with glandular pubescence. It is a native of North America from Canada to the Carolinas, in bogs and swamps, and sometimes in dry mountain lands. It is a shrub one or eight feet in height, with dark red flowers. It is called Sheep-Laurel in North America, as it is supposed to be very injurious to sheep. Several varieties of this plant with lighter and darker flowers have been described. There are several other species, all of them natives of North America. They are all remarkables for the irritability of their stamens, and each of the stamens has a little cavity formed for it in the corolla, to serve as a protection to the anthers.

They are handsome shrubs when in blossom, and are great favourites in gardens and shrubberies. They grow best in a peat soil, or they may be planted in a very sandy loam or vegetable mould. They may be propagated by layers or seeds. When the seeds are used they should be sown early in the spring in flat pans or pots filled with peat earth, and very slightly covered over; the pots may be then set in a close frame, or in the front of a hothouse, till the plants come up, when they may be transplanted to other pots, which should stand in a close frame till they have struck root; they should then be hardened to the air by degrees.

(Don, *Gardener's Dict.*; Burnett, *Outlines of Botany*.)

KATER, HENRY, an English mathematician of some eminence, and an excellent practical philosopher, was born at Bristol, April 16th, 1777. but of his early life very little is known. He obtained a commission in the army; and in 1808, while holding the rank of lieutenant in the 12th regiment (infantry), he became a student in the senior department of the Royal Military College, Sandhurst. During his residence at that institution he was promoted to a company in the 62nd regiment; and on quitting the College he received a certificate of the first class. He was afterwards made brigade-major of the eastern district.

Captain Kater was first engaged in making experiments to determine the relative merits of reflecting telescopes constructed according to the methods of Cassegrain and Gregory; and his conclusion was that the ratio of the illuminating power of the former to that of the latter kind was as 2½ to 1. On this subject he wrote two papers, entitled 'On the Light of the Cassegrainian telescope compared with that of the Gregorian,' which were published in the 'Philosophical Transactions' for 1813.

The determination of the precise length of the seconds' pendulum, an object of high importance in physical science, engaged the attention of Captain Kater during several years. The methods which had previously been employed to determine accurately the centre of oscillation in an irregular and heterogeneous body vibrating as a pendulum were found totally inadequate to this purpose; but Captain Kater succeeded in surmounting the difficulty by availing himself of a property of that centre which had been demonstrated by Huyghens: this property is that, if the centre of oscillation in a suspended body be made the point of suspension, the body will perform a vibration about it in a time equal to that in which it performs a vibration about the original point of suspension. The distance between the two points, experimentally obtained, is evidently equal to the length of a mathematical pendulum vibrating in the same time as the given pendulum. The *knife-edge* mode of suspension was first used by Captain Kater in these experiments; and the details of the construction of the pendulum are contained in a paper which was published in the 'Philosophical Transactions' for 1818. [PENDULUM, P. C., pp. 408, 409.]

A bill having been introduced into parliament for establishing a uniform system of weights and measures in this country, Captain Kater distinguished himself by the experiments which he made to ascertain the length of the seconds' pendulum, for the purpose of assigning the physical value of the English foot; and these experiments gave for the length of such pendulum, in London, in vacuo and when reduced to the level of the sea, 39·13929 inches. At the request of the Royal Society of London, Captain Kater proceeded, with the instruments, in July, 1818, to Dunnose in the Isle of Wight, to Arbury Hill, Clifton, Leith Fort, Portsoy, and the island of Unst, where he made the necessary experiments; and he subsequently computed for those places the several lengths of the seconds' pendulum: an account of the experiments, with the computed results, was published in the 'Philosophical Transactions' for 1819. Captain Kater also investigated, by the aid of Clairaut's theorem, the diminution of terrestrial gravity from the pole to the equator; and the great accuracy with which the force of gravity may be determined by means of his pendulum suggested to him the application of the latter to the important purpose of finding the minute variations of that force in different parts of a country whose substrata consist of materials having different degrees of density.

But the name of Captain Kater will be transmitted to posterity in connection chiefly with his invention of the floating collimator, an instrument which has conferred on practical science essential benefits, its object being the determination of the position of the line of collimation in the telescope attached to an astronomical circle; and this end is obtained by the collimator with greater certainty than by the spirit-level, the plumb-line, or by the reflexion of an object from the surface of a fluid. [COLLIMATOR, P. C.] Accounts of Captain Kater's horizontal and vertical collimators are given in the 'Philosophical Transactions' for 1825 and 1828.

The 'Philosophical Transactions' contain also a paper by Captain Kater on an improved method of dividing Astronomical Circles and other Instruments; one on the length of the French Metre estimated in parts of the English Standard; one on a remarkable Volcanic Appearance in the Moon in February, 1821; two papers on the comparison of British Standards of Linear Measures; one paper entitled 'An Account of Experiments made with an Invariable Pendulum belonging to the Board of Longitude;' and two papers on the 'Construction and Adjustment of the New Standards of Weights and Measures in the United Kingdom of Great Britain and Ireland.'

Besides these valuable papers, Captain Kater was the author of a large portion of the work entitled 'A Treatise on Mechanics,' constituting one of the volumes of Dr. Lardner's 'Cyclopædia'—this volume being the joint production of Lardner and Kater. In it is a chapter on the subject of pendulums constructed on the principle above mentioned; and it may be observed that, for the purpose of measuring the distance between the knife-edges, Captain Kater employed a scale furnished with powerful microscopes, to one of which a micrometer was adapted: with this apparatus the 10,000th part of an inch becomes a measurable quantity. He published in 1832 'An Account of the Construction and Verification of certain Standards of Linear Measures for the Russian Government,' 4to., London.

Captain Kater was a Fellow of the Royal Society of London, and in 1814 he received from the Emperor of Russia the decoration of the Order of St. Anne. After a life spent in philosophical research, he died in London, April 26, 1835, leaving behind him many proofs of his zeal for the promotion of physical science.

(From the papers in the *Philosophical Transactions*.)

KAUFMANN, MARIA ANGELICA, was born at Chur in the Grisons, or Graubündten, in 1741 or 1742. Her father, Joseph Kaufmann, was a portrait painter, of very ordinary ability; he, however, devoted unusual attention to the education of his daughter, who displayed uncommon abilities at an early age, both for painting and for music. He took her, while still young, to Milan, where they dwelt some time; and in 1763 they visited Rome, and there Angelica attracted universal notice among the virtuosi, and obtained considerable reputation for her portraits in oil: in singing too, according to Winckelmann, she was equal to any of her contemporaries. She painted a half-length of Winckelmann and made an etching of it herself. Winckelmann, in a letter to a friend, speaks in admiring terms of Angelica's accomplishments, especially her facility in speaking the German, Italian, French, and English languages.

In 1765 Angelica visited Venice, and in the same year came, in company, with Lady Wentworth, to England, where she was received in a most flattering manner: she was elected one of the original thirty-six members of the Royal Academy, founded in 1768. She returned to Italy in 1782, having in the previous year been married to Antonio Zucchi; she did not, however, change her name, but was always known as Angelica Kaufmann. She died at Rome in 1807, or according to some accounts in 1808. She etched several plates, and many of her own works have been engraved by Bartolozzi and other eminent engravers. Angelica is said, previously to her marriage with Zucchi, to have been cheated into a marriage with an adventurer who gave himself out as a Swedish count: as the story, however, though often repeated, does not appear to be sufficiently authenticated, an allusion to it is sufficient. The account of her which appeared in Huber's 'Manuel des Amateurs,' &c., in 1796, was declared to be wholly incorrect by Angelica herself, in an Italian periodical in 1806; but the story of the impostor does not occur in this notice.

Angelica, though not beautiful, had a very graceful person and most agreeable manners, and she was very highly accomplished generally. To these attractions must be attributed her success, for as a painter she did nothing of value beyond an elegant female portrait, or an occasional female figure. Her compositions are deficient in every essential quality of art; in drawing she was extremely feeble, and her male and female characters are not otherwise different than in costume.

(Goethe, *Winkelmann und sein Jahrhundert*; Fiorillo, *Geschichte der Zeichnenden Künste in Deutschland*, &c.; Nagler, *Künstler-Lexicon*.)

KEAN, EDMUND, was born about 1787, in London. His father, Edmund Kean, seems to have been a stage-carpenter; his mother was Miss Ann Carey, daughter of George Savile Carey, and grand-daughter of Henry Carey. [CAREY, HENRY, P. C. S.] George Savile Carey, who was born in 1743 and died in 1807, supported himself by delivering public lectures interspersed with recitations, songs, &c. He was the author of numerous songs and nine dramatic pieces. Miss Carey was an actress at minor theatres and with strolling players and in showmen's booths. Kean's father seems to have cared little about him, his mother neglected him, and when he was two years old Miss Tidswell, an actress at the large theatres, who was acquainted with Miss Carey, took charge of him, and, probably from this circumstance merely, was reported to have been his mother. He was sent to one or two day-schools in London, but, as may easily be supposed, got little literary instruction. His theatrical education, however, commenced early; Miss Tidswell instructed him in her art, and his mother, as soon as she found that he might be made useful, took him with her in her occasional occupation of selling flowers and perfumery from door to door, the beauty and intelligent countenance of the child pleading strongly for the mother; she afterwards took him with her in her rambles with strolling players and showmen. Master Carey, as he was then called, was so clever, that once, when Miss Carey and her son were performing in Richardson's booth at Windsor (the Richardson so well-known for his annual exhibitions at Bartholomew Fair), Master Carey was required to give his recitations before George III. at the Castle, which he did to His Majesty's great delight, and was dismissed with a handsome present. He continued his performances, sometimes with his mother and sometimes alone, at small places of public amusement in London and the neighbourhood till about the age of sixteen, when he left her entirely, and joined a company of strollers in Scotland.

Kean's first performance of a complete character was that of Young Norval, in 'Douglas,' in Richardson's booth; his first engagement with a regular company was in 1804, when he made his appearance at Sheerness on Easter Monday, on which occasion he played George Barnwell and Harlequin in a pantomime. He was still called Master Carey, and his salary was 15*s*. a-week. From this time till 1814, when he made his first appearance at Drury Lane Theatre, London, his life was a series of the vicissitudes, struggles, and privations incident to the profession of an actor in country theatres. In 1808 he became acquainted with Miss Chambers, an actress in the same company in which he had obtained an engagement at Gloucester. Maria Chambers, in July, 1808, became the wife of Edmund Kean, as he then called himself; and when she was near her accouchement with her first child they travelled together on foot from Bristol to Swansea, about one hundred and fifty miles, with only four pounds to pay their expenses on the road. On the 13th of September, 1809, Howard Kean was born. In the winter of the same year they passed over to Ireland, and at Waterford Kean became acquainted with Sheridan Knowles, then an obscure actor, or rather singer. Knowles wrote a drama in blank verse, called 'Leo, or the Gipsey,' which was performed at the Waterford theatre, and in which Kean played the chief character with great effect, and the drama was eminently successful. It has never been printed, but an analysis and extracts are given in the 'Life of Kean.' Charles Kean, the second son, was born at Waterford in 1810 or 1811.

Kean had a high opinion of his own powers, and in his country engagements always stipulated for the privilege of playing the first characters, as they are technically called, declaring that he would 'play second to no man except John Kemble.' On two different occasions when the managers, against his will, had announced him to perform with Master Betty, the Young Roscius, he disappeared till after Master Betty had gone away. One of Kean's best engagements was at Exeter, where his salary was 2*l*. a-week, for which he not only played the leading characters in tragedy, comedy, and farce, but Harlequin in the usual pantomime and the monkey in 'Perouse.'

While Kean was residing at Exeter, in 1813, he engaged to play four nights at Teignmouth; having completed his engagement, he had a benefit, on which occasion he played Rolla in 'Pizarro,' and then there was 'Chiron and Achilles,' in which his son Howard performed, and lastly there was a pantomime, in which he exhibited his usual grace and agility as Harlequin. On this occasion Dr. Drury, late head master of Harrow School, happened to be present, with his wife. On the following morning Mrs. Drury called to pay for the tickets, and told Mrs. Kean that Dr. Drury was much struck with Mr. Kean's performances, and intended to speak to Mr. Pascoe Grenfell, one of the Drury Lane Committee, in his favour. In November, 1813, while playing to a very thin audience at Dorchester, he observed a gentleman in the boxes who was very attentive to his performance, and who seemed to admire it, but who did not applaud. Kean saw that he was appreciated, and played his best. The gentleman was Mr. Arnold, manager of Drury Lane Theatre. On the following morning Mr. Arnold engaged him provisionally on behalf of the Committee of Drury Lane Theatre, for three years, at a salary of eight, nine, and ten pounds per week for each successive year.

A short time before Kean was seen by Mr. Arnold, Mr. Elliston had offered him an engagement at 3*l*. a week to play at the Olympic Theatre, in Wych-street, London, but the engagement had never been completed, and Kean thought no more about it. When he came to London however, and Elliston heard that he was to be brought out at Drury Lane, he claimed his man, appealed to Mr. Arnold, and threatened to appeal to the law, the consequence of which opposition was that from the 6th of December 1813 till the 26th of January 1814, poor Kean and his wife and child were almost famished, not having received a shilling of salary, except 8*l*. which were sent to him at Dorchester to pay their expenses to London.

At length Mr. Arnold ventured to complete his bargain, and the play-bills of Drury Lane announced 'The Merchant of Venice,' 'Shylock by Mr. Kean, from the Exeter Theatre.' There had been no previous puffing, and the house was thinly attended, but the applause was tumultuous; he repeated the character; the house was well filled, and his fame was thenceforth established. On his first night 164*l*. were paid at the doors; on the second, 324*l*.; afterwards the average was upwards of 500*l*. His performance of Othello on one occasion brought 673*l*. 18*s*. 6*d*. After his third performance of Shylock, Mr. Whitbread invited him to breakfast to complete his engagement for three years, at 8*l*., 9*l*., and 10*l*. a week. Immediately after the contract was signed Mr. Whitbread tore it to pieces in Kean's presence, and presented him with a sketch of a new engagement, by which the Drury Lane committee bound themselves to pay him a weekly salary of 20*l*. per week. Not long afterwards the Committee made him a present of 500*l*., and he received many valuable presents from individuals. Drury Lane Theatre was saved from the ruin which had previously threatened it, and rapidly advanced to a state of unexampled prosperity.

Kean's career of success, including a visit to America in 1820, was uninterrupted till his criminal connection with the wife of Alderman Cox became the subject of comment in the newspapers. On the 17th of January, 1825, the action of Cox *v*. Kean was tried, and a verdict of 800*l*. damages was pronounced against him. Some of the newspapers made a series of comments of unusual severity on his private character. The public were exasperated against him, and he was driven from the stage of Drury Lane and afterwards from that of Edinburgh. After some time however he was allowed to go on with his performances at Drury Lane, but he failed to reinstate himself in his former position, and therefore gladly accepted an invitation to pay a second visit to America.

After an absence of two seasons in the United States Kean returned to London, having during the time not only acquired but saved a considerable sum. The London public had relinquished their animosity, but it was in vain. He had always, in the time of his prosperity, been a dissolute man, but he had now fallen into habits of almost constant intoxication. His constitution was broken up, his memory was impaired to such a degree that he could not study a new part, his alacrity of spirit was gone, and his performances were little more than a faint reflection of what they had been. He had separated from Mrs. Kean after the trial with Alderman Cox, and allowed her 200*l*. a year; his mother was alive in 1832, and had from him an allowance of 50*l*. a year. His eldest son, Howard, died in 1813. His son Charles was at Eton College, and when Kean found that he was disposed to become an actor, he absurdly quarrelled with him, and abandoned him, and the young man was obliged to take to the stage in order to obtain the means of subsistence. Charles Kean was a year or two in America; after his return his father became reconciled to him, and in 1833 it was announced that Kean would play Othello, at Covent Garden Theatre, and that Charles Kean would play Iago with him. Kean struggled through the part as far as the speech 'Villain, be sure,' when his head sunk on his son's shoulder: he was borne off the stage, and his acting was at an end: the audience in kindness immediately left the theatre.

Kean lingered on at his residence at Richmond for a while, and before he died wrote to his wife to ask her 'to forget and forgive.' She immediately came to him, and attended him till his death, which took place May 15, 1833.

Kean in his person was small, but well-formed; his face was thin, but handsome; his eyes and hair were black; his countenance, in variety and intensity of expression, was wonderful; his voice, in its upper tones was somewhat harsh, in its lower tones it was soft and melodious; his action was free, graceful, varied, and appropriate; his conception of character was original and true, and evidently the result of observation and deep and careful study. He did not, as some have supposed, trust to the impulse of his feelings. He studied his characters much and anxiously. Frequently, after his family were retired to rest, he would act scene after scene before the pier-glass, endeavouring to produce, by expression of countenance, gesture, emphasis, and modulation of voice, the effect which his conception of the character required.

Kean was indisputably the greatest tragedian of modern times; perhaps, he has not been surpassed at any time. His Othello, in truth and vigour of conception, in brilliance of execution, and power of effect, was entitled to rank with the best of Mrs. Siddons's performances It was an exhibition of consummate skill. The audience was irresistibly swept along by his overpowering energy and pathos, and acknowledged by a series of bursts of applause the intense sympathy which he had infused into all ranks of society and all degrees of intelligence with which the theatre was crowded. In some of his other characters he exhibited the striking points rather than the whole of the character; but this reproach did not apply to his Othello, Richard III., Shylock, and Sir Giles Overreach. These characters were all pervaded with an intensity of passion which he exhibited with matchless energy and truth. His power indeed was in the display of character and passion in all their varied shades. In passages of declamation he had peculiarities of intonation and utterance which gave him a strong and by no means pleasing mannerism. His comedy appears to have been by no means equal to his tragedy. He played Abel Drugger on one occasion for his benefit, and though it was well received, he did not repeat it. Old Mrs. Garrick, who witnessed it, and who admitted that he rivalled Garrick in Richard III., told him that his Abel Drugger was decidedly inferior to her husband's.

Kean's accomplishments in arts connected with his profession were very varied. His fencing was much admired for skilful play and elegance of attitude. He played well on the pianoforte, and sang with exquisite taste and expression.

Of his private character little favourable can be said, though, if the circumstances of his early life be considered, much may be offered in excuse. He was profusely extravagant, spending the vast sums which he received in personal gratifications, and habitually indulging in dissipation among low society in taverns which are kept open to a late hour in the neighbourhood of the theatres.

(*Life of Edmund Kean*, London, 1835, 2 vols. 8vo.)

KEILL, JOHN, a distinguished British mathematician and natural philosopher, was born at Edinburgh in 1671, and having received the rudiments of education in that city, he completed his course of study in its university, of which the celebrated Dr. Gregory was then the mathematical professor. In 1694 he was entered in Baliol College, Oxford, where he distinguished himself by the lectures which he delivered in private on various subjects relating to natural philosophy, principally from the works of Newton; and in 1698 he published in London 'An Examination of Dr. Burnet's Theory of the Earth, with some Remarks on Whiston's New Theory.' In this work Keill pointed out, not without some harshness, the errors into which those theorists had fallen; and the severity of his strictures drew from each of them a reply: it is evident, however, that the advantage in the argument is on the side of Keill. In 1700 he was elected a Fellow of the Royal Society of London, and in the same year he succeeded Dr. Millington as Sedleian professor of natural philosophy. Two years afterwards he published a work in Latin under the title of 'Introductio ad veram Physicam,' which was well received in this country, and was also much esteemed in France—it being there considered as an excellent key to the 'Principia' of Newton. An edition of it in English was published in London in 1733, under the title of 'An Introduction to Natural Philosophy,' &c.

In 1709 Keill went to New England with the appointment of treasurer to the Palatines, who were sent to America as emigrants at the expense of the British government; these persons had been induced to leave Germany, and were living in London in great poverty: he returned, however, in the following year, and was immediately chosen Savilian Professor of Astronomy at Oxford. In the year 1711 he was charged by Queen Anne with the duty of deciphering papers; and it is mentioned as a proof of his sagacity that he once deciphered a letter written in Swedish, though he knew not a word of the language. He held this post about five years.

In 1713 the University of Oxford conferred on him the degree of Doctor in Physic; and in that year he published an edition of Commandine's 'Elements' of Euclid, with a tract on Trigonometry, and one on the Nature of Logarithms. In 1718 he published a work entitled 'Introductio ad veram Astronomiam,' which he afterwards translated into English, and published in 1721 under the title of 'An Introduction to the true Astronomy, or Astronomical Lectures delivered at Oxford.'

In the 'Philosophical Transactions' for 1708 there are two papers by Keill, of which the first is entitled 'On the Laws of Attraction and other Physical Principles,' and the other, 'Of the Laws of Centrifugal Force.' In the volume for 1713 there is a paper by him on 'The Newtonian Solution of Kepler's Problem,' &c. He also gave a paper entitled 'Theoremata quædam Infinitam Materiæ Divisibilitatem spectantia;' and one which is designated 'Observations on Mr. John Bernoulli's Remarks on the Inverse Problems of Central Forces, with a New Solution of the Problems;' both of these were published in the 'Transactions' for 1714.

Dr. Keill died Sept. 1, 1721, in the fiftieth year of his age.

A writer in the 'Acta Eruditorum' having, in a notice of Newton's Treatise on the Quadrature of Curves, stated that the English philosopher had taken the Method of Fluxions from Leibnitz, the indignation of Newton's friends was excited; and in the paper on the Laws of Attraction, &c., which, as above mentioned, was published in the 'Philosophical Transactions,' Keill formally asserted the claims of Newton to priority in the discovery. This paper gave offence to Leibnitz, who, in a letter to the Secretary of the Royal Society, required that Keill should be compelled to retract his assertion: this was not done; and Keill, in a letter to the Secretary, detailed the evidences of what he had stated. [COMMERCIUM EPISTOLICUM, P. C.]

Dr. Keill was not fortunate on another occasion. Entering into the war of problems which was at that time carried on between the English mathematicians and those of the Continent, he somewhat presumptuously challenged John Bernoulli to determine the path of a body when projected in a medium which exercised on it a resistance varying with the square of the velocity: the challenge was accepted, and before Keill could complete his own solution, Bernoulli announced that he had succeeded in obtaining one: the former was, in consequence, compelled to endure in silence the reproof which the foreign mathematician did not fail, unsparingly, to administer.

An edition, in Latin, of Dr. Keill's principal works was published at Milan, in 1742, in 4to., under the title 'Introductio ad veram Physicam et Astronomiam (Huygenii Theoremata de Vi Centrifuga) quibus accedunt Trigonometria; de Viribus Centralibus; de Legibus Attractionis.'

(From the *Philosophical Transactions*.)

KEY ISLANDS are a group of islands of considerable extent in the Indian Archipelago, situated between 5° 20 and 6° 30′ S. lat., and between 132° 30′ and 133° 40′ E long. Three islands are rather large, and called Great Key, Little Key, and Key Watela. The number of the smaller ones is not known, as they are rarely visited by Europeans.

They rise to a moderate elevation above the sea, and all the heights are overgrown with forest-trees, which constitute one of the principal sources of wealth to the inhabitants, who are engaged in ship-building to a considerable extent; a great number of country vessels that ply between Borneo and Timor on the east, and the coast of Papua on the west, are built on this island, especially in the harbour of Doola, which lies on the western coast of Little Key. These vessels are stoutly built, of excellent timber, and are sold for a moderate price. There is no town at Doola, but the harbour is large and surrounded by numerous villages. The native population of the island of Banda obtain from this place an abundant supply of provisions, especially cattle. The European and India goods obtained by this traffic are partly re-exported by the inhabitants to the Arroo Islands [SUNDA ISLANDS, vol. xxiii. p. 291] from the harbour of Elie, which lies on the eastern shores of Great Key. This place is also remarkable for the manufacture of earthenware, which is greatly prized by the inhabitants of all the neighbouring groups, and preferred to all other utensils of that description. Many of the inhabitants are occupied with fishing trepang, and there arrive annually several vessels from Macassar to fetch the produce of this fishery. Very little is known of the inhabitants of this group, except that a part of them have embraced the Islam. This is especially stated of the inhabitants of Elie. It is further stated, that a great number of families from Banda and Ceram have settled among them, and perhaps it may be attributable to these foreigners that the native population has attained a higher degree of civilization than their neighbours.

They are stated to be more friendly to foreigners, and to be more honest in their dealings.

(Kolff, *Reize door den weinig bekenden zuidelijken Molukschen Archipel.*)

KILIAN, the name of a distinguished family of engravers of Augsburg. There have been many engravers of this name and family, but four only were artists of superior ability: Lucas and Wolfgang, the sons of Bartolomaeus Kilian, a goldsmith, who was born in Silesia in 1548, and died at Augsburg in 1583; Bartolomaeus, the third son of Wolfgang; and Philipp Andreas Kilian, a more recent artist of the same family.

Lucas Kilian was born at Augsburg in 1579, and was educated as an engraver by his stepfather Dominick Custos. He studied also the works of Tintoretto and Paul Veronese at Venice, after which he engraved several prints which were sold at Augsburg and obtained him the reputation of one of the best engravers of his age; his style of drawing was however not quite correct, and was somewhat mannered. He died at Augsburg in 1637. Lucas had great command of the graver, and has been known to execute two portraits in a single week; his works are very numerous.

Wolfgang Kilian was born at Augsburg in 1581, was also instructed in engraving by his stepfather Custos, and, as his brother had done, studied also in Venice. The prints he there produced are the most carefully executed of his works. He was latterly compelled by the wants of a numerous family and hard times (it was during the Thirty Years' War) to look more to the quantity than the quality of his labour, and he accordingly executed chiefly portraits. His greatest work is the Celebration of the Westphalian Peace in Augsburg in 1649, in two sheets, after a picture by Sandrart: it contains about fifty portraits. He died at Augsburg in 1662.

Bartolomaeus Kilian, the third son of Wolfgang, was born at Augsburg in 1630, and was first instructed in engraving by his father, who afterwards by his son's request sent him to study with Matthaeus Merrian, a celebrated engraver at Frankfort on the Mayn. From Frankfort Bartolomaeus went to Paris, where he remained a few years, maintaining himself by his own labour; and he returned to Augsburg about 1655, a very able artist both with the graver and the etching-needle. Sandrart terms him a born engraver: his works are very numerous, but are chiefly portraits. He died at Augsburg in 1696.

Philipp Andreas Kilian, the son of Georg Kiliau, closely related to the above, was horn at Augsburg in 1714, and was taught engraving by G. M. Preissler in Nürnberg. He studied also in the Netherlands and in various parts of Germany, and became one of the most distinguished artists of his time; besides his technical skill in the use of the graver he had a good taste and was a correct draftsman, but his execution is somewhat peculiar and monotonous. In 1744 Augustus III., king of Poland and elector of Saxony, created Kilian his court engraver, and invited him to reside in Dresden, but Kilian preferred his native city. He however visited Dresden in 1751 for the purpose of conducting the execution of a collection of prints after the most celebrated pictures of the Dresden Gallery—'Recueil d'Estampes d'après les plus célèbres Tableaux de la Galerie de Dresde.' The completion of this collection was interrupted by the breaking out of the Seven Years' war, in 1756. Upon the cessation of this work he commenced an extensive series of illustrations of the Bible in quarto, which he accomplished by the assistance of various other artists, to the number of 130 prints, but they are not among his best works. He executed many portraits; two of the best of which are the emperor Francis I. and Maria Theresa, after G. von Mytens. Three days before his death he was engaged on a portrait of Pope Clement XIII., which he very nearly completed. He died in 1759.

Heineken enumerates twenty-one members of this family, of whom eighteen were artists, and fourteen of these engravers.

(Heineken, *Nachrichten von Künstlern und Kunstsachen.*)

KILLIGREW, THOMAS, a younger son of Sir Robert Killigrew, was born at Hanworth in Middlesex, in 1611. He travelled in his youth, was present at an exorcism of the nuns of Loudun, was appointed a page of honour to Charles I., and attended Charles II. during his exile, marrying one of the queen's maids of honour. His coarse and licentious wit qualified him peculiarly for securing the favour of his master, who in 1651, in spite of the remonstrances of his wiser counsellors, sent him as his envoy to Venice, where he used his place for raising money for himself, and was expelled with disgrace. On the Restoration Killigrew became groom of the bedchamber, and enjoyed an intimacy and influence with the king which the first men in the nation were unable to obtain. He has sometimes been said to have been officially appointed to be the royal jester; but for this assertion there is no ground, though he was in the way of taking such liberties as none but professional jesters would in any other reign have been allowed to take. He died at Whitehall in 1682. He wrote eleven plays, of which the first two were printed in 1641, and the whole collection in a folio volume in 1664. They do not by any means justify his reputation as a wit. A sufficient specimen of them is furnished by the comedy of 'The Parson's Wedding,' reprinted in Dodsley's 'Old Plays.' Killigrew's oldest brother, Sir William, a much more respectable person, was the author of four or five plays, and of two volumes of moral reflections. He died in 1693. The youngest brother, Dr. Henry Killigrew, wrote a tragedy in his youth, took holy orders, and held several preferments. He was Master of the Savoy at his death, which took place after Sir William's. Dryden's fine elegy on Mrs. Anne Killigrew celebrates a daughter of Dr. Henry.

KIN. [Descent, P. C; Intestacy, P. C.]

KING, PETER, LORD, was born in 1669, at Exeter, in which town his father, Mr. Jerome King, carried on the business of a grocer and salter, though said to be descended from a good family in Somersetshire. To this business he brought up his son, and the future Lord Chancellor of Great Britain served for some years in his father's shop. It was probably his relationship to the celebrated John Locke, whose sister was his mother, that put it into his head, while thus situated, to think of making himself a scholar; but the story told is, that he had by himself made extraordinary proficiency in learning, purchasing books with all the money he could procure, and devoting every moment of his leisure to study, before he was taken any notice of by Locke, by whose advice however he then went to the University of Leyden. How long he studied there we are not informed. He first made himself known by the publication, in an octavo volume, in 1691, of the First Part of his 'Inquiry into the Constitution, Discipline, Unity, and Worship of the Primitive Church;' in which with considerable learning he advocated the right of the Protestant dissenters from episcopacy to be comprehended in the scheme of the national establishment. The Second Part, occupied with the Worship of the primitive church, followed soon after. This work excited much attention, and, besides a correspondence between Mr. Edward Elys and the author, which was published in octavo, by the former, in 1694, drew forth, on its being reprinted in 1713, during the discussions on the Schism Bill, 'An impartial View and Censure of the Mistakes propagated for the ordaining power of Presbyters in a celebrated Book entitled An Enquiry, &c.' in an appendix to 'The Invalidity of the Dissenting Ministry;' and also 'An original Draught of the Primitive Church, in answer to a discourse entitled An Enquiry,' &c., 8vo., Lond. 1717. Both these answers professed to be 'by a Presbyter of the Church of England,' and the latter at least is known to be the production of a nonjuring clergyman named Sclater. Meanwhile King had entered himself at the Inner Temple, and was in due course called to the bar. He appears to have begun very early to make a figure in his profession; and he also soon entered upon a political career, having in 1699 obtained a seat in the House of Commons as one of the members for Beeralston, which he retained for seven parliaments, or to the end of the reign of Queen Anne. He did not yet, however, altogether abandon his first pursuit, but in 1702 published in octavo another learned theological work, 'The History of the Apostles' Creed, with critical Observations on its several Articles.' In July, 1708, he was chosen Recorder of London, and was soon after knighted. In 1709 he was appointed by the House of Commons one of the managers at the impeachment of Dr. Sacheverell, and in 1712 he gave his services, without a fee, as one of the counsel for Mr. Whiston, on his trial for heresy before the Court of Delegates. In November, 1714, a few months after the accession of George I., Sir Peter King was made Chief Justice of the Common Pleas; and he was sworn a privy counsellor in April of the following year. After the great seal had been taken from the Earl of Macclesfield, he was, in June, 1725, appointed Lord Chancellor, and was at the same time raised to the peerage as Baron King of Ockham in the county of Surrey. Lord King however did not as Chancellor satisfy the public expectation, or, it is supposed, his own; and he is said to have injured his health by his labours to make himself master of the department of professional learning necessary for his new duties. He resigned the seals on the 26th of November, 1733, and died at his seat of Ockham on the 22nd of July, 1734. By his wife Anne, daughter of Richard Seys, of Boverton in Glamorganshire, Esq., he left four sons, who all inherited the title in succession, and from the youngest of whom the present peer (created Earl of Lovelace in 1838) is descended.

(*Biographia Britannica.*)

KING'S COLLEGE, CAMBRIDGE, was originally a seminary for a rector and twelve fellows, founded by King Henry VI. in 1441; but in 1443 he changed its form, and endowed it for a provost, seventy fellows and scholars, three chaplains, six clerks, sixteen choristers, and a music-master (who is now also organist), sixteen officers of the foundation, twelve servitors for the senior fellows, and six poor scholars.

Eton College was founded by Henry VI. in 1441, and when he re-founded King's College in 1443 he placed it in immediate connection with Eton College for the supply of its scholars, each of whom at the end of three years from the day of his admission to King's College, is either elected a fellow or is no longer a member of the College. For the last twenty years the vacancies at King's College have been on an average less than four in the year. The process of electing the scholars on the foundation at Eton College for admission to King's College is described under ETON COLLEGE, P. C. S.

The Society, as at present constituted, consists of a provost, a vice-provost, a dean of divinity, two deans of arts, three bursars, a tutor and classical lecturer, a morning reader, a divinity lecturer, a lecturer in mathematics, a conduct, and an organist. The visitor is the Bishop of Lincoln.

A public examination takes place in the Hall of King's College at the end of Easter Term, when the students are divided into classes according to their respective degrees of proficiency; and books, to the value of 10*l.* and stamped with the College arms, are apportioned to the three first scholars in the classical and mathematical examination; the three scholars who are highest in the divinity examination receive prizes in three unequal proportions from the yearly interest of 500*l.* left for that purpose.

There are also other annual prizes which have been specially provided for, either by the College or by bequests of individuals:—20*l.* to be equally divided between such scholars as have in the course of the year been most distinguished for learning and regularity of conduct; 6*l.* to such scholar or scholars as shall be adjudged to have deserved well by application to study and good conduct; two 5*l.* prizes for Latin declamations; two 5*l.* prizes for English declamations: and one 5*l.* prize for the best translation of an English subject into Greek iambics.

King's College has some peculiar privileges. The provost has absolute authority within the precincts; the undergraduates (under certain restrictions) are exempt, within the limits of the college, from the power of the proctors and other university officers; they keep no public exercises in the University schools, nor are in any way required to be examined by the University for their degree of B.A.

King's College and Trinity Hall are the only colleges at which undergraduates can be elected fellows; in King's College, however, they are obliged to take the degrees both of B.A. and M.A. in the University when of sufficient standing, otherwise they are not entitled to the full proportion of their dividends.

There are thirty-six church livings in the patronage of the College,—two in Cambridgeshire, two in Devonshire, one in Dorsetshire, one in Essex, four in Hampshire, two in Hertfordshire, one in Lancashire, two in Lincolnshire, one in Middlesex, five in Norfolk, one in Northamptonshire, six in Suffolk, five in Surrey, one in Sussex, one in Warwickshire, and one in Wiltshire.

The original buildings of King's College consisted of the present chapel and a quadrangular court to the north of it, built of stone, 120 feet in length by 90 feet in breadth. The buildings which constituted this court having become much decayed, it was determined that a large quadrangle should be erected to the south of the chapel; Gibbs was appointed the architect. [GIBBS, JAMES, P. C.] The building was commenced in 1724, and he erected on the west side of the quadrangle the Fellows' Building, or Grecian Building, as it is commonly called. Nothing more was done till July 12, 1824, when the new buildings were re-commenced by Wilkins, and completed in 1828. [WILKINS, WILLIAM, P. C.]

The quadrangle is 280 feet in length by 270 feet in breadth, and consists of the Hall, Library, Chapel, and apartments for the fellows and scholars. It is separated from Trumpington Street on the east by a screen, in the centre of which is the entrance-gateway beneath a domed tower. The Hall, on the south side of the quadrangle, is 102 feet long, 36 feet wide, and 45 feet high, a noble room with a beautiful timber roof, similar to that of Crosby Hall in London, the arches terminating in pendants and adorned with elaborate tracery. There is a music-gallery at each end, and an elegant screen at the west end. The roof is surmounted by two stone lantern-towers, and there is an oriel window filled with painted glass. The Library is supported by buttresses on the exterior, and is ornamented with pinnacles and a pierced parapet. The interior is 93 feet long, 27 feet wide, and 18 feet high, and is handsomely fitted up with projecting book-cases of carved oak. The Grecian Building is 236 feet in length, 46 in breadth, and 56 in height. It is built of Portland stone, in three stories, with a lofty Tuscan portico, and comprises twenty sets of apartments for the fellows. The Provosts' Lodge, 98 feet in length, is a highly ornamented specimen of the Tudor domestic style. It has a lawn in front, and a bridge of one arch which connects it with the walks and fields on the other side of the river Cam. The interior contains some spacious apartments elegantly fitted up. The state-rooms are 35 feet long by 20 feet wide.

The Chapel, which is the only part of the original buildings now remaining, is the architectural glory of King's College. The first architect was Nicholas Cloos, and the first stone was laid in September, 1447. The walls were erected to a considerable height, but little progress was made during the latter part of the disturbed reign of Henry VI., and still less during those of his successors, till, in May, 1508, Henry VII. gave 5000*l.* towards the completion of the building, and his executors, in 1513, under a power conferred by his will, gave a further sum of 5000*l.* for the same purpose. In July, 1515, the exterior, including the roofs, was complete. In 1526 an agreement was made for the painted windows. The screen and stalls were not finished till about 1534.

This magnificent chapel, on the exterior, is 316 feet in length, 84 feet in width, and 90 feet in height to the top of the battlements; the height to the top of each of the four corner turrets is 146½ feet. The interior length is 291 feet, the width 45½ feet, and the height 78 feet. The exterior walls and the two roofs are supported by eleven vast buttresses on each side and four towers at the angles, and there are eight small chapels originally constructed for chantries, on each side between the buttresses. The exterior appearance of the chapel, with its towers and buttresses, lofty windows, pinnacles, and pierced battlements, is as beautiful as it is grand and imposing. In the interior the vast stone roof unsupported by pillars is one of the wonders of architectural skill. Eleven principal ribs spring from the buttresses on each side, forming an arch somewhat flattened at the centre, whence ponderous stones, each of which is said to weigh a ton, hang as pendants, and appear to be the key-stones of the arches. The pendants are carved with alternate roses and portcullises, the principal ribs are connected with each other by diagonal ribs, and the whole roof is formed into one great whole of the lightest and most richly carved fan-tracery, producing an effect of the strongest admiration and astonishment. It is stated that the stone pendants are not really key-stones, but might be safely taken away, together with the walls between the buttresses and the four towers, leaving, as it were, the skeleton of the building to support the roofs. The exterior roof, of light materials, is separated from the interior stone roof by a space of about six feet.

The great east window and twenty-four side-windows, each nearly 50 feet high, are filled with painted glass, and form a series of scriptural pictures of exceeding beauty. The great west window alone is of plain glass, probably for sake of additional light. The whole of the interior, with its screen in the centre, its walls of carved stone, and its stalls and tabernacle-work of carved oak, is worthy of the highest admiration.

(Lysons, *Cambridgeshire;* Dyer, *History of the University of Cambridge;* Wilson, *Memorabilia Cantabrigiæ; Cambridge University Calendar*, 1846; *Cambridge Guide*, 1845.)

KING'S COLLEGE, LONDON, an institution established in October, 1828, and incorporated by royal charter 14th August, 1829, as a college for the general education of youth, 'in which college,' says the charter, 'the various branches of literature and science are intended to be taught, and also the doctrines and duties of Christianity, as the same are inculcated by the United Church of England and Ireland.'

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The charter precludes, in the following terms, persons who are not members of the Established Church from holding office in the college: 'Provided always, that no person who is not a member of the United Church of England and Ireland, as by law established, shall be competent to act as a governor by virtue of his office, or to be nominated or act as life-governor, or be eligible as a member of the council, or to fill any office in the college, except only the Professorships of Oriental Literature and Modern Languages.' King's College is therefore intended to be exclusively a Church of England institution; and in this respect only does it mainly differ from University College, London, which was established two or three years earlier, with the design of affording the advantages of a university education to persons who were excluded either entirely or partially from the universities of Oxford and Cambridge, on account of their not being members of the Church of England. [UNIVERSITY COLLEGE, LONDON, P. C.] The visitor appointed by the charter is the Archbishop of Canterbury for the time being, and the governors, ex-officio, are the Lord Chancellor, the Archbishop of York, the Bishop of London, the Lord Chief Justice of the Queen's Bench, the Secretary of State for the Home Department, the Speaker of the House of Commons, the Lord Mayor of London, and the Deans of St. Paul's and Westminster. There are also life-governors, but their number is limited to eight. The council consists of the governors and the treasurer, and a number of others. The proprietors are those who hold shares or have been donors to the amount of 50*l*. Proprietors are entitled for each donation of 50*l*. or upwards, or for each share, to nominate one student, either for general or medical education in the college, and one pupil in the school, or two pupils in the school. The chief officer of the college is the Principal.

The college was opened in 1831. There are five departments: the Department of General Literature and Science; the Department of Applied Sciences; the Medical Department; the Theological Department; and the School.

In the Department of General Literature and Science, matriculated students, not under the age of 16 (except in special cases), are admitted to a regular and prescribed course of general study, but are allowed to attend any particular lectures not prescribed in that course. 'Occasional students are admitted, who attend any particular course or courses of lectures given in the college. There are apartments fitted up in the college for a limited number of students not under eighteen years of age, who are required to dine in hall. The prescribed course of study comprises religious instruction according to the principles of the Established Church; the Greek and Latin classics; mathematics; English literature, and modern history. The course of religious instruction is given by the Principal and the chaplain, and consists of lectures and weekly examinations. All matriculated students are required to attend chapel daily, and a register of their attendance is kept. The academical year consists of the Michaelmas, Lent, and Easter Terms. Examinations take place at the end of the Michaelmas and Easter Terms, when the students are classed according to proficiency, and at the close of the academical year there is another examination, followed by a public distribution of prizes. After completing a three years' course, those students who have passed through it with credit, and have also attended three extra courses of lectures, are entitled to the diploma of 'Associate of King's College.' There are Professorships of Classical Literature, Mathematics, English Literature and Modern History, Natural Philosophy and Astronomy, Experimental Philosophy, English Law and Jurisprudence, Political Economy, Geology, Chemistry, Botany, Zoology, Fine Arts, Hebrew Language and Literature, Oriental Languages, and of the French, German, Italian, and Spanish Languages respectively, and also of Vocal Music, and Drawing and Perspective.

The Department of General Instruction in the Applied Sciences includes mathematics, general philosophy, chemistry, geology, and manufacturing art, with a special course for students in civil engineering and architecture. The course in this department is two years. Certificates of Approval and Certificates of Honour are granted to students who have distinguished themselves, and who are thus entitled to the diploma of Associate.

In the Medical Department all the usual branches of medical science are taught. The matriculated students are those who enter at once upon the course required by the College of Surgeons and the Society of Apothecaries; and the Occasional Students attend only the lectures of particular professors. At King's College Hospital some of the officers and all the dressers are selected from the pupils of the College.

The Theological Department was instituted in 1846, but has not yet (Jan. 26) been opened. It is intended for students of King's College who shall have passed three years in the department of general literature and science, and who have received a diploma; for graduates of Oxford and Cambridge; and for all persons who shall be approved by the Principal and recommended by a bishop. The course of study will be for six terms (two years), and the fees will amount to 80*l*. It is intended to employ the students as district visitors, and to instruct them in the best methods of conducting schools. They are also to be taught congregational singing. On the completion of the course of study the Principal is to be empowered to grant certificates of attainments and good conduct, which certificates are to be exhibited to the bishop on application for holy orders.

There are libraries attached to the several departments, and also a general library.

The School Department is for youths from nine to sixteen years of age, and the course of instruction comprises Greek, Latin, French, mathematics, writing, arithmetic, book-keeping, history, geography, and English literature; and for the first three classes German, and for the first four drawing. The terms are eighteen guineas annually, exclusive of books and stationery, with an entrance fee of one guinea. In 1845 the number of students and pupils was as follows:—

Matriculated Students.	
Department of General Literature and Science	125
Department of Applied Sciences	30
Medical Department	152
	307
Occasional Students.	
In the various classes, exclusive of the Medical	35
In the Medical Classes	36
School.	
Pupils	471
Total	849

There are several small endowments by benefactors of the college. The Worsley endowment is for the instruction in every department of two scholars, to whom a stipend of 25*l*. a year is paid, and who, on the completion of their studies, are sent out as missionaries; and there are several others for prizes for proficiency and good conduct. Three scholarships have been founded for matriculated medical students. The Master and Fellows of Magdalene College, Cambridge, have given an exhibition for students of the College. In 1835 Mr. Marsden left to the College a valuable library of about 3000 volumes, chiefly in Oriental literature and philology.

King's College forms the eastern wing of Somerset House, which was left in an uncompleted state. In 1830 the government granted this site to the college for one thousand years, on condition that the proprietors completed the building in a style corresponding to the other part of the edifice. The college buildings extend from the Strand to the Thames. They comprise lecture-rooms, a chemical laboratory, a workshop, museums of anatomy, materia medica, zoology, botany, geology, and mineralogy, and libraries, besides a dining-hall, apartments for a limited number of students, and various offices. The school-rooms are in the basement story.

KIVA, KHIVA, or KHYVA, a country in Asia, forming a part of that natural division which goes by the name of Turan, or Lower Turkistan, is situated on the east of the Caspian Sea, between 39° and 45° N. lat., and between 49° and 59° E. long. Its political boundary is not distinctly determined, as it mostly runs through deserts, inhabited by nomadic tribes, which only nominally acknowledge the sovereignty of the Khan, or pay no obedience to his orders. Only on the east, the boundary between Khyva and Bokhara is more exactly fixed. It traverses the river Oxus a few miles north-west of the Bokharian fortress of Charchui, and runs northward near the town of Karakol. On the north of Khyva is the desert called Kizil Cum, which is east of the Sea of Aral, this lake, and the table-land of Oost-oort, which extends from the Sea of Aral to the shores of the Caspian. The Caspian constitutes its western boundary. On the south of Khyva is the desert called Desht Cowas, and through it lies the boundary-line separating Khyva from Persia and Merve. The authority of the Khan of Khyva may extend over a country containing about 150,000 square miles, or over 30,000 more than the extent of the British empire in Europe.

Surface and Soil.—We begin with the wide isthmus which lies between the Caspian and the Sea of Aral. Between 44° and 45° N. lat., an extensive promontory projects into the Caspian. It is called Manghislak, and consists of a mountain-mass, divided into three chains, which according to an estimate rise to 1500 or 2000 feet above the level of the Caspian. From this place a mountainous country extends in a north-eastern direction towards the northern shores of the Sea of Aral; but with its nature we are totally unacquainted, as the caravans ascend it only at its eastern extremity, before they get to the table-land called Oost-oort. At this ascent the mountain-mass does not appear to be more than about 600 feet above the low steppe which extends along its northern base. The country south of this mountain-tract is unknown, with the exception of the eastern part, which is called Oost-oort, and which extends along the western shores of the Lake of Aral, to which it descends with steep cliffs. It is a table-land, about 500 or 600 feet above the sea, and consists of a calcareous formation, which probably is the reason that it has no river or wells, though it is annually covered with a thick layer of snow, and the surface is rather hilly than undulating. The scanty vegetation consists mostly of single plants of the family of the *Chenopodiaceæ*, and at some places tracts several miles in extent are overgrown with *Salsola arbuscula*, Lin., and *Atraphaxis spinosa*, Lin. In general however the soil is a red loam, and is entirely without vegetation. This table-land terminates on the east near 42° N. lat., but towards the Caspian it does not appear to go so far south, perhaps not farther than the Gulf of Kinderli (43° N. lat.).

To the south of the Oost-oort is a depression which appears not to be many feet above the level of the Sea of Aral. It begins on the east near Kana Oorgentsh, where it is only a few miles wide, but it grows wider in approaching the lagune of Kuli Daria, or Kara Boghaz, where it is more than twenty miles wide. The surface of this depression is covered with a minute sand, similar to that found at the bottom of the sea. It is therefore supposed by some writers that the river Oxus or Amoo Deria at some period sent its waters through this depression to the Kara Bogaz. This supposition is supported by the general opinion of the natives. The lagune of Kara Bogaz receives its waters from the Caspian by a narrow strait, and they are therefore brackish. According to the best authorities, the lagune is more than a hundred miles in length, and between twenty and thirty miles across. The banks and the adjacent countries are low.

Above thirty miles from the lagune, and south of it, is an isolated mountain-range running east and west. It extends along the northern shores of the Gulf of Balkhan, and is also called Balkhan. Near the Caspian Sea the hills are of moderate elevation, but north-east of the innermost recess of the bay are some summits called Great Balkhan, which appear to attain an elevation of at least 2000 feet above the level of the sea. This chain does not advance much farther east, but turns southward, and encloses the bay also on the east, where it is known by the name of Little Balkhan. At its southern extremity, south of 40° N. lat., another depression is said to exist, by which it is supposed that the Oxus may have discharged its waters into the Caspian, but this fact rests on information collected from the natives. Between 40° and 39° N. lat. the Caspian is skirted at no great distance from the shores by a chain of mountains, which do not appear to attain a great elevation. They are called the Lambuil mountains. At their southern extremity, near 39° N. lat, the third depression is said to occur. Farther south, to the boundary of Persia, or rather to the river Atreck, and the Gulf of Hassan Kuli, an uninterrupted ridge of sand-hills skirts the Caspian, about ten miles from its shores.

The country which extends from the shores of the Caspian Sea to the vicinity of the river Oxus, south of the Kara Bogaz, is called the Desert of the Truchmenes or Turcomans. With the exception of the mountains and hills already noticed, it is a plain, whose surface is only here and there interrupted by flat depressions, in which lakes are generally found, of which however the greater part is dried up during the summer. The northern part of it cannot properly be called a desert. There certainly are many sandy tracts, but they are not extensive, and the remainder consists of a loamy hard soil, impregnated with salt, which in spring and the beginning of summer is partly covered with grass; but later in the season is without vegetation. In the hot season the Truchmenes feed their herds of camels and horses on the leaves of the bushes and trees that grow in the depressions, or bring them to the boundary of Persia, or of the cultivated part of Khyva. The southern part however is almost entirely covered with sand, and is called Desht Kowar.

Khyva Proper, or the cultivated portion of the Khanat, consists of a comparatively narrow tract contiguous to the course of the river Oxus, and extending from Pitniak, the most southern town of the country (41° N. lat.), to that of Kungrad (north of 43°), a distance of about 150 miles. Its western boundary may be marked by a line drawn from the town of Khywa to that of Kana Oorgentsh, which falls short of a hundred miles. The mean distance of the two lines does not exceed 30 miles, and the area of this tract falls short of 4000 square miles. It is not equal to double the extent of Norfolk. This tract is thickly inhabited, and produces almost every kind of grain in abundance. But its fertility is properly not derived from the soil, which, where it is beyond the reach of irrigation, consists of a hard loam, impregnated with salt, and nearly without vegetation. But the whole region is traversed by so many canals, that it resembles a net. The water is drawn from the Oxus, and runs with a perceptible current to the west and north-west, where the canals terminate in a series of lakes at the foot of sand-hills which divide Khyva Proper from the Desert of the Truchmenes.

This description however applies only to the southern part of the region, or that which lies between 41° and 42° 10′ N. lat.: the delta of the Oxus, or that portion of the country which is enclosed by its arms, contains very little land fit for agricultural purposes. It is annually inundated by the river, and mostly overgrown with reeds and rushes, but there are considerable tracts which serve as pasture-ground for cattle, which is of great importance, as the southern country has no meadow land or pastures. Where the delta borders on Lake Aral, it is a complete swamp all the year round. This country is so low, that probably the whole delta would be laid under water if the level of the Sea of Aral were raised a few feet.

On the east of the river Oxus the cultivable ground is of small extent. About 42° 20′ N. lat. begins a tract of higher ground about two miles from the river, which runs parallel to it for about forty miles to the south-east. This ridge is about four miles wide, and is called Shikhodshelli; it rises about 600 feet above its base, and descends gradually eastward into the Desert of Kizil Cum. Where this ridge terminates (40° 35′), the cultivated land probably extends to five or six miles from the banks of the Oxus, and here also there are several smaller canals.

River and Canals.—The river Oxus, whose modern name is Amoo Deria or Gihon, originates in the elevated mountain region which divides Lower Turkistan from Chinese Turkistan, and which goes by the name of Bolor Tagh. There it issues from a lake, called Sir-i-kol, which is about fourteen miles long from east to west, with an average breadth of one mile, and near 37° 27′ N. lat. and 73° 40′ E. long. Pliny mentions the fact of its rising in a lake, which was supposed to be a blunder, until this lake was recently discovered by Lieutenant Wood. [Oxus, P. C.; Turkistan, P. C., p. 411.] This lake is 15,600 feet above the sea-level, and on three sides bordered by hills, about 500 feet above its level, whilst along its southern bank they rise into mountains, 3500 feet above the lake or 19,000 above the sea, and are covered with perpetual snow, from which never-failing source the lake is supplied. At Issar, about eighty miles from the place where the river leaves the lake, its surface is only 10,000 feet above the sea-level, and it continues to descend rapidly in traversing the mountain region, where it is called Panja. The mountains by which its course is enclosed, terminate at Kilah Chap, where the Oxus is joined by its first great tributary, the Kokcha, or river of Badakshan. Immediately above and below this place the river is fordable in summer. Higher up it cannot be forded on account of the rapidity of the current, nor lower down on account of the depth and the great volume of water, for in these parts it is joined by several large tributaries from the south and north. Where the river enters the lower country, it is from 300 to 400 yards wide, and runs about three miles and a half an hour. It certainly could be navigated in these parts, but it does not appear to be used for that purpose. The waters are led into several canals to irrigate the adjacent fields. The course of the Oxus within the mountain region exceeds three hundred miles, and its windings are large and numerous

From Kilah Chap its general course is to the west for about two hundred miles, through a country where cultivated tracts alternate with sandy deserts of moderate extent. After having passed the meridian of Balkh (67° E. long.), its course declines more to the north-west, and in that direction it continues to the boundary-line of Khyva, watering the adjacent country for more than two hundred and fifty miles. The country which it traverses is unfit for cultivation, except in the immediate vicinity of the river, where the fields are irrigated from the river. It is here still a rapid stream and navigable, but not far from the boundary-line between Bokhara and Khyva rapids are said to exist, which are full of rocks, and during low-water dangerous to be passed by boats. In this middle part of its course the Oxus is not joined by any permanent stream.

Tho lower course of the Oxus, from the above-mentioned rapids, above the Bokharian fortress of Charchui, to its mouth in the Sea of Aral, probably exceeds five hundred miles in length, so that its whole course amounts to nearly thirteen hundred miles. It therefore is larger than any river in Europe, except the Volga. Nearly two hundred miles of its lower course lie through a desert country, similar to that traversed by it in its middle course, but there does not occur any obstruction to navigation, and it is navigated. The river reaches Khyva Proper near 41° N. lat., and traverses it in one bed as far north as 42° 20′, or upwards of a hundred miles. It course is turned by the northern extremity of Mount Shikhodshilli to the west, and a few miles lower down the river divides into two arms, of which the smaller, called Lowdahn, continues to run in a western direction about fifty miles, when it falls into Lake Ak-Cheganak. This lake is situated near the base of the table-land of Oost-oort, and at a distance of more than a hundred miles from the Sea of Aral. It extends about thirty miles from east to west. On its northern side begins a deep depression, which extends along the base of the table-land to the Sea of Aral, and has a mean bread of fifteen miles. It is entirely filled with water even in winter, when the level of the Oxus is lowest, but only to a moderate depth. It is overgrown with reeds, rushes and other aquatic plants, with the exception of a comparatively narrow stripe in the middle, which is unincumbered, and where a perceptible current runs to the Sea of Aral. The water of this swampy tract is sweet. Nearly halfway between the place where the Lowdahn branches off from the Oxus and its influx into Lake Ak-Cheganak, it sends off a branch to the south-west, which is called Szarkrauk, and passes near the town of Kana (Old) Oorgendsh, but its farther course is not known. At Kana Oorgendsh it was, in September, 1842, a river about sixty or seventy feet wide, and two feet deep.

From the place where the Lowdahn branches off the main stream of the Oxns runs due north about ten or twelve miles, and then sends off an arm to the north-east, called Kook-usak, which after a course of more than thirty miles falls into a lake called Daukara. From this lake a swampy depression similar to that of lake Ak-Cheganak is stated to extend to the Aral; but this fact rests only on the information of the natives. From the efflux of the Kook-Usak the Oxus runs again north-west, and sends a branch, called Kara-Baili, to Lake Daukara, and two smaller ones, Kiatt Chargan and Kok-Daria, to the depression north of Lake Ak-Cheganak. Farther on, at a distance of about thirty miles, the Oxus divides into two arms, of which the smaller and western, called Taldyk Daria, reaches the Sea of Aral without dividing any farther, but the eastern, Ulu Daria, enters the sea by two arms, of which the eastern is known as Kasak Daria.

The Sea of Aral, into which the Oxus disembogues, is a great inland lake. [Aral.] It contains numerous islands, and some of them are inhabited and cultivated. The largest, called Tokmak Ata, lies opposite the mouths of the Oxus, and is about twenty miles long. It is partly cultivated and partly overgrown with wood. The distance from the shore is about fourteen miles; and it is stated that when the water of the sea is low a man on horseback can pass through this strait, so shallow is this sea.

The Aral is not mentioned by the classical writers: were they unacquainted with this sea? or did it then constitute a part of the Caspian? Some modern writers have maintained the latter opinion, and it has been asked, over which part of the isthmus lying between the two seas, the strait passed, which united them. It cannot have been the case between 42° 20′ and 46° 30′, as in these parts the isthmus is occupied by the table-land of the Oost-oort, in which no depression of such a description occurs as would be required to form a wide and deep strait. The Russian surveys of the Caspian have made us acquainted with its eastern shores and the countries immediately adjacent to them. The hills which skirt the shores are, as already observed, interrupted at three places. But the two southern openings are of small width, and at a distance of from 300 to 400 miles from the southern shores of the Sea of Aral, and it is hardly probable that a strait of such a length could have passed through the country without leaving indelible traces; but such traces have not been found.

The northern depression above noticed, which opens into the Caspian, with the extensive lagune of Kara Bogaz, may have formed a strait, for its soil consists of such sand as is left behind wherever the sea retires. It is also of considerable width, except towards the eastern extremity, west of Kuna Oorgensh, where it is only a few miles across. In these parts it appears rather to have formed the bed of a river than the receptacle of a strait. This leads us to another more complicated question. The antient authors, who mention the Oxus, state that it flowed into the Caspian Sea, and the Arabic geographers of the middle ages, who were better acquainted with these countries than the antients, hold the same opinion; it can therefore hardly be doubted that it was so. Arrian, whose authority is the best of all, distinctly states that it flowed into the Caspian Sea (*Anab.* iii. 29). But where did the river reach the Caspian? Some authors have maintained that it passed through the southern depression, and entered the Gulf of Khyva, or Ashaïh Beyuri, north of 39° N. lat., which is only one degree farther north than the place assigned to the mouth of the Oxus by Ptolemy. Others think that it reached the sea by the middle opening, and flowed into Balkan Bay. But Alexander von Humboldt is of opinion that historical facts prove that, as late as A.D. 1500, the Oxus still carried its waters to the Kara Bogaz. The most decisive proof he finds in the 'Theatrum Orbis Terrarum' of Ortelius (1570), where an account and map of Russia and Tartary are found, which both had previously (1562) been published in London, by Anthony Jenkinson, the agent of the Russia Company, who was sent to establish a commercial intercourse with central Asia by the way of the White Sea and Moskow. The title of Jenkinson's work is, 'Russiae, Moscoviae, et Tartariae Descriptio, Auctore Antonio Jenkinsonio, Anglo, edita Londini 1562, et dedicata Ill. D. Henrico Sydneo, Walliae Praesidi.' In this map the Oxus is laid down as falling into a large arm of the Caspian at 41° N. lat. This is evidently the lagune of the Kara Bogaz, but it appears that at the time of his travels (1559) the lagune advanced much farther eastwards, which change may have been produced by a change in the level of the Caspian. In his account Jenkinson states that tho water of the Oxus no longer reached the bay as it formerly did, and he attributes this change to the great volume of water which was drawn from the river to irrigate the adjacent countries. But Oorgendsh was at his time a large commercial town, built near the river, which was navigable at that place. In fact, he embarked here, and ascended it to the vicinity of Bokhara. In the history of Abul Ghasi it is stated that in 1575 the Oxus turned to the northward, and began to run into the Sea of Aral, and that the fertile country surrounding Oorgentsh was then converted into a desert. Since that time this place has presented only ruins to the travellers who visited it; no river has been found in its vicinity in the last three centuries. But it would appear that in the last fifteen years the river has mado some efforts to re-occupy its old bed. Several statements tend to prove it, and Basiner found, in Sept. 1842, that the Szarkrauk, near Kana Oorgentsh was from sixty to seventy feet wide, and two feet deep, and that tho place, which was formerly uninhabited, had again been settled, and contained a population of 1000.

A river like the Oxus, traversing such a level country as Khyva, must be subject to frequent and great changes in its course. The river, like the Nile, brings down during the freshets a great quantity of detritus; but, unlike the deposit which the Nile leaves on the field after having re-entered its bed, the earthy matter contained in the waters of the Oxus diminishes the fertility of the soil. To prevent inundations the banks of the river and of the larger canals have been raised considerably above the level of the country. The detritus is thus confined to their beds, and it leaves there a thick layer of mud mixed up with sand. The canals must annually be cleansed, and this is a laborious work. In spite of the embankments partial inundations are rather frequent, and destructive of life and property. In 1838 a considerable portion of the cultivated tract was laid under water, and it is stated that more than five thousand persons perished in this inundation. The level of the river is highest from May to July, and then its waters are very turbid; but in the remainder of the year they are clear and well-tasted. It runs with a considerable current, at least two miles an hour. Its depth varies between six and ten feet. It must be much navigated, as it is stated that there are more than a thousand river-barges in the country.

No country in the world has so many canals as Khyva. The number of the larger canals is stated to exceed twenty. In the southern districts they run westward, but farther north to the north-west, and terminate in that series of small lakes which, with the sand-hills contiguous to them on the west, separated the cultivated region from the Desert of the Truchmenes. Their width varies between seventy and a hundred feet, and their length is considerable; that of Shawat, which is the largest, is at least seventy miles long. From these larger canals others of minor dimensions branch off and water the country to tho distance of twenty miles. The canal of Palwan has twelve such lateral canals, of which one-fourth exceed twenty miles in length and about six are more than fifteen miles long. The water of these canals is brought to the fields by ditches. During the freshets a considerable current runs through the canals, and even at other seasons it is perceptible. The canals are still more navigated than the Oxus itself.

Climate.—Tho climate partakes of that excess of cold and heat by which the plain north and east of the Caspian is distinguished above all other parts of the globe. We have no regular meteorological obervations. On the 8th of October, 1842, the thermometer stood at $90\frac{1}{2}^{\circ}$ at two o'clock in the afternoon in the shade, and on the 22nd of December the same year it fell as low as 11° below zero of Fahrenheit. The summers are very dry; rains fall rarely, but gales are frequent. Frost is commonly experienced towards the end of October, and the lakes and canals are soon covered with ice. The Oxus however does not freeze before the end of the year. In the beginning of January, 1843, the ice of the river was found to be between thirteen and sixteen inches thick. Snow does not fall in large quantities, hardly more than four inches deep at once, and lies rarely more than four days on the ground, which is remarkable, if the frost is continuous. The climate is generally healthy; but in autumn fevers and agues are endemic.

Productions.—Agriculture is attended to with great care and industry; sometimes the fields are ploughed seven times. Great attention is paid to the preparation of manure. On the fields are cultivated rice, wheat, barley, millet, sesamum, cotton, jugari (Holcus saccharatus), peas, lentils, hemp, poppy, and clover; in the gardens, melons and water-melons, pumpkins, carrots, turnips, peas, onions, potatoes, and cucumbers; in the orchards, mulberries for rearing the silk-worm, apricots, apples, pears, plums, cherries, and vine, also currants. But the fruits are not distinguished by flavour, except the melons and water-melons. On the banks of the canals and ditches are alleys of aspen, ash, willow, and poplar. Forest-trees are only found on the eastern banks of the Oxus. In the lower region a plant grows wild, whose roots, *morena*, are used for dyeing red.

The horses of the Truchmenes are very beautiful, and held in great estimation, especially those which are called *argamaks*. Common horses are brought to Khyva by the Khirgis. Many camels are kept, even by the poorer people, and also asses. Few cattle are reared, on account of the want of meadows, except by the Karakalpakes, who import cows and oxen into the cultivated region. Sheep are reared by the Truchmenes, or imported from Bokhara, on account of the fleece: the Kirghis import a considerable number for slaughtering. Fowls are numerous; but turkeys, geese, and ducks, are only kept by the khan. Water-fowl are numerous in the delta, but other wild birds are rare. Of wild animals there are bears, wolves, foxes, wild cats, jackals, hares, wild goats, deer, and wild hogs, mostly in the delta, where also the tiger is sometimes met with. Fish abound in the lakes, river, and Sea of Aral; but are not much eaten, except by the Karakalpakes. Turtles and crayfish abound. Silk-worms are reared to a considerable extent.

Gold and copper are said to exist in the Shikhodshilli mountains, but are not worked. The other useful minerals are stone for building, limestone, pipeclay, salt, and sulphur.

Population and Inhabitants.—The whole population is estimated at 2,000,000, of which one-fourth are stated to be settled in Khiva Proper; so that in that part of the country about 125 persons live on a square mile, which does not appear to be an over-estimate, as there are several places containing some thousands of inhabitants. This region is inhabited by two nations—the Usbecks and the Sartes. The former are a branch of the Turks, whose language they speak, and are the ruling nation. They have abandoned the nomadic life and live in houses, and in summer frequently in tents erected on the fields which they cultivate. Many families of them inhabiting the delta east of Kungrad live on the produce of their herds and still lead a nomadic life. The Sartes are Persians, and the same race of men which, in other parts of Central Asia, are called Tajiks. It appears that they are the most antient settlers of the country. They speak the Persian language, and occupy themselves with the cultivation of the soil, commerce, and handicraft trades. They are a very peaceful and industrious race of men. Among these nations a few families of Jews, Armenians, Afghans, Aimaks, Kirghis, and Karakalpakes are settled; the three last have been imported as slaves.

The uncultivated portion of the Khanat is in possession of three nomadic tribes—the Truchmenes, Karakalpakes, and Kirghis. All three are Turkish nations, and speak dialects of the Turkish language. The Turkomenes (Truchmenes) or Turcomans, wander about in the wide region lying between Khyva Proper and the Caspian, and extending from the southern boundary of the table-land of Oost-oort to the mountains of Korassan and of the Aimaks. They live on the produce of their large herds of horses, camels, and sheep. Their women are very industrious, and make carpets, tents, felts, cloth, and girdles. Though they do not pay strict obedience to the orders of the khan, they admit a certain degree of dependence and acknowledge it by sending presents to him. The Karakalpakes (Black-caps) are numerous in the delta, especially to the east of Kungrad, and some families are found on the south of the Oxus and Lowdahn, north of 42° N. lat. They are, besides, dispersed over all the shores of the Sea of Aral, where they are especially occupied in fishing. At other places they cultivate a piece of ground, but rely for subsistence especially on their herds of cattle, sheep, and goats. They are peaceful and entirely dependent on the khan. The Kirghis, who call themselves Kasauks, wander about in that immense plain which extends from the banks of the Volga to Lake Balkash. Some of their tribes living in the vicinity of the Karakalpakes appear to be in some degree dependent on the khan of Khyva, but we do not know if that dependence is real or only nominal. They have numerous herds of horses and sheep, of which they annually import a great number into Khyva.

Towns and Villages.—It is observed as a very remarkable circumstance, that in no part of Central and Western Asia, except in Khyva, the country lying between two towns or large villages is interspersed with a great number of single farming establishments, which are situated in the centre of the lands belonging to them. This proves that the inhabitants must enjoy a considerable degree of security. The number of towns containing from 3000 to 10,000 inhabitants is rather great in proportion to the extent and population of the country.

Khyva, the capital and residence of the khan, consists of about 700 mud houses, but the suburbs contain 1500, and the population exceeds 12,000 individuals. The streets are crooked, and so narrow that a loaded camel cannot pass through them. The palace of the khan is only a large mud building. There are two colleges and three mosques, all built of brick. The karavansera is also of brick and arched over.

The other large towns are New Oorgentsh, Gurlan, Mai gyt, and Kiptshak, in the vicinity of the Oxus, and Shawat and Tasshathaus in the interior of Khyva Proper. The town of Kungrad may be considered the capital of the nomadic population of the delta. In summer it has very few inhabitants, but in winter it is the common residence of several nomadic tribes that inhabit the adjacent country. Its walls are stated to be more than twelves miles in circuit.

Manufactures.—The manufactures of Khyva are inferior to those of Bokhara, but still of some importance. The chief are those of cotton, of which several kinds of stuffs are made by the Sartes, who also work up all the raw silk made in the country, and they produce some very good articles. Worsted cloth and other articles of wool are made by the nomadic nations. In some places are large manufactures of earthenware. Several utensils of copper are made in the town of Khyva, but all articles of iron are imported, almost exclusively from Russia: only a few Kirghis settled in the khanat exercise the trade of blacksmiths.

Commerce.—In a country like Khyva, whose soil supplies its inhabitants abundantly with food, whilst its manufactures afford almost all the other necessaries of life, but do not yield any article for exportation, foreign commerce must be very inconsiderable. The most active is that with Bokhara, from which place also a few Indian goods are imported: we are however not acquainted with the details of this trade. From time to time a caravan goes from Khyva to Orenburg. It exports a few manufactured articles, sheep-skins, hides, and horses, and brings back utensils of cast-iron, some woollen cloth, and copper and other metals. It passes through Kana Oorgentsh, traverses the table-land of Oost-oort, near the shores of the Sea of Aral, and after descending to the low plain its route lies through the steppe of the Little Horde of the Kirghis The commerce between Khyva and Persia is still less important. Khyva sends there chiefly horses, and receives in return dried fruits and some silk goods.

History.—Khyva probably was a part of Bactria when that country submitted to the sway of Cyrus, the founder of the Persian empire, and constituted a portion of the province of Bactria at the time of the conquests of Alexander the Great. After his death it was united to the kingdom of Syria, but separated from it by the revolt of Theodotus of Bactria (256 before Christ), who founded a separate kingdom in these parts. But in the second century before Christ the nomadic nations of Upper Turkistan began to descend into Turan, and took possession of the countries north of the Oxus and south of the Sea of Aral. They seem to have laid waste the country and kept possession of it during more than two centuries. In the second century after Christ however they were subjected to the sway of the Chinese emperors, who at that period extended their dominions to the shores of the Caspian. It is not known at what time and in what way the Chinese were compelled to abandon this country. In the third century of our æra it was connected with Persia, and remained so up to the tenth century, when one of its governors acquired independence and erected the kingdom of Karizm or Khowarism, which appears to have remained an independent state until conquered by Gengis Khan (1218). The descendants of Gengis Khan remained in possession of the country, which continued to form an independent kingdom under the name of Khowarism, up to 1379, when the town was taken by Timur, and the country annexed to his possessions. Khyva remained a part of Mawar-el-nahr, or the kingdom of Samarkand, to the beginning of the sixteenth century, when a Turkish nation, the Usbecks, under the auspices of Shibani Khan, descended from Upper Turkistan, and by degrees took possession of the whole of Turan. Khyva, as it appears, soon became an independent state under an Usbeck prince, and has remained so up to this time. A few years ago Russia complained that the caravans passing between Orenburg and Bokhara, in travelling to the country east of the Sea of Aral, were frequently molested and robbed by the subjects of the Khan of Khyva; and as they knew that the khan was unable to restrain the nomadic nations from attacking the caravans, they resolved on taking possession of the country; probably also with the view of extending farther their conquests in this direction. In the autumn of 1839 Russia dispatched an army of 5000 men, under General Perowski, but they did not reach Khyva. They suffered greatly from want of water, fuel, and fodder for horses and camels during their passage through the Desert of the Little Horde of the Kirghis, and before they reached the base of the table-land of Oost-oort, they were overtaken by such severe cold that nearly all the camels (12,000) and a great number of the horses perished; and thus they were obliged to return to Orenburg, and when they arrived there it was found that one-third of the soldiers had died.

(Murawiew, *Reise in Chiwa;* Humboldt, *L'Asie Centrale;* Basiner, *Nachrichten über seine wissenschaftliche Reise nach Chiwa*, in Zimmermann's *Denkschrift über den untern Lauf des Oxus;* Abbo., *Narrative of a Journey from Heraut to Khiva, Moscow, and St. Petersburg*, &c.)

KLAPROTH, JULIUS HEINRICH VON, one of the most eminent Oriental scholars of modern times, was born at Berlin, on the 11th of October, 1783. He was the son of the celebrated chemist Klaproth, who wished to bring him up to his own profession, but the boy was little inclined to it, and employed most of his time on other pursuits unknown to his father. He was about fifteen when, during a public examination of the pupils of the college in Berlin where he received his instruction, he was so backward that one of his examiners cried out indignantly, 'Why, you know nothing at all.' 'Beg your pardon,' answered young Klaproth, 'I know Chinese.' His answer was received with astonishment and distrust, but he immediately gave proofs of his having made great progress in that difficult language, and he became henceforth an object of admiration to all who had an opportunity of witnessing his extraordinary talents. He had learned Chinese secretly without the help of a master, and, according to his own saying, he first began it in 1797, after he had found out a small and incomplete, but nevertheless valuable collection of Chinese books in the public library at Berlin. His father soon became reconciled to the pursuits of his son, but perceiving that he devoted his time exclusively to Oriental languages, he sent him, in 1801, to the university of Halle, with a strict injunction to study the classical languages. Klaproth remained several years at Halle, and in 1802 published the first number of his 'Asiatisches Magazin.' The learned Count John Potocki having heard of Klaproth, hastened to make his acquaintance, and was so struck with him that he immediately proposed to him to enter the service of the emperor Alexander of Russia. Klaproth accepted the proposition, and the count being in great favour with the czar, Klaproth was formally invited to settle in Russia. Upon his arrival at St. Petersburg, early in 1805, the Academy of Sciences presented him with a diploma of Adjunctus, for the Eastern languages and literature, and the Russian government being then engaged with the plan of sending an embassy to China, Count Potocki obtained for Klaproth the place of an interpreter. Klaproth actually got his commission before the appointment of an ambassador. This honour was finally bestowed upon Count Golowkin, a vain and ambitious man; and Count John Potocki was put at the head of a body of scholars who were to accompany the embassy. Klaproth set out alone, before the embassy was ready to undertake the journey, and after having traversed the Ural Mountains, and passed through Katherinenburg, Tobolsk, and Omsk, employing all his time in studying the country and its inhabitants, he finally arrived at Irkutzk, which was the place of meeting for all the members of the embassy. Count Golowkin and his suite arrived soon after him, in October, 1805, and after having been detained some time at Irkutzk and Kiakhta, the embassy crossed the Chinese frontier on the 1st of January, 1806. They had scarcely proceeded a hundred and eighty miles when they were again detained, Count Golowkin having refused to submit to the Chinese court-ceremonial, and after having remained a month in a miserable Mongol town, the count was informed that the court of Pekin did not wish to see him. The embassy consequently returned to St. Petersburg. Klaproth however did not accompany them, but took a solitary route through Southern Siberia, and only reached the Russian capital in the beginning of 1807. The information which he brought back to St. Petersburg was deemed so important, and his own abilities were so fully acknowledged, that before the end of the year he was sent on a scientific mission to the Caucasian provinces. He returned from this country in January, 1809, with a large stock of scientific and political knowledge, most of which afterwards formed the subject of separate works and articles in learned periodicals. The Academy of St. Petersburg chose him an extraordinary member, and the emperor conferred upon him the title of Aulic councillor, and made him a knight of the order of Wladimir, an honour which placed him among the Russian nobility. However, Klaproth had expected still greater distinctions, and the Russian government having secretly put a stop to his intended publication of his journey through the Caucasus, he began to feel uneasy in Russia. He was too frank, too liberal, and too bold to feel happy among slaves. He nevertheless prolonged his sojourn in Russia, and was active in establishing a school of Oriental languages at Wilna, and in making a descriptive catalogue of the Chinese and Mandshu MSS. in the imperial library at St. Petersburg. He was sent, in 1811, to Berlin, for the purpose of superintending the engraving of the characters which were intended for printing those MSS. In 1812 he tendered his resignation to the Russian government, and after a considerable time received his dismission, with the remark that by soliciting permission to retire he had forfeited all his civic and scientific titles and privileges in Russia. In St. Petersburg however there were strange rumours afloat as to the real cause of his disgrace, and it was said there, and afterwards repeated in foreign countries, that his love of rare MSS. and books went beyond mere scientific attachment. No sooner was Klaproth free than he began to bring out his journal of his travels in the Caucasus; but Germany became the theatre of a long and bloody war, and the learned Orientalist fled from place to place without finding repose for his pursuits. During this war he became acquainted with some of the most distinguished men in the French armies, and his name became known to Napoleon. Klaproth's admiration for the French emperor must have been great, for after Napoleon had been banished to Elba he suddenly left Germany and visited the fallen hero in his exile. Napoleon received him very well, and it appears that Klaproth, expecting the emperor's early return to France, offered him his services, and was chosen the future editor of one of the first newspapers in France. The 'hundred days' however passed away without any notice being taken of Klaproth, and when the Bourbons returned to Paris he was at Florence, in rather uncomfortable circumstances. Count John Potocki, having heard of this, invited him to settle in Paris, and there Klaproth lived some time by his pen, when he accidentally met with William von Humboldt, who, although he had seen him only once, employed all his influence to procure for him a situation suitable to his pursuits and his merits. It was at Humboldt's recommendation that the late King of Prussia, Frederick William III., conferred upon Klaproth the honorary title of royal professor of Oriental languages and literature, which was accompanied with a liberal pension, and a promise to defray the expenses of printing whatever works the professor might think fit to publish. Klaproth was further allowed to stay in Paris as long as he pleased. Placed beyond all want, and moreover enjoying an income which enabled him to gratify his love of pleasure and refined society, Klaproth now exhibited an extraordinary activity, and it was in the years subsequent to 1816 that he published most of those literary productions which established his European reputation. The life which Klaproth led in Paris, leaving his study only to plunge into the torrent of mental and physical excitement of the gayest capital of Europe, proved fatal to his health. In 1833 the symptoms of a dropsy of the chest becoming alarming, a tour to Berlin, where he was received with great distinction by the king and the public, produced a good effect; but shortly after his return to Paris the symptoms became worse, and his bodily sufferings were unfortunately accompanied by occasional derangement of his intellectual faculties. The skill of the first physicians of Paris proved ineffectual, and after long and painful sufferings Klaproth died suddenly, on the 27th of August, 1835, and was buried in the cemetery of Montmartre.

Klaproth was one of the best scholars and decidedly the best linguist of an age which can justly boast of great linguists. His penetration and sagacity, and the quickness of his perception, were extraordinary; clearness and perspicuity distinguish his style; and his memory was so happy and capable of retaining the most different impressions without ever confounding them, that he seldom made more than scanty extracts. When he began a work, it was already clear and distinct in his mind, and the composition did not take him more time than was required for the mechanical act of writing. If we compare Klaproth with William von Humboldt, we find that Klaproth had the superiority in analytical power, while Humboldt surpassed Klaproth in the synthetical. Klaproth's biographer in the 'Biographie Universelle,' says that he was naturally of a kind disposition towards everybody. Yet this kind-man was the dread both of his literary enemies and friends. The former dreaded his answers to their attacks, and the latter observed the greatest precaution in their intercourse with him, lest they should irritate his irascible temper; and it would seem as if he made no distinction between scientific and moral error, so severely did he handle those who incurred his scorn through a display of inaccuracy or ignorance in matters of learning. His controversy with Professor Schmidt, the Mongol scholar in St. Petersburg, is an instance of this.

It would take much space to give a complete catalogue of his numerous publications, especially as the majority of them consist of pamphlets, memoirs, and dissertations, many of which are not of any general interest. Previous to 1812 he had only published some minor works, as, for instance, 'Inschrift des Yü, übersetzt und erklärt,' Halle, 1811, 4to., being a German translation, with notes, of a Chinese inscription; and articles in different learned periodicals. The 'Asiatisches Magazin' was edited by himself. The following are his most remarkable works.

1, 'Reise in den Kaukasus,' with maps, Halle and Berlin, 1812-14, 2 vols. 8vo.: of these 'Travels in the Caucasus' a French translation, with valuable additions, appeared in Paris in 1823; 2, 'Exécution d'Automne (The Autumnal Execution), Peking, 20ème année Kia King, 8ème lune, jour malheureux:' this severe critique of Weston's translations from the Chinese was published in Paris in 1815; 3, 'Supplément au Dictionnaire Chinois-Latin du Père Basile de Glemona, imprimé en 1813, par les soins de M. de Guignes,' Paris, 1819, fol.; 4, 'Abhandlung über die Sprache und Schrift der Uiguren,' &c., Paris, 1820, 8vo. (a Treatise on the Language and the Characters of the Uigurs); 2nd edition, in French, Paris, 1823; 5, 'Asia Polyglotta,' in 4to., with tables, in folio, Paris, 1823; 2nd edition, Paris, 1829, with a Life of Buddha according to the legends of the Mongols: this is a classification of the Asiatic nations according to their languages, with a comparative vocabulary of most of the Asiatic languages; 6, 'Examen critique des Extraits d'une Histoire des Khans Mongols, inséré par M. Schmidt dans le 6ième vol. des Mines de l'Orient,' Paris, 1823, 8vo.; 7, 'Sur l'Origine du Papier Monnaie en Chine,' Paris, 1823, 8vo: this very interesting treatise on the origin of paper-money was shortly afterwards translated into English. Paper-money was known in China as early as 119 B.C., and was in general use in the tenth century of our æra, but it fell into disuse in the middle of the fifteenth century; Marco Polo mentions it 8, 'Tableaux Historiques de l'Asie depuis la Monarchie de Cyrus jusqu'à nos Jours,' with twenty-four maps, Paris, 1824-26. 9, 'Mémoires relatifs à l'Asie,' &c., Paris, 1824-28, 3 vols. 8vo., with maps and engravings; one of the most valuable works on Asia. 10, Dr. W. Schott's 'Angebliche Uebersetzung der Werke des Confucius aus der Ursprache, eine literarische Betrügerei,' Leipzig and Paris, 1825, 8vo.: 'Dr. W Schott's alleged translation of the works of Confucius, from the language in which they were originally written; a literary fraud,' by W. Lauterbach (the pseudonymous name of Klaproth). Two Chinese, the one a labourer and the other a cook, having arrived in Germany, got their livelihood by showing themselves for money. They excited the curiosity of the learned, whom they persuaded that they were priests of high rank, and the Prussian government believing their story, sent them to Halle, where they were to teach Chinese in the university. There Professor Schott became acquainted with them, and made use of their names and assistance in publishing a German edition of the works of Confucius, which however was little better than a re-translation of previous English translations. Klaproth, with his usual sagacity, discovered the fraud, unmasked the Chinese impostors, and chastised Schott most severely, but, in this instance at least, most deservedly. 11, 'Tableau historique, géographique, ethnographique, et politique du Caucase et des provinces limitrophes entre la Russie et la Perse,' Paris, 1827, 8vo.; one of the most important works on the Caucasus, especially at the time when it was written. 12, 'Vocabulaire et Grammaire de la Langue Géorgienne, publié par la Société Asiatique,' Paris, 1827: the first part is Georgian-French, the second French-Georgian. 13, 'Vocabulaire Latin, Persan, et Coréan, d'après MS. écrit en 1303,' Paris, 1828, 8vo. This vocabulary was copied from a MS. which once belonged to Petrarch, and was first published in the 'Journal Asiatique.' 14, 'Chrestomathie Mandchou,' Paris, 1828, 8vo.; 15. 'Aperçu de l'Origine des diverses écritures de l'ancien Monde,' Paris, 1832; 16, 'Lettre sur les Découvertes des Hiéroglyphes Acrologiques adressée à M. le Comte de Goulianoff,' Paris, 1827, 8vo., followed by a 'Seconde Lettre' on the same subject, addressed to Mr. D. S—, published in the same year; and, 17, 'Examen critique des Travaux de M. Champollion, jeune, sur les Hiéroglyphes,' Paris, 1832, 8vo. Klaproth is of opinion that although the younger Champollion deserves great credit for having improved and increased our knowledge of hieroglyphics, by correcting and extending the theory of Dr. Young, and discovering the signification of many new signs, yet Champollion's theory is only available for reading the names of kings and other high personages, and is useless with respect to ideographical and symbolical signs, which, according to Klaproth, Champollion unsuccessfully attempted to decipher. 'The system of Champollion,' says Klaproth, 'is not founded on a solid basis, and we thus see him altering, whenever he thinks fit, that signification which he laid down as the original meaning of the phonetical as well as symbolical characters. That scanty knowledge of the antient Egyptian language which we can derive from the Coptic language is quite insufficient for explaining the sense of an antient Egyptian inscription, even if it were written in phonetical characters; and the alterations made in the inscription of Abydos,' continues the reviewer, 'gives an adequate idea of the degree of confidence which we can bestow upon the theories of deciphering hieroglyphics.' Klaproth, of course, speaks of the state of knowledge of his time. 18, 'Notice d'une Mappemonde et d'une Cosmographie Chinoises, pubtiées en Chine, l'une en 1730, l'autre en 1793,' Paris, 1833, 8vo.; 19, 'Nipon o Daï itsiran, ou Annales des Empereurs du Japon, traduit par M. Isaac Titsingh, revu et corrigé sur l'original par M. Klaproth, et précédé d'une Histoire Mythologique du Japon,' Paris, 1834, 4to.

Among the publications edited or translated by Klaproth, we must mention the publications of the Asiatic Society of Paris, of which he was one of the founders; Güldenstädt's Travels in the Caucasus; Count John Potocki's Travels in the steppes of Astrakan and the Caucasus; Father Della Penna's description of Tibet; a description of the same country, translated from the Tibetan language into Russian, and thence into French; Timkowski's Travels to Pekin; 'Magazin Asiatique,' from 1825-27, &c. &c. Among his minor productions a letter to Baron Alexander von Humboldt on the invention of the Compass, and another on the art of printing and gunpowder, are both important and interesting. Klaproth's contributions to the learned periodicals of France, Germany, and Russia would fill moro than twenty octavo volumes. Klaproth was not only an Oriental scholar, but also an excellent theoretical as well as practical geographer, as appears from Critical Observations on Arrowsmith's Map of Asia; his 'Carte de l'Asie Centrale, d'après les cartes levées par l'ordre de l'Empereur Kiang-Loung, par les Missionnaires de Pekin,' Paris, 1835, in four large sheets: 'Carte de la Mongolie, du Pays des Mandchou, de la Corée, et du Japon,' Paris, 1833; and many others of a smaller compass, in several of his works. Klaproth left ready for the press 'Description géographique, statistique, et historique de l'Empire Chinois,' which was to appear in French and English, but has not yet been published. He left incomplete a MS. containing the plan of a new 'Mithridates,' and a Commentary on Marco Polo: both these works were completed in his mind, but as he was not in the habit of making many notes previous to writing, there is no hope of seeing these two MSS. ever made ready for the press. A complete catalogue of all his publications is contained in *Catalogue de la Bibliothèque de feu M. de Klaproth, par le Libraire Merlin*, Paris, 1839, 8vo.

(*Biographie Universelle; Neuer Nekrolog der Deutschen;* Quérard, *La France Littéraire.*)

KLE'BER, JEAN BAPTISTE, according to the best authorities, was born at Strasbourg in the year 1754, though some place the date of his birth three or four years earlier. He was brought up by his father, who was a domestic in the household of the Cardinal De Rohan, to the profession of an architect, and was sent to Paris at an early age to complete his studies. While there circumstances enabled him to render some important services to two young Bavarians, who, having interested themselves in his behalf, induced him to accompany them to Munich, and through their influence he entered the military college of that city. His rapid progress in acquiring the science of war gained him the patronage of General Kaunitz, son of the celebrated Austrian minister of that name, by whom, at the completion of his college career, he was appointed to a sub-lieutenancy in an Austrian regiment. He served seven years in that corps, which he left in 1783, in order to return to his native country. He there resumed his former profession, and obtained the situation of inspector of public buildings at Béfort in Upper Alsace.

The breaking out of the French Revolution opened to him a more brilliant career. He bad taken a prominent part in a revolt at Béfort in 1791, and had enabled the republicans of that town, by putting himself at their head, successfully to resist the regiment of Royal Louis, which had been called to suppress it. To screen himself from the consequences of this action he enlisted as a private soldier in the grenadier company of the battalion of volunteers which had been raised in the department of the Upper Rhine. By his bravery and talents he soon attained the rank of adjutant-major, in which capacity he acted for some time under General Custine, and when Custine was afterwards brought to trial, he had the courage to present himself before his sanguinary judges, and give testimony in his favour. At the siege of Mayence in 1793 he displayed considerable courage and judgment: his services were rewarded by the rank of adjutant-general, and shortly afterwards he became brigadier-general. From thence he was ordered to La Vendée to oppose the insurgent royalists; he led there the soldiers of the garrison of Mayence, on whose courage and devotion be could reckon. At the celebrated combat of Torfou (September 19, 1793), while charging the enemy at the head of the advanced guard of his regiment, he fell with several wounds, and his life was only preserved by the prompt assistance of his soldiers. The agents of the National Convention construed into a crime his humane interference in stopping the cruelties which were exercised towards the prisoners and the unoffending inhabitants of the country. However he was only removed to a command in the Army of the North, and afterwards in that of the Sambre and Meuse, when he rose to the rank of a general of division.

At the battle of Fleurus (June 26, 1794) he commanded the left wing of the French army, and by his skilful manœuvres greatly contributed to the victory. He then marched against Mons, which he retook from the Austrians, and having forced the passage of the Roer, he drove the enemy back to the right bank of the Rhine. Returning towards Maastricht, he took that strong fortress, after a siege of twenty-eight days.

In 1795 he directed the passage across the Rhine of the army of the Sambre and Meuse, and, when compelled to retire before superior forces, he effected a retreat in which his cool intrepidity and skilful dispositions were alike remarkable. In the year following he partook of the glory which attended the success of General Jourdan's operations at the opening of the campaign; and he afterwards refused the command of Pichegru's army, when this general was disgraced for holding treasonable communications with the enemy. [PICHEGRU, P. C.]

Discontented with the manner in which the Directory managed the military affairs, Kléber retired to Paris, where he spent the greater part of the year 1797, and occupied himself with writing his memoirs. When however Bonaparte was appointed to the chief command of the army for Egypt, he made it a special request to the Directory to be allowed to take him as one of his generals of division. Kléber joyfully accepted the companionship of arms with a chief whose brilliant achievements already prognosticated his future glory. The army likewise which he accompanied was in a great measure composed of the veteran soldiers who bad distinguished themselves in the plains of Italy.

At the siege of Alexandria, on the first landing of the French forces, he was wounded in the head while gallantly climbing the ramparts, but he did not retire from the conflict till he bad received a second and a severer wound. When the city was taken Kléber was appointed to the command of it, and of the whole province of which it was the head-quarters. He afterwards joined his division and took part in the expedition to Syria; he there distinguished himself by the capture of the forts of El Arish and Gaza, and was at the taking of Jaffa. He was also at the memorable siege of St. John of Acre, where he rendered himself conspicuous by his undaunted bravery, and shared every danger with the common soldiers. He was however withdrawn from the siege by order of Bonaparte, who desired him to march with his division to reinforce the troops stationed at Nazareth under the command of General Junot, and to repel the large army composed of the remnants of the Mamelukes under Ibrahim Bey, the Janissaries of Aleppo and Damascus, and numerous hordes of irregular cavalry, who were advancing to the support of their besieged countrymen at Acre. The arrival of Kléber's division was most opportune, for the enemy had already crossed the Jordan, and were rapidly pressing in considerable numbers towards the coast. Kléber left Nazareth with the entire body of his troops in order to make an attack upon the Turkish camp, but in attempting to do so he was anticipated by the enemy, who advanced against him with fifteen thousand cavalry and as many infantry. Kléber formed his small army of two thousand men in squares, and placed the artillery at the angles, which had scarcely been effected when he was fiercely attacked by the whole force of the enemy's horse. A deadly fire from the close ranks of the squares responded to this impetuous attack, and for six hours that the contest lasted not one square was broken nor a foot of ground lost. Succour at length arrived, and the battle of Mount Thabor (April 17th, 1799) terminated in the total defeat of the Turkish troops. The siege of Acre however was renewed in vain, every assault against it proved unsuccessful, and 'British valour, combined with Asiatic enthusiasm,' was finally triumphant. [ACRE, P. C.; BONAPARTE, P. C.]

The French on their return to Egypt obtained at Aboukir another signal victory over the Turks; and the day after this decisive battle Bonaparte returned to Alexandria, where he learnt the capture of Corfu by the Russians and Turks, and the close blockade of Malta by the same powers. These circumstances, combined with the loss of his fleet at the battle of the Nile, determined him upon leaving Egypt.

On the 22nd of August, 1799, he secretly embarked, accompanied by several of his generals, his secretary Bourrienne, with Berthollet and Monge, who had joined the expedition for the furtherance of science. Before leaving he signified his resolution to Kléber in a letter, by which he appointed him his successor in the chief command of the Egyptian army, and authorized him to conclude a convention for the evacuation of the country in the event of no succour arriving from France during the following spring, and if the mortality from the plague among his soldiers should amount to fifteen hundred men.

The sudden departure of Bonaparte spread anxiety and distrust throughout the camp; the reputation of his successor however, who enjoyed the highest confidence of the army, tended greatly to dissipate their fears. But the talents of Kléber did not at first appear to be equal to the difficult circumstances in which he was placed. He not only permitted himself to be swayed by feelings of indignation at what he deemed the abandonment of the army by its former chief, but he committed the fault, which in his position became a crime, of openly declaring his opinions to his dissatisfied colleagues in command; he thus caused the seeds of discontent and desire of home, which had been previously sown among the troops, to ripen to a maturity which soon threatened the ruin of the expedition. A letter addressed by him to the Directory contains many erroneous and exaggerated statements which had been furnished by Poussielgue the army administrator, and presents a most gloomy picture of the state of affairs in Egypt. A copy of it is in the Memoirs dictated by Napoleon at St. Helena to the Count de Montholon, and is rendered the more valuable on account of the copious comments which accompany it, and which, though written in no friendly spirit, are for the most part borne out by contemporary testimony. In this letter Kléber complains that his army is reduced to one-half; that it is destitute of the necessary stores and munitions, and that the greatest discontent prevails. He further asserts that the Mamelukes were dispersed but not destroyed, and that the Grand Vizier was marching from Acre at the head of thirty thousand men. Two copies of this letter were sent, one of which fell into the hands of the English, and was the immediate cause of the expedition under Sir Ralph Abercromby, by which the French were compelled to abandon Egypt. In justice however to Kléber it must be mentioned that his chief fault consisted in trusting too implicitly to the statements which had been given to him by one who, though loaded with favours from Bonaparte, made this ungrateful return to his absent benefactor in order to secure his present interests.

Kléber, under the influence of these despondent feelings, addressed proposals of accommodation to the Grand Vizier; though at the same time he made vigorous preparations to repel the Turkish army. An unexpected reverse moreover increased the necessity of a negotiation. The Grand Vizier with upwards of forty thousand men had crossed the desert, and, assisted by some British officers, had captured the fort of El Arish, justly deemed one of the keys of Egypt. General Dessaix was, against his will and contrary to his judgment, appointed negotiator on the part of the French, and, after many debates and frequent delays, a convention was signed at El Arish on the 28th of January, 1800, by which it was agreed that the whole of Kléber's army should return to Europe, with its arms and baggage, either on board their own vessels or some furnished by the Turks; that all the fortresses of Egypt, with the exception of Alexandria, Rosetta, and Aboukir, should be surrendered within forty-five days from the time that the convention was ratified; and finally, that the Vizior should pay a sum equivalent to about 120,000*l.* during the time that the evacuation was taking place. The English admiral, Sir Sidney Smith, though not vested with full authority from his government to conclude such a convention, had entered willingly into it, and was honourably preparing to see it carried into effect. Three months however before these events the British government had dispatched orders to Lord Keith, who had the command of the Mediterranean fleet, to refuse his consent to any treaty in which it was not stipulated that the French army should be considered prisoners of war; and a letter from this admiral reached General Kléber, warning him of his intention to detain any vessel returning to Europe by virtue of a capitulation. The French commander made a noble use of the opportunity which was now presented to him of retrieving his military character. Danger revived his energies and roused his courage. He immediately ordered the evacuation of the strongholds to be stopped, and prepared to resume hostilities. In one of those animating proclamations so common in modern French warfare, he indignantly declared to his soldiers that victory was the only answer to such insolence, and bade them be ready to fight. This appeal to their courage was received by the shouts of the army. On the night of the 19th of March, 1800, Kléber formed his army, which was 12,000 strong, into four squares, with the artillery at the angles, and the cavalry between the intervals; the two squares on the left were commanded by General Regnier, and those on the right by General Friant; the whole army was drawn up on the plain fronting the ruins of Heliopolis. Before them was the Ottoman army, amounting to upwards of forty thousand men; in their rear was Cairo with its three hundred thousand inhabitants, waiting only the signal of success to join the standard of their faith. The formation of the French had taken place by moonlight; perfect order and deep silence prevailed throughout the ranks, and every soldier felt that the fate of Kléber and of Egypt hung on the issue of the contest. A large body of Turkish troops had been stationed in the village of Matarieh, and a movement was made by the division of Regnier to cut it off before the remainder of the army could come up to its support. No sooner did the Janizaries perceive the approach of the hostile columns than, sallying forth from their entrenchments, they attacked them with desperate courage. Steadily onwards however moved the unbroken bands, pouring forth a rolling fire. They drove the enemy back to their entrenchments, while the grenadiers, pressing on over masses of the dead and dying, scaled the works, and became masters of the camp. This combat was but the prelude to a general attack, for the Vizier's army was marching to avenge the destruction of its advanced guard. Vast masses of Turkish cavalry soon enveloped the compact squares, by whose murderous fire they fell so rapidly that a barrier of bodies was formed around them, and impeded the renewed attacks of the impetuous horsemen. But Asiatic valour could not long withstand European discipline, and the Turks at last fled in confusion towards the desert. Kléber, following up his success, hastened to El Kangah, where was posted the remainder of the enemy's army, who seeing themselves so closely pressed, hastily retired, leaving behind them the whole of their baggage and munitions. Thus ended the battle of Heliopolis, important in its results, and attended by little loss to the French, who numbered only two or three hundred killed and wounded. The relief of Cairo, in whose citadel two thousand men under General Verdier were closely besieged, was the next object. The firing had scarcely ceased in the plains of Heliopolis when the sound of a distant cannonade was heard from Cairo; it informed Kléber that fresh exertions were required, and he instantly proceeded to the rescue of his countrymen. The Turks under Ibrahim Bey, who formed the besieging army, agreed, on hearing the result of the previous battle, to evacuate the town; but the excited populace of Cairo refused to listen to any terms, and prepared themselves for a desperate resistance. It became necessary to take by storm Boulak, a fortified suburb, and the French, who had returned from the pursuit of the Grand Vizier, invested the city. On a further refusal to surrender, a severe cannonade was directed against it, and it was finally entered by assault. A desperate struggle ensued between the besieged, who occupied the houses, and the besiegers, who were pressing on in the streets. Night alone terminated the contest; and, on the following morning the Turks offered to capitulate, and were permitted to do so on favourable terms. Kléber, in this instance, as in many others, enhanced his victory by his moderation and humanity.

About the time that these events were taking place, another body of the Turkish army had laid down their arms to General Belliard; and Mourad Bey, the chief of the Mamelukes, deprived of every hope of ultimate success, concluded an honourable convention with the French commander. Thus, within a month of the battle of Heliopolis, the French were again in possession of their previous conquests. With an army trifling in numbers, with a numerous enemy in his front, more than half composed of Mameluke cavalry, whose skill and courage are so greatly renowned, with all Egypt revolted in his rear, and when the English considered that he would be compelled to surrender on any conditions, in less than forty days he had overthrown the whole Ottoman force, and subjected the revolted Egyptians. A graphic description of the Turkish mode of warfare is to be found in the eighth volume of Alison's 'History of Europe,' to which valuable work we have been much indebted for the details of this narrative.

Released from immediate danger, Kléber now began to direct his energies to more pacific labours, and to apply them to the administration of the conquered country. His plan appears to have been to distribute portions of land among the veterans of his army, and to adopt the course followed by the British government in India of enlisting in his service the native troops. Scarcely however had he entered on this work when he became the victim of an obscure assassin. A young man, a native of Aleppo, named Suleiman, was incited to the atrocious act by religious fanaticism and the prospect of an ample reward. He had performed the pilgrimages of Mecca and Medina, and his mind was deeply imbued with the tenets of the Mussulmans' faith. He chanced to be wandering in Palestine, when the retiring remnant of the vizier's army was passing through that country, and he became acquainted with the aga of the Janizaries, at whose suggestion he consented to become the instrument of what he considered divine vengeance on 'the sultan of the French.' He was furnished with a sum of money, with which he proceeded to Cairo, and spent several weeks in seclusion in a mosque of that city. He had intimated his purpose to the four principal sheiks of the mosque, who, though they attempted to dissuade him from it, took no steps to prevent its execution. He armed himself with a poignard, and having followed Kléber several days without being able to effect his purpose, he at length determined upon concealing himself in an abandoned cistern in the garden attached to the mansion which the general occupied. On the 14th of June, 1800, Kléber was walking in that garden with Protain, the architect of the army, and he was pointing out to him some repairs which the building required, when Suleiman presented himself before him as a suppliant for alms; while Kléber was listening to his petition, he seized the opportunity of rapidly striking him several times with his dagger. The architect, who was armed with a stick, attempting to interfere, received a severe though not deadly wound. The guards having hastened at the cries of Kléber, secured the assassin, whom they found concealed behind some ruins. Universal sorrow spread through the army, and the Arabs themselves, who had frequently admired and experienced his clemency, joined in the regret. A military commission was immediately assembled to try the assassin, who boldly confessed, and even gloried in his crime. The four sheiks, the partakers of his confidence, were beheaded, and Suleiman was impaled alive.

Thus prematurely perished this distinguished general, and with him the hopes of the eastern expedition. He had formed many important designs for colonizing the country, and it is probable that, under his judicious rule, it might long have been preserved a valuable acquisition to the French Republic. 'There is no military man,' says Napoleon, 'who will deny that the army of Abercromby would have been defeated and destroyed if Kléber had lived. How material was the weight of a young fanatic, acting on the faith of a doubtful passage of the Koran, in the general balance of the world!' Though many may hesitate to agree with this assertion, there can be no doubt that the military talents of Kléber contrast very favourably with those of his successor General Menou, to whom by seniority devolved the chief command of the expedition. In a conversation with Dr. O'Meara, Napoleon further remarks that, of all his generals, Desaix and Kléber possessed the greatest talents. There was also a melancholy coincidence in their deaths: on the same day, and nearly at the same hour, that Kléber fell under the stroke of an assassin in Egypt, Desaix, who had left that country about three months previously, found a glorious death on the plains of Marengo.

'Kléber,' says a celebrated French writer, 'was the finest man in the army. His lofty stature, his noble countenance, whose features were animated by the fire of his soul, his valour at once bold and calm, his prompt and sure intelligence, rendered him on the field of battle the most commanding of commanders. His talents, though unaided by education, were brilliant and original. The works of Plutarch and Quintus Curtius were his constant and exclusive study; he sought in them that nurture of lofty minds which the records of antiquity present. His disposition however was capricious, indocile, and captious. It has been said of him, with truth, that he was as unwilling to command as to obey. He obeyed indeed under General Bonaparte, but it was discontentedly; when he commanded it was under another's name, as in the campaign with General Jourdan; it was in the midst of combat that, by a species of inspiration, he assumed the command, and exercised it with masterly skill; and, no sooner was victory obtained, than he returned to that subordinate rank which was the object of his preference. He was licentious in his conduct and language, but as upright and disinterested a chief as could be met with in an age when the conquest of the world had not yet corrupted the character of the conqueror.' (Thiers.)

His funeral eulogium, which was pronounced by J. B. Joseph Fourier, is published in the 12th vol. of the work entitled 'Victoires et Conquêtes des Armées Françaises.'

(Alison, *Hist. of Europe*, vols. iii. iv.; Thiers, *Hist. du Consulat et de l'Empire*, livre v.; *Dict. Historique des Batailles*, 4 vols., Paris, 1818; *Memoirs dictated by Napoleon at St. Helena to the Count de Montholon (Translation)*; *Précis des Evenemens Militaires, ou Essais Historiques des Campagnes, &c.* 1799 *à* 1814; Las Cases, *Mémorial de St. Hélène*, vol. i. p. 307, 308; *Biographie Universelle Classique*, &c., *deuxième Partie*, Paris, 1829; *Biographie Moderne*, vol. ii., Paris, 1815.)

KLINGENSTIERNA, SAMUEL, a Swedish mathematician and philosopher, was born in 1689 at Tolefors, near Linkoeping, and received his education at Upsal. It was intended by his parents that he should follow the law as a profession; but, after having made some progress in the study of jurisprudence, he abandoned that pursuit, his taste inclining him to the cultivation of the mathematical sciences.

His first production was a dissertation on the height of the atmosphere; and this was followed by one on the means of improving the thermometer: both dissertations were, in 1723, inserted in the Memoirs of the Royal Society of Upsal. In 1727 he set out from Sweden for the purpose of improving himself by travelling; and, after passing through parts of Germany and France, he made a visit to England, from whence he returned in 1730. At Marburg he became known to the celebrated professor Wolf, and applied himself diligently to the study of his philosophy with a view of introducing it into Sweden on his return. At Paris he was introduced to Clairaut, Fontenelle, and Mairan; and he is said to have communicated to those eminent mathematicians some useful remarks concerning the integral calculus and the figure of the earth.

Shortly after his return to Sweden he was appointed professor of mathematics; and being thwarted in his project of teaching the philosophy of Wolf, which was supposed to be in some respects at variance with the doctrines of Christianity, he devoted himself the more ardently to the immediate duties of his professorship. He numbered among his pupils Stroemer, Wargentin, Melanderheilm, and Mallet; and at the same time he contributed greatly by his writings to the improvement of mathematical science.

On the retirement of Dalin, the tutor of the Prince Royal of Sweden, afterwards Gustavus III., Klingenstierna, who for the correctness of his moral character no less than for his talents was highly esteemed by the influential persons of the country, was unanimously chosen to fill his post: he acquitted himself in the performance of this important duty with great success; and, as a recompense of his zeal, he received the title of Councillor of State and was made a Knight of the Polar Star. On the termination of this public duty, Klingenstierna, feeling his health decline, quitted the court and passed several years in strict retirement. The Academy of Sciences at St. Petersburg having, however, offered a prize for the best Essay on the means of correcting or diminishing the chromatic and spherical aberrations of light in refracting telescopes, he once more exerted himself; and, having collected his various papers on optics, he composed from them a general theory with relation to the proposed subject, which he sent to the 'Academy;' when the members of that body unanimously awarded him the sum of one hundred ducats. This work, which was entitled 'Tentamen de definiendis et corrigendis aberrationibus radiorum luminis sphæricis refracti, et de perficiendo telescopio dioptrico,' was published at St. Petersburg in 4to. in 1762.

While the improvement of refracting telescopes engaged the attention of mathematicians it happened that Dollond, in England, proposed objections to an assumption of Euler, that when light passes from air to glass and from air to water, the logarithms of the refractions of the mean refrangible rays are proportional to the logarithms of the refractions of the least refrangible rays; and assumed as a principle deduced from the experiments of Newton, that with a prism of glass contained in a prism of water, a constant ratio subsisted between the differences of the sines of the refractions of the red and violet rays in passing from air into the first medium and from that medium into the second. This principle, and the accuracy of

Newton's experiment on which it was founded, were impugned by Klingenstierna, who, from his own experiments, found that the light emergent after the refractions was affected with colour, under the circumstances in which Newton supposed that it would be wholly free from it. In 1754 he transmitted to Dollond an account of his experiments, together with some investigations relating to the dispersions of heterogeneous light in lenses, and these papers induced that distinguished artist to have again recourse to experiments with a view of discovering more precisely the phenomena of refraction. It was in the prosecution of these experiments that Dollond discovered that combination of lenses of flint and crown glass by which the dispersions of light have been so nearly corrected in optical instruments.

Klingenstierna published, in Latin, an edition of Euclid's 'Elements;' a translation in Swedish of Musschenbrock's Physics, and two discourses, in Swedish, which were delivered before the Academy of Stockholm: one of these is an éloge on the mechanician Polhen; and the other relates to some electrical experiments which had been made at that time. He was early made a member of the Royal Society of Upsal; and he was afterwards received in the Academy of Sciences at Stockholm. He was elected a fellow of the Royal Society of London in 1730; and in the 'Philosophical Transactions' for 1731 there is a paper by him on the quadrature of hyperbolic curves.

Klingenstierna died Oct. 28, 1785; and by order of the queen, the mother of his pupil Gustavus III., he was buried in the tomb of Dalin, who had died a short time before him.

(*Biographie Universelle.*)

KNAPPIA, a genus of plants belonging to the natural order Gramineae. It has an inflorescence, with a somewhat one-sided raceme. The flowers solitary; glumes not keeled, and blunt. It has 2 paleae, which are scarious, very hairy, obtuse, unequal, and without awns. There is but one species of Knappia.

K. agrostidea, an elegant but very small grass, with a small fibrous root, having numerous stems and short rough leaves. The spikes are slender, consisting of from 5 to 10 mostly sessile alternate spikelets. It is found in sandy maritime pastures, but is a rare grass.

(Babington, *Manual of British Botany.*)

KNAUTIA (named after Christopher Knaut, a German botanist), a genus of plants belonging to the natural order Dipsaceae. The inner calyx is cup-shaped, with radiant teeth, the outer one forming a thickened margin to the germen. It has a 4-fid corolla, a fruit with 4 sides and 8 little depressions, the receptacle with spinous scales shorter than the involucre.

K. arvensis, the Field Scabious, has its lower leaves simple, the stem-leaves pinnatifid, the inner calyx with 8 or 16 somewhat awned teeth. The stem rises from 2 to 3 feet in height, is slightly branched, and with but few leaves. The flowers are purple, in large convex long-stalked heads. This is the only British species of this genus. There are a few species of Knautia natives of Europe.

(Babington, *Manual of British Botany*; Don, *Gardener's Dictionary.*)

KNIBB, REV. WILLIAM. Of the early life of this devoted missionary few particulars have yet been made public, but the very brief interval which has elapsed between his unexpected death and the time of writing this article (January, 1846) is sufficient to account for the lack of such biographical information. From a sketch of his life and character in the 'Patriot' newspaper of December 22, 1845, to which we are mainly indebted for the materials of this notice, it would appear that he was born at Kettering in Northamptonshire (a place, it may be remarked, early connected with the history of Baptist Missions, as noticed under MISSIONS, P. C., p. 270), about the commencement of the present century. In due time he was apprenticed to a printer at Bristol, where he appears to have made an early profession of religion. His elder brother, Thomas, left England in December, 1822, to undertake the charge of a school connected with one of the Baptist Mission churches in Jamaica, where he died, in May, 1824. The intelligence of his death so excited the zeal of William Knibb, who is said then to have been little more than of age, that he offered himself to go out to supply the place of his deceased brother; and, his offer being accepted, he sailed, with his wife, in November, 1824. On his arrival he was very kindly received by the negroes at Kingston, who had become much attached to his brother. Towards the close of 1829 he removed, in consequence of delicate health, from Kingston to the north-western part of the island, where he took charge of the Ridgeland mission, in connexion with Savanna-la-Mar; and subsequently, on the death of Mr. Mann, another missionary of the same denomination, he accepted a pressing invitation to succeed him as pastor of the mission church at Falmouth, then consisting of between eight and nine hundred members. Shortly after Mr. Knibb's settlement at Falmouth he was brought into painful notoriety in consequence of the breaking out of an alarming spirit of insurrection among the slave population. A notion had by some means been widely circulated among the negroes to the effect that the King of England had determined to emancipate them from slavery, and that the *free paper*, as they termed the supposed authority for their liberation, had been actually sent to the West Indies, but had been suppressed or held back through the influence of the slave-owners; and, in consequence of this belief, the slaves upon several estates in Jamaica avowed, towards the latter end of December, 1831, their determination to do no work after Christmas. So soon as the missionaries became acquainted with this state of things, they endeavoured to remove the erroneous impression from the minds of such of the negroes as were under their influence, and were so active in their measures as to lead to a report among the disaffected slaves that the white people had bribed Mr. Blyth (a Presbyterian missionary) and Mr. Knibb to withhold their freedom. Insurrectionary movements were, in spite of all the efforts of the missionaries, actually commenced by the negroes, although the interposition of Mr. Knibb, who possessed great influence over the slaves, prevented their rising upon many estates. Notwithstanding this fact both he and his brother missionaries were regarded with great jealousy by the planters, overseers, and others in the slave-holding interest, whose enmity had been excited by their efforts for ameliorating the condition of the negroes, and by the part they had taken in exposing many cases of gross cruelty and oppression. On the 1st of January, 1832, Mr. Knibb was compelled, without regard to his sacred office, to join the militia, and while on service he was treated with marked indignity. Having, a few days later, memorialized the governor for exemption from military service, he was arrested, and debarred from any communication with his family, upon the plea of alarming intelligence by which, it was pretended, the missionaries were implicated in the rebellion. After suffering much persecution, he was released in February, no evidence being obtained to support a criminal prosecution; but in March fresh steps were taken to bring him to trial, though on the day appointed for trial the proceedings were abandoned upon the appearance of about three hundred witnesses who came forward, upon a few hours' notice, in his defence.

During the continuance of disturbances in the island Mr. Knibb's chapel and mission premises at Falmouth were razed to the ground by the men of the St. Ann's regiment, who had used them as barracks for a time; and as similar outrages had been committed on other missionary stations, it was determined that Mr. Knibb, accompanied by Mr. Burchell, should visit England to explain the circumstances of the mission. They accordingly reached England in the beginning of June. Down to that time the Baptist Missionary Society had carefully avoided taking any part in the question of emancipation, regarding it as one of the political questions on which it was desirable to observe a rigid neutrality. Mr. Knibb was accordingly cautioned not to commit the Society by his proceedings; but, warmed with enthusiasm excited to the highest pitch by his personal knowledge of the horrors of the system, he boldly declared that the Society's missionary stations in Jamaica could no longer exist without the entire and immediate abolition of slavery, and, feeling that the time for neutrality was passed, he declared his determination at the annual meeting of the Society on the 21st of June, to avow this at the risk of his connexion with the Society. Mr. Knibb carried the meeting, and subsequently the feelings of the greater part of the country with him, and his stirring appeals had no unimportant share in bringing about the Emancipation Act of 1833

In the autumn of 1834 Mr. Knibb returned to Jamaica, and in the following year the building of a new chapel at Falmouth, and of a new Lancasterian school for children of all denominations at Trelawney, was commenced under his superintendence. The same benevolence and energy which had led Mr. Knibb to take so determined a part in promoting the abolition of slavery, induced him now to expose the failure of the apprenticeship system established by the act of 1833, as a means of preventing the evils anticipated from sudden emancipation. He showed that many of the worst features of slavery were continued under the guise of apprenticeship, and induced some planters to anticipate the course of law by immediate emancipation. After the complete emancipation of the slaves or apprentices, on the 1st of August, 1838, Mr. Knibb purchased, by the aid of English friends, a tract of ground for the purpose of furnishing independent residence and occupation for the liberated negroes; and he erected a normal school at the village of Kettering, in Trelawney, for training native and other schoolmistresses for both Jamaica and Africa. In 1842, in consequence of the prosperous state of the mission churches in Jamaica, it was determined by the missionaries and congregations to separate themselves from the Baptist Missionary Society, so far as any dependence upon the Society's funds was concerned; and in the same year Mr. Knibb visited England to promote the establishment of a theological seminary in connexion with the native mission to Africa, which had been commenced about two years before, through his exertions. In the early part of 1845 he again visited England, to obtain pecuniary aid for the negroes connected with the Baptist churches in Jamaica, who were, in a new way, made the victims of cruel oppression, in consequence of the adoption, by the colonial legislature, of a system of taxation which bore upon the liberated negro labourers with extreme severity, by limiting the supply of food and other necessaries, and at the same time importing, by the aid of the revenue thus obtained, large numbers of foreign labourers, so as to overstock the labour-market, and reduce the persecuted negroes to the greatest distress. Having succeeded in obtaining both sympathy and pecuniary assistance, he returned to Jamaica in July, 1845. In the following November he was seized with yellow fever, and died, after an illness of only four days, on the 15th of that month, at the village of Kettering. Though his funeral took place on the following day, such was the respect entertained for his memory that not less than eight thousand persons are said to have assembled on the occasion.

It is yet, perhaps, too soon to form, between the enthusiastic panegyrics of his friends and admirers, and the bitter vituperations of his political opponents, and of the men whose oppressions he exposed with such unflinching courage, an accurate estimate of the character of William Knibb. Of a peculiarly ardent temperament, and feeling that he had undertaken the championship of a cause which demanded all the zeal and energy which could be called into exercise for the exposure of enormous wrongs, he sometimes exceeded, in the estimation of his best friends, the bounds of prudence, if not of charity; but it should never be forgotten that his long residence in Jamaica, and his intimate knowledge of the state of the negro population, caused him to feel with an intensity not to be realized by his friends in this country, the cruelties which he laboured to abolish or to mitigate. As an instrument in the mental and moral elevation of the negro character, the name of Knibb will long be honoured by the friends of the African race. A full account of the important transactions in which he was involved is given in the second volume of Dr. Cox's 'History of the Baptist Missionary Society.'

KNOLLER, MARTIN VON, a distinguished German painter of the eighteenth century, was born in the village of Steinach in the Tyrol, in 1725. His father appears to have been a poor painter of some sort, and he intended his son to follow his own pursuit. He was however in such circumstances as to make it necessary for his son to perform the menial work of the house, which Martin appears to have found particularly distasteful. The boy accordingly ran away from his home, and found shelter in the house of Hofkammerrath von Hormayr, at Innsbruck, who, when he had heard the boy's story, let his father know of his safety, and placed him with an ordinary painter of the name of Pögel, who thus became Knoller's first master, though he can have had but the slightest influence upon him, if any at all. Martin's father however required his son's services in every way, and he was forced to return home, where he divided his time between the pursuit of his art, in assisting his father, and in what other way he could, and in the performance of menial domestic offices. Such was the state of affairs when circumstances brought the painter Paul Troger, on his return to Vienna, to the village of Steinach, where he saw and admired some of the extraordinary productions of Knoller, then twenty years of age. Troger perceived the lad's ability, and offered to take him with him to Vienna. Young Knoller went with his patron, and in eight years from that time he had not a superior of his own age in the Austrian dominions. Already, in the years 1748-50, he assisted Troger in the frescoes of the cathedral church of Brixen; and in 1753 he obtained the great prize of the Austrian Academy for historical painting. In 1753 Knoller returned to the Tyrol, and in the following year painted in fresco the church of Anrass so much in the manner of Troger that it might pass for the work of that master. Troger, though correct, was cramped and formal in design and sharp in his outlines. In 1755 Knoller visited Rome, and greatly improved his style during the three years he spent in that city. From Rome he was invited to Naples by Count Firmian, the Austrian ambassador at Naples, who employed him much in that city, and in the decoration of his palace at Milan. Knoller visited Rome several times subsequently, and contracted a close friendship with Winckelmann and with Mengs. In 1764 he finished one of his principal works, the frescoes of the church of Volders near Hall, in the Tyrol, consisting of passages from the life of San Carlo Borromeo. In 1765 he returned to Milan to his former patron, Count Firmian, whose esteem and patronage induced Knoller to make Milan his head-quarters, and he there married, in 1767, the daughter of a merchant, by whom he had nine children. Knoller painted many works in Milan, in oil and in fresco, the best of which is a ceiling in the palace of the Prince Belgioioso, representing the apotheosis of one of his ancestors. The palace of the Count Firmian was rich in Knoller's works. His principal German works are the frescoes of the convent church of Ettal in the Bavarian Alps; and the seven cupolas of the church of Neresheim in Würtemberg, painted in 1770-75, for which he received 22,000 florins. He painted a large fresco, 110 feet by 33, in the town-hall at Munich, representing the Ascension of the Virgin; and there are altar-pieces by him in several churches in the south of Bavaria. He was much engaged also at Vienna, but chiefly in portrait painting: he was there ennobled, with the title of *von*, by Maria Theresa. There are many of his works in the Tyrol, at Innsbruck, Botzen, and other places. The church of his native place, Steinach, possesses three altar-pieces by Knoller. He died in 1804. He was gay in colouring, and correct and vigorous in design, and his works are chiefly characterised for their physical qualities—dramatic and effective composition, strong expression, and vigorous and uncommon attitudes. His sphere was almost exclusively the practical part of art; the true historical and aesthetical he hardly approached; but this might be said of many more eminent painters. A Life of Knoller was published in the 'Beiträge zur Geschichte und Statistik von Tyrol,' for 1831.

(Lipowsky, *Künstler-Lexicon*; Fiorillo, *Geschichte*, &c.; Nagler, *Künstler-Lexicon*.)

KNOWLTO'NIA, a genus of plants belonging to the natural order Ranunculaceae. It has 5 sepals, from 5 to 15 petals, with the margins naked. The stamens and ovaries numerous; many 1-seeded succulent fruits, not pointed by the style, which is deciduous. The species are 1-seeded perennial herbs, with greenish yellow flowers.

K. vesicatoria is a plant which has the appearance of an umbelliferous perennial. It has biternate leaves, the segments somewhat cordate, rigid, and smooth, the lateral obliquely truncate at the base. The umbels are nearly simple, and few-flowered. The leaves are used as vesicants in the Cape of Good Hope. There are four other species, natives of the Cape of Good Hope, where these plants grow in abundance. They will thrive well in a mixture of loam and peat, and may be increased either by dividing the root or by seed.

(Don, *Gardener's Dictionary*; Lindley, *Flora Medica*.)

KNOX, REV. VICESIMUS, D.D., was born at Newington Green, Middlesex, Dec. 8, 1752. His father was the Rev. Vicesimus Knox, LL.B., Fellow of St. John's College, Oxford, and head master of Merchant Taylors' School, London. Vicesimus Knox, the son, was also educated at St. John's College, Oxford, where he pursued his classical studies with great diligence, and became very skilful in Latin composition. Having taken his degree of B.A. and been elected to a Fellowship, he left the university, and in 1778 was elected master of Tunbridge School, Kent. He married about the time of his settling at Tunbridge, and his wife died in 1809, leaving two sons and a daughter. A short time after his marriage he received the degree of D.D. by diploma from the University of Philadelphia. After having been master of Tunbridge School thirty-three years, he retired, and was succeeded by his eldest son. He was rector of Rumwell and Ramsden Crays, in Essex, and minister of the chapelry of Shipbourne, in Kent. He performed the duties of a parish priest nearly forty years with great regularity. In the latter part of his life he resided in London. He was much admired as a preacher, and frequently gave bis aid in behalf of public cbarities by delivering a sermon. He died while on a visit to his son at Tunbridge, Sept. 6, 1821.

Dr. Knox's chief works were—1, 'Essays, Moral and Literary,' 12mo., 1777, which came out anonymously, and met with so much success that be republished them in 1778, with additional essays, in 2 vols. 12mo.; many editions have been since published. 2, 'Liberal Education, or a Practical Treatise on tbe Methods of acquiring Useful and Polite Learning,' 8vo., 1781, enlarged in 1785 to 2 vols. 8vo. This work was chiefly intended to point out tbe defects of the system of education in the English universities, and is said to have had some effect in producing a reformation 3, 'Elegant Extracts in Prose,' 8vo. 4, 'Winter Evenings, or Lucubrations on Life and Letters,' 3 vols. 12mo., 1788. 5, 'Elegant Extracts in Verse,' 1790, 8vo. 6, 'Sermons intended to promote Faith, Hope, and Charity,' 1792, 8vo. 7, 'Elegant Epistles,' 8vo., 1792. 8, 'Family Lectures,' 8vo., 1794. 9, 'Christian Philosophy, or an Attempt to display the Evidence and Excellence of Revealed Religion,' 2 vols. 12mo., 1795. 10, 'Considerations on the Nature and Efficacy of the Lord's Supper,' 12mo., 1799. Dr. Knox published a few other minor works, occasional sermons, and pamphlets.

Dr. Knox's writings were once much admired. His style has considerable neatness and elegance, but he has little originality or power of thought, and his popularity has for some years been gradually decreasing. The selections in the 'Elegant Extracts' were made with much taste and judgment. They were very useful works in their day, and had for many years a large circnlation.

(*Annual Biography and Obituary*, 1822; Watt's *Bibliotheca Britannica*.)

KOBELL, the name of several German and Dutcb landscape painters, of whom the two following are the most distinguished:—

Ferdinand Kobell was born at Mannheim in 1740, and was educated by bis father with a view to his obtaining an honourable position in the civil service of the Electoral government, under which he bimself held the place of hofkammerrath, or counsellor of the exchequer. Ferdinand however had an invincible passion for landscape-painting, which the encouragement of the elector palatinc, Karl Theodor, enabled him finally to follow, notwithstanding the opposition of his father. He studied eighteen months at Paris, in 1768-70, at the expense of the elector, who appointed bim his cabinet painter after bis return to Mannheim: be was also made a member of and secretary to the Academy of Mannheim. In 1793 he removed to Munich, where he died in 1799. Kobell was also a very able etcber: a set of his prints, 179 in number, was published in Nürnberg in 1809:—'Oeuvre complet de Ferd. Kobell, peintre de la Cour Electorale Bavaro-Palatine, et graveur à l'eau forte,' &c. In 1822 a 'Catalogue Raisonné' was published by Baron von Stengel, in which 267 prints are described. Nagler has printed a list of them in his Dictionary. Kobell's landscapes are well selected, true in colouring, and executed with care: the figures in them are painted by himself.

Franz Kobell, the younger brother of Ferdinand, was born at Mannheim in 1749. He was intended for a merchant, and spent four years in a merchant's bouse at Mainz; but his love for the arts, especially landscape and architecture, finally overruled all obstacles, and his brother's patron, the elector Karl Theodor, befriended him also, and enabled him, in 1776, to visit Italy, wbere he remained an entbusiastic student of Italian scenery, chiefly at Rome, for nine years. Franz Kobell, though he executed a few pictures in oil, was scarcely a painter, literally, for his works are almost exclusively drawings, chiefly with the pen, and tinted wlth sepia. He was so industrious in this stylo of art, that the number of his drawings is said to exceed ten thousand, the great bulk of which are in tbree collections—that of the Duke Albert of Sachsen-Teschen in Vienna, that of H. von Rigal in Paris, and that of Baron Stengel in Munich. He died at Munich in 1822; and a flattering notice of him appeared in the 'Kunstblatt' of the same year, from the pen of his friend Speth, tbe author of an excellent work on Italian art of the earlier ages—'Die Kunst in Italien,' 3 vols. 8vo., München, 1819-23.

(Meusel, *Miscellaneen Artistischen Inhalts*; Lipowsky, *Künstler-Lexicon*; Nagler, *Künstler-Lexicon*.)

KOBRE'SIA, a genus of plants belonging to the natural order Cyperaceæ. It has the spikes aggregate; the lower flower pistiliferous, the perigone of one scale inclosing tho germen and covered by the glume. The upper flower staminiferous without any perianth. Tbere is but one species of this genus, *K. caricina*, which has an erect stem from 6 to 12 inches in height, slender leaves shorter than the stem, from 4 to 5 spikes aggregated at the summit of the stem, and from 6 to 8 flowers. There is often an abortive stamen at the base of the nut. This plant is found throughout Europe and in Great Britain, on moors in Yorkshire, Durham, and Perthshire.

(Babington's *Manual of British Botany*.)

KOCH, JOSEPH ANTON, a celebrated German landscape painter, was born of poor parents at Obergiebln am Bach, in the valley of the Lech, in the south of Germany, in 1768. Some of bis early attempts attracted the notice of Bishop Umgelder, vicar-general of Augsburg, who placed Koch with a painter in that city and provided for his maintenance. He was shortly afterwards sent by the bishop to the Carls-Academie at Stuttgardt, where he remained seven years, and became in the meantime an able landscape painter. Koch tried his fortune in Rome at an early date, and be met with complete success; he married a Roman girl and settled himself fixedly in Rome, wbere he enjoyed a great reputation for, with tbe exception of a short interval, at least balf a century, and he was for many years looked upon as the Nestor of the German artists there. He died at Rome, January 12, 1839.

Koch was not exclusively a landscape painter, though he is chiefly distinguished as such. He is known for some clever illustrations to Dante. Among his pictures not exclusively landscapes are, Noah's Sacrifice, the Emancipation of the Tyrol by Hofer, the Flight of Laban, the fresco illustrations to Dante in the Villa Massimi, besides some others. He has painted several fine Alpine views; and many poetical landscapes, which are rather characteristic pictures of a peculiar class of scenery than prospects of particular localities. He frequently composed his landscapes out of such peculiarities of mountain scenery as were congenial with bis individual taste, and the parts were always well arranged, and true and characteristic in their details. In colouring he was not excellent, but rather heavy and monotonous. His latest works were comparatively careless in execution. Koch was also an etcher of considerable skill, and among his works in this class are 24 designs from the antient fable of the Argonautic expedition, after Carstens.

(Nagler, *Neues Allgemeines Künstler-Lexicon*.)

KOELE'RIA, a genus of plants belonging to the natural order Gramineae. It has unequal glumes, the upper one with 2 or 3 ribs, sborter than the spikelet, whicb is compressed. The outer palea is nerved, keeled, and acuminate; the seed loose, and the styles terminal. Tbere is but one British species of this genus.

K. cristata has a compact panicle, spiked, oval, and interrupted below, the outer palea 3-ribbed and acute; the leaves narrow, rough at the edges, and ciliated. In dry places the leaves are much shorter than the stem; in damper places elongated, and often nearly as long as the stem.

(Babington, *Manual of British Botany*.)

KONIGA, a genus of plants belonging to the natural order Cruciferae. It has an oval compressed pouch, from 1 to 2 seeds in each cell, simple filaments, and 8 hypogynous glands. But one Britisb species of this genus has been discovered, *K. maritima*, which is a procumbent plant, with bipartite bairs, linear lanceolate acute leaves, oval pointed glabrous pods. It is the *Lobularia* of Koch, and the *Glyce* of Lindley. Tbe flowers are white and sweet-scented.

(Babington, *Manual of British Botany*.)

KOTTBUS. [Cottbus, P. C.]

KRAFFT, ADAM, a celebrated old sculptor and architect of Nürnberg, wbere he was born about 1435; he married in 1470. There are several of his performances still extant in the city and churches of Nürnberg, but the principal is the remarkable tabernacle in stone, fixed against one of the columns of the choir of the churcb of St. Lawrence, Lorenzkirche. It is in the form of a square open Gothic spire, and is 64 feet bigh, the pinnacle being turned downwards, like the crook of the crosier or an episcopal staff, to avoid the arch of the churcb. The ciborium is placed immediately npon a low platform which is supported partly by the kneeling figures of Adam Krafft and his two assistants; the rail or baluster of the platform is richly carved, and is ornamented with the figures of eight saints. The whole tabernacle is also profusely ornamented with small figures in the round and bassi-rilievi:—immediately above the ciborium, on three sides, are representations in basso rilievo of Christ taking leave of his Mother, the Last Supper, and Christ on the Mount of Olives; high above these are—Christ before Caiaphas, the Crowning with Thorns, and the Scourging; above these is the Crucifixion; and, lastly, above that is the Resurrection, all in the round. This elaborate work was executed by Krafft for a citizen of the name of Hans Imhof, and for the small sum of 770 florins; if the ordinary florin, about 70*l.* sterling. There is a print of this tabernacle in Doppelmayr's work on the artists of Nürnberg. Recent writers have indulged in various conjectures regarding the time and works of Krafft, but the circumstances of both are still involved in their former uncertainty. He is supposed to have died in the Hospital of Schwabach in 1507. Sandrart has inserted the portrait of Krafft in his 'Academy,' from the figure mentioned above, under the tabernacle.

(Sandrart, *Teutsche Academie*, &c.; Doppelmayr, *Historische Nachricht von den Nürnbergischen Künstlern*, &c.; Füssli, *Allegemeines Künstler-Lexicon;* Nagler, *Allgemeines Künstler-Lexicon.*)

KÜGELGEN, GERHARD and CARL VON, twin brothers and distinguished painters, were born at Bacharach on the Rhine, in 1772. Their father was Hof-kammerrath, exchequer counsellor, in the service of the elector of Cologne, who in 1791 sent the twins to complete their studies in Rome after they had made sufficient progress at home. Gerhard painted history and portrait; and Carl, landscape. Gerhard was induced to try his fortune at St. Petersburg, whither he was soon followed by his brother Carl: they both met with great success, and married two sisters, of a noble family of Curland; but Gerhard, after a few years, removed in 1804 to Dresden; Carl remained at St. Petersburg, where he was appointed court painter. Gerhard had established himself, and a high reputation, at Dresden, where he held the appointment of professor of painting at the Academy, when his career was suddenly cut off in a most melancholy manner. He was brutally robbed and murdered on the road from Pillnitz to Dresden, not far from the capital, in 1820. It was a common highway robbery; the miserable wretch who committed the deed was not in the least aware of who his victim was. He was a private soldier, and his singular cupidity was the cause of his detection. He even drew off the boots of Kügelgen, and his afterwards taking these boots to be mended to the very man who had made them and who knew them, is said to have been the cause of his detection.

Kügelgen's works are of a very unpretending character; in most of them an abstract religious sentiment is the chief and characteristic motive; in execution they are careful, delicate, and somewhat formal, yet pleasing and impressive. He delighted in compositions of one or at most very few figures; often three-quarter lengths of the size of life. His biography, by F. Hasse, was published at Leipzig in 1824.

Carl Kügelgen painted many landscapes, and executed many drawings of the scenery of Russia, both in the northern and southern provinces. He made two journeys in the Crimea for the express purpose of painting its scenery; the first journey was made in 1804 by the desire of the Emperor Paul, the second by the express permission of the Emperor Alexander, in 1806. Thirty oil paintings and sixty sepia drawings, part of the fruits of the second journey, were purchased by the emperor, and placed together in a hall in Kammoi Oatrof. In 1818 Alexander sent Kügelgen for a similar purpose into Finnland, of which country he painted fifty-five pictures, which also were purchased by the emperor. Kügelgen executed in all 171 pictures and 290 finished drawings. He died at Reval in 1832. His Life is in the 'Neuer Nekrolog der Deutschen,' x. 1.

(Nagler, *Neues Allgemeines Künstler-Lexicon.*)

XUNDUZ. [TURKISTAN, P. C.]

KUPETZKY, JOHANN, a very celebrated portrait painter, was born at Bösing or Bozin, near Presburg in Hungary, in 1667 or 1666. His father, originally of a Bohemian family, was a poor weaver, and he intended his son to follow his own business; Kupetzky however had very different intentions: he fled from home when only fifteen years of age, begged his way to Switzerland, and there, at Lucerne, obtained admission into the house of a painter of the name of Klaus, who instructed him in painting, and was soon surpassed by his pupil. Kupetzky, after a time, found his way to Rome, where he underwent many hardships until he was relieved and introduced by his friend J. C. Füssli to the principal painters and virtuosi at Rome. Alexander Sobiesky became a valuable patron to him. After a stay of twenty-two years in Italy he was invited by the Prince Adam von Liechtenstein to Vienna, where he soon obtained the reputation of the first portrait painter of his time. He numbered among his patrons and admirers the emperors Joseph I. and Charles VI., and the Prince Eugene; and in 1716 he was invited by Peter the Great to Carlsbad. Peter wished Kupetzky to enter his service and to return with him to Petersburg, but Kupetsky was obstinately fond of his liberty, and would never enter the service of any prince. The Czar Peter gave him many commissions notwithstanding his refusal to enter his service. All that Kupetsky had ever required of the Emperor of Austria was, that he might be allowed to worship God in his own way. He belonged to the sect called the Bohemian Brothers. This liberty, however, very nearly involved him in serious difficulties, as he was accused or threatened to be accused, by some of his rivals, of malignant heresy; and fear of the Inquisition appears to have taken possession of him, and he secretly left Vienna and settled in Nürnberg, where he died in 1740. Kupetzky painted history and portrait, but chiefly portrait. His pictures have a great deal of character and much effect: his friend and admirer Füssli says they combine the vigour of Rubens, the truth and elegance of Vandyck, and the effect of Rembrandt. Many of his portraits and some of his pictures have been engraved, especially by Bernhard Vogel, in mezzotint. The prints engraved by Vogel were added to by V. D. Preissler and published in a collection in folio at Nürnberg in 1745, under the following title:—'Joannis Kupetzky, incomparabilis artificis, Imagines et Picturae quotquot earum haberi potuerunt, antea ad quinque dodecades arte quam vocant nigra aeri incisae, a Bernhardo Vogelio, jam vero similiter continuatae opera et sumptibus Valentini Danielis Preissleri, Chalcographi.'

Kupetzky's portrait of himself, in spectacles, a work of prodigious merit, has been copied by L. de Laborde, from Vogel's print, and is inserted as a specimen in his history of mezzotint engraving—'Histoire de la Gravure en Manière Noire.' J. C. Füssli published a Life of Kupetzky, with one of Rugendas, at Zürich, in 1758.

(Fiorillo, *Geschichte der Zeichnenden Künste*, &c.; Dlabacz, *Allgemeines historisches Künstler-Lexicon für Böhmen.*)

KURDISTAN (the country of the Kurdes) comprehends the larger portion of that mountain-region which divides the elevated table-land of Iran (Persia) from the low plains of Mesopotamia or Al-Jezireh. As it does not constitute a political division, its boundaries are not exactly determined. Some authors consider the country surrounding the lake of Van as forming a part of Kurdistan, but as that country is mostly inhabited by Armenians, and there are only a few Kurdes among them, the mountain-range of the Erdesh Tagh (38° 20′ N. lat.) must be considered as constituting the boundary-line between Armenia and Kurdistan. From this range it extends in a south-eastern direction to the province of Louristan, or to about 34° N. lat. The width of this mountain-region may be about a hundred miles. This gives an area of 28,000 square miles, or the extent of Ireland. About three-fourths are under the dominion of the Turkish sultan, and form portions of the eyalets of Bagdad, Mosul, and Van; the remainder belongs to Persia, and constitutes the province of Kurdistan, of which Kermanshah is the capital.

The higher mountain-region occupies the northern portion, and extends from the Erdesh Tagh to a range, which on the west approaches the banks of the Tigris south of Jezireh-ibn-Omar; from which point it extends in an east by south direction across the whole region, being overtopped near the boundary-line of Persia by the elevated peak of Rowandiz (10,120 feet above the sea-level). This range is called at its western extremity, where it hardly rises a thousand feet above the sea-level, the Soli Range, but in the middle, where it attains 3000 feet and more, the El Khaïr Mountains; it is still higher where it approaches the table-land of Iran. The whole country between this range and the Erdesh Tagh is mountainous. In the vicinity of its northern limits the rocky masses are rarely and not deeply furrowed by depressions in the shape of valleys. They form a table-land, from 6000 to 7000 feet elevated above the sea-level, whose surface presents a succession of low hills with gentle declivities and small plains between them. This is the table-land of Ali Baugh, on which very few lofty summits rise. The climate is very dry, and the vegetation scanty. It is mostly used as pasture-ground in summer. In proceeding southward the country gradually changes its features. The valleys sink deeper and the masses between them rise higher, and thus the table-land is changed into a mountainous country consisting of high ridges with steep acclivities and comparatively narrow valleys between them. Some of the ridges attain a great elevation, as the Marannan mountains, the Jawur Tagh, and the Jelooh mountains; the Jawur Tagh appears to be the highest, and to rise between 12,000 and 13,000 feet above the sea. The declivities of the ridges and the valleys present a vigorous vegetation in the numerous forests and in the growth of the different kinds of grain and vegetables which are cultivated. The forests chiefly consist of different kinds of oak (Quercus valonia and Q. infectoria), from which those immense quantities of gall-nuts are collected which constitute the most important article of commerce in this region. In the valleys the European cerealia are raised; and the orchards produce apples, pears, plums, and cherries. Many of the valleys open towards the plain of Mesopotamia, and these are wider, but the larger number extend from north to south, and are seldom more than two miles wide, and generally not half so much.

This portion of Kurdistan is in possession of some tribes of Kurds, which are independent when the pashas of Bagdad and Mosul are not in arms to punish the least act of disobedience. It is as difficult for the Turks to penetrate into the valleys of these regions as for the Russians to get possession of those of Circassia. Probably more than half the population are Mohammedans, and the other half Christians, among whom the Nestorians are the most numerous. Their patriarch resides in Julamerik, a small town situated in the vale of the river Zab Ala, or Great Zab, and enjoys almost the power of a sovereign. Near the southern extremity of this region are the towns of Amadiyah and Rowandiz, the two places whence the gall-nuts are exported. Amadiyah lies in a valley from five to six miles wide and very fertile, and is built on an isolated limestone rock elevated about 80 feet above the valley; it contains about 200 houses, many of which are inhabited by Jews. The town of Rowandiz is some miles west of the peak of Rowandiz. It is built on a tongue of land formed by the confluence of two rivers, and contains more than 1000 houses and perhaps 10,000 inhabitants. Numerous caravans pass between this place and Mosul. They export gall-nuts, madder, hides, and tobacco, and bring back several European and Indian articles.

The southern portion of Kurdistan, or that which lies between 36° and 34° N. lat., can hardly be called mountainous, except in its eastern districts, which are contiguous to the elevated table-land of Iran. The surface however is greatly diversified by several ranges of hills. Three such ranges may be traced between the banks of the Tigris and the eastern mountains. These three ranges go by the names of the Hamrin Hills, the most south-western, Ali Tagh, the central ridge, and Kara Tagh, the north-eastern. They run parallel to one another from north-west to south-east. The Hamrin Hills terminate on the banks of the Tigris between the town of Tekrit and the mouth of the Zab Asfal or Lesser Zab (near 35° N. lat.); the Ali Tagh, south of the confluence of the Zab Ala or Great Zab (near 36° N. lat.); and the Kara Tagh joins the El Khaïr mountains south-west of the peak of Rowandiz. These ridges are connected with each other at several places by hilly tracts. It appears however that the greater part of this region is occupied by plains of considerable extent. The hills as well as the greater part of these plains are either entirely sterile or possess only a soil of indifferent quality, but along the base of the hills, partly on their declivities and partly in the adjacent level country, there are lands of considerable fertility, well cultivated, and populous. The mountain-region which borders this country on the east varies from ten to twenty miles in width, and it contains several high ranges, as the Shahn mountains, the Azmir Tagh, and the Kurhur Tagh. In the second range is the Pir Omar Gudrun, an elevated mass which appears to rise above the snow-line, as it supplies the adjacent countries with ice all the year round. This mountain-region is united to the high masses surrounding the peak of Rowandiz. It is well wooded, whilst the lower western ridges are almost entirely destitute of trees.

The largest river of Kurdistan is the Zab Ala or Great Zab. It rises in the north-western corner of the table-land of Ali Baugh, within the boundary of Persia, at an elevation of about 7000 feet above the sea-level; receives by its numerous affluents the drainage of almost the whole of Northern Kurdistan, enters Southern Kurdistan by a narrow glen where the Kara Tagh mountains are connected with the Khaïr range, and joins the Tigris about 30 miles below Mosul. At the place of their confluence the rivers are nearly equal in size. The waters of the Tigris are highest in April and May, but in the Zab in June and July, for about that season the greater part of the snow with which the mountain-region is covered during the long winter dissolves, and thus the water brought down by this affluent serves during the summer to keep up the level in the lower part of the Tigris. The water of the Zab Ala is much colder than that of the Tigris. The other large rivers of Kurdistan are the Zab Asfal, or Lesser Zab, and the Diyálah. They rise in the elevated region dividing Southern Kurdistan from the table-land of Iran, and after draining the first-mentioned country, they fall into the Tigris; they break through all the lower ridges of Southern Kurdistan.

There are several considerable towns in Southern Kurdistan. The most northern is Arbil (Arbela) or Erbil, built between the Great and Lesser Zab, in a plain which has a very fertile soil, yielding rich crops without being irrigated. The town is built on some considerable hills, which all travellers consider as artificial. It contains 6000 people, three large mosques, and two baths. Altún Kupri, on the banks of the Lesser Zab, contains 8000 inhabitants. Kerkuk, farther south, is a rather large place, which carries on a considerable commerce with Suleimaniyah, to which place it sends large quantities of gall-nuts, honey, sheep, and cattle, brought from the mountain-region lying farther east, and whence it receives European, Persian, and Indian goods. Its population may amount to between 10,000 and 12,000 individuals. There are some manufactures of coarse calicoes.

Suleimaniyah, the modern capital of Southern Kurdistan, and the residence of the hereditary pasha or wali, who however is dependent on the pasha of Bagdad, is not far from the base of the Azmir range, and of the peak called Pir Omar Gudrun, which rises to more than 10,000 feet above the sea-level. The plain of Banna, at the eastern border of which it lies, is between 3000 and 4000 feet above the sea. It was built in 1788, and contains more than 2000 houses and about 10,000 inhabitants, six caravanserais, five baths, and five mosques. The commerce with the adjacent countries is considerable, and is concentrated in this place.

Little is known of the climate of Kurdistan, except that of Suleimaniyah, where the winters are very cold and the summers very hot. Snow covers the plain of Banna for six weeks, or even two months. In May the climate is very agreeable, the thermometer standing at six o'clock in the morning at 66°; at half-past one, at 78°; and at ten o'clock in the evening at 69°: but in July the heat is very oppressive, especially during the north-eastern winds, which are called *sherki*, and which affect the human body more than the samoun at Bagdad, as they suddenly raise the temperature ten degrees and more, and produce the most unpleasant feeling. They continue to blow sometimes for eight or ten days, and return frequently, even as late as the end of September. When the sherki does not blow, the changes of the atmosphere are very regular in summer. At sun-rise it is quite calm; but immediately afterwards a light breeze begins from the east, which increases gradually until the sun attains the meridian, when it blows a gale, or at least strong gusts of wind, from the south. Later in the day the wind turns to the west and moderates. The mornings are generally unpleasant, but the afternoons are very agreeable.

The fields of Kurdistan produce wheat, barley, and Indian corn; millet and rice are grown only in the lower districts towards the banks of the Tigris. Tobacco and cotton are largely cultivated, and supply articles of commerce. Legumes, especially lentils, are much grown. Melons, watermelons, and cucumbers are very abundant. The orchards yield figs, pomegranates, olives, oranges, walnuts, apricots, peaches, plums, apples, pears, cherries, and abundance of grapes of good quality; in some places there are plantations of dates. Poplar and chinar trees (plantanus orientalis) are planted, and among the forest trees are several kinds of oak, and also wild pear-trees of great size, and between them wild rose-bushes.

Sheep, cattle, and horses abound; the best horses are imported from Bagdad. There are bears, wild hogs, wild goats, antelopes, and jackals. Land-turtles are frequent, but of small size. Bees are very abundant, and honey is a considerable article of commerce; locusts sometimes lay waste a part of the country; birds are not numerous, except partridges and quails.

Minerals appear to be scarce, except building-stone. In the mountain-region iron and sulphur are met with; and in some places these mines are worked on a small scale. There are several salt springs in the hills between the lesser Zab and the Diyálah, from which large quantities of salt are obtained. Naphtha and petroleum abound, especially in the vicinity of Kerkuk, and some of the springs yield a considerable revenue to the wali; they are noticed by Strabo (p. 738, ed. Cas.).

As the passes through the ranges of mountains and hills are rather difficult, single travellers are subject to be robbed and murdered. Commerce is therefore carried on by caravans. At least one caravan departs every month from Suleimaniyeh for the Persian towns of Tabriz and Hamadan. They take to Tahriz chiefly goods obtained from Bagdad, as coffee, dates, and European and Indian manufactures; and bring back large quantities of silk for the manufacturers of Bagdad, and some silk stuffs. The exports to Hamadan consist partly of goods obtained from Bagdad, and partly of the produce of the country, as tobacco, fruits, honey, gall-nuts, &c.; the imports consist of hutter, hut especially of the manufactures of Kasbin, as velvets, brocades, cotton goods, &c. The commerce with Kerkuk, which is the chief market for the produce of Kurdistan, is very active; from that place are brought to Suleimaniyah gall-nuts, honey, sheep-skins, and cattle; and exchanged for fruits, rice, leather, coffee, cotton stuffs, &c. There is also much commerce with Bagdad, where coffee, dates, and European and India goods are obtained in exchange for the silk brought from Tabriz, and for the produce of the country, consisting of sheep, gall-nuts, sumach, cheese, hutter, gummi, tallow, soap, and tobacco. These articles are also taken to Mosul, where they are exchanged for calicoes and other cotton stuffs, silks of Damascus and Diarbekr, stuffs for turbans, boots, and shoes. The least active hranch of the commerce of Suleimaniyeh is that with Erzerum, to which place hardly anything is exported except those articles which are imported from Bagdad, for which the returns are iron, copper, and mules. Armenia supplies the whole of Kurdistan and some neighbouring countries with these animals.

The population of Turkish Kurdistan is estimated at about one million, of which four-fifths are Kurds, and the remainder Armenians, Persians, Jews, and Turks. The Kurdish population of Persian Kurdistan may amount to 20,000 individuals. But as a numerous colony of Kurds is found in Khorassan, and several tribes have also been dispersed over the hilly region in Mesopotamia, and as far west as Aleppo and the Taurus range, the whole population of the nation may perhaps not fall short of two millions. The Kurds are a stout race of men, of dark complexion, with black hair, a large mouth, small eyes, and a savage look. They are very regularly huilt, and attain a great age. Their language is derived from the same stock as that of the modern Persian, but not having been fixed by writing, it has degenerated much more. There are several dialects, which vary considerably in proportion to the distance at which the different tribes live from one another. The name of Kurd signifies a valiant warrior, and is therefore adopted as an honourahle denomination. In Turkish Kurdistan the nation is composed of two castes, the warriors, called Bebbehr or Babans, and the working people or agriculturists, called Guran. The latter are considered by the Behbehr as a race of men totally different from them, and are treated as slaves. The Bebbehr never cultivate the ground, and the Guran never serve as soldiers. A great portion of the population is still addicted to a migratory life. Even when settled in villages, they leave them in summer, and retire with their herds to the adjacent mountain-ranges, from which they return when the harvest time approaches. Though the Kurds are as good Mohammedans as their neighbours, their women enjoy a much greater degree of liberty, and are frequently met with in the streets. Ladies of rank wear a veil, but the women of the middling and lower classes go about without. The Kurds are much more inclined to associate than their neighbours the Persians or Turks.

The Kurds were known to the antients. Xenophen (*Anabasis*, iii. 5, 15, &c.) called them Carduchi (Καρδοῦχοι), and later historians Κορδιαῖοι, Γορδιαῖοι, Gordiani. When subject to the kings of antient Persia, they belonged partly to the province of Assyria, and partly to Media, as at present their country is divided between Turkey and Persia. The battle of Gaugamela (Arbela) was fought in Kurdistan, near the modern town of Arbil. After the time of Alexander their country was united to the kingdom of Syria, but was dismembered from it in the third century before Christ hy the Parthians. It afterwards became a part of the new Persian empire, and fell with it under the dominion of the caliphs of Bagdad. After the destruction of the caliphat, Kurdistan partook of the numerous revolutions in Persia and Mesopotamia. The famous sultan Saladin was a Kurd, of the tribe of Rewandooz, and appears to have got possession at least of a part of the country. But it soon passed under the dominion of the Moguls (1258), and finally (1388) was conquered by Timur. After the establishment of the Soofee dynasty (1502), Kurdistan constituted a part of Persia, and remained so till the seventeenth century, when the Kurds, oppressed by the Persians, revolted, and subjected themselves to the dominion of the Turkish emperor.

(Rich, *Narrative of a Residence in Kurdistan;* Heude, *Voyage up the Persian Gulf, and a Journey overland from India to England;* Ainsworth, 'Account of a Visit to the Chaldeans inhabiting Central Kurdistan,' in *London Geogr. Journal*, xi.; Ainsworth, *Travels and Researches in Asia Minor*, &c.; Shiel, 'Notes on a Journey from Tabriz, through Kurdistan, &c. to Suleimaniyeh,' in *London Geogr. Journal*, vol. vii.; Rawlinson, *Journey from Tabriz through Persian Kurdistan*, &c.; Ritter, *Erdkunde von Asien*, vol. ix. and xi.)

KYD, THOMAS, was one of those dramatic poets who immediately preceded Shakspere. Three plays of his are extant—1, 'Cornelia; or Pompey the Great, his fair Cornelia's Tragedy,' a translation, respectably executed, from the French of Garnier, printed in 4to. 1594, 1595; 2, 'The First Part of Jeronimo,' 1605, 4to.; 3, 'The Spanish Tragedy, or Hieronymo is mad again;' of which there are many editions, the oldest known being of 1599, though the play was certainly printed earlier. All the three are in Dodsley's Old Plays. 'The first Part of Jeronimo' is merely an Introduction to the 'Spanish Tragedy.' The former, and probably the latter also, must have heen on the stage about the year 1587 or 1588; and they kept their place in 1601 and 1602, when Ben Jonson was paid for making large additions to the Second Part, which are in the modern editions, and are quite worthy of his genius. The portions written by Kyd himself are the objects of continual ridicule to Shakspere and his contemporaries, whose comic characters parody the most extravagant speeches of the mad Hieronymo. Yet the play, even in its Introduction, and still more in the Second Part, possesses great vigour, both of imagination and of passion. It is an irregular and rude work, belonging essentially to the infancy of the drama, in its conception of character as well as in its plan and in its language. But it was hy no means unworthy of the great popularity which it enjoyed. It is a tragedy of bloodshed, after the manner of 'Titus Andronicus,' to which, however, it is much inferior; and it has been observed by more than one critic, that there are in it points which may naturally enough be supposed to have suggested thoughts for 'Hamlet.' Kyd has also been supposed to have heen the author of the old 'Taming of a Shrew,' 1594, and of the tragedy of 'Solymun and Perseda,' 1599. For the former supposition there is no ground; and for the other there is no better reason than the particular mention made of the story of a 'Solyman' in the 'Spanish Tragedy.'

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VOLUME II.

L.

LAACHER SEE. [ANDERNACH, P. C.]

LABEO, QUINTUS ANTISTIUS, a Roman of some distinction as a jurist, was the father of a more distinguished son. He was at the battle of Philippi, on the side of M. Brutus and Cassius, and after the defeat he killed himself in his tent, and was buried there. (Appian, *Civil Wars*, iv. 135.) Q. Antistius Labeo, the son, was a pupil of C. Trebatius; but contrary to the practice of that time, instead of devoting himself exclusively to one master, he attended several. He lived in the time of Augustus. Labeo was distinguished for his knowledge of Roman law and Roman usages, and also for the freedom with which he expressed his opinions to Augustus (Suetonius, *Octavianus Caesar*, c. 54), to whose measures he set himself in opposition. Some critics suppose that he is alluded to by Horace (1 *Sat.* 3. 82); but there might be other persons of the name of Labeo. Ateius Capito, his rival in legal knowledge, was raised to the consulship by Augustus in order that he might have that superiority in rank which his talents alone could not give him. Labeo never enjoyed any higher honour than the praetorship. (Tacitus, *Annal.* iii. 75.) The character of Labeo is given by Gellius (xiii. 10): 'Labeo Antistius principally applied himself to the study of the civil law, and publicly gave his opinions to those who consulted him. He was also not unacquainted with other liberal pursuits, and he deeply studied grammar, dialectic, and antient learning; he was also well acquainted with the origins and principles of Latin words, and he availed himself of that kind of knowledge especially to clear up most legal difficulties.' He was confident in his abilities and acquirements, and bold enough to advance many new opinions. He was a copious writer, and is said to have produced four hundred different treatises, from which there are sixty-three excerpts in the Digest, and he is very often cited by the other jurists. Labeo wrote commentaries on the Twelve Tables, fifteen books at least on Pontifical Law, and fifteen De Disciplinis Etruscis. His works which are mentioned in the Digest are, eight books of Πιθανά, of which Paulus made an epitome with notes; and ten books of Posteriora, so called from having been published after his death, of which Javolenus made an epitome; but Gellius refers to the fortieth book of Posteriora. He also wrote Libri ad Edictum, Libri Praetoris Urbani, and thirty Libri Praetoris Peregrini.

A brief notice of C. Ateius Capito may be appropriately introduced here, for he was the rival of Labeo, and founded a sect or school which was opposed to that of Labeo. The father of Capito attained the rank of praetor; his grandfather was a centurion who served under L. Cornelius Sulla. Capito was made Consul Suffectus by Augustus A.V.C. 758, and it was during his term of office that he decided that a patron could not take his freedwoman to wife against her consent, a decision perfectly consistent with Roman principles. Capito was a flatterer; Labeo was an independent man and said what he thought. Instances of Capito's adulation are recorded by Tacitus (*Annal.* iii. 70) and Suetonius. He died in the time of Tiberius, A.D. 22. (*Annal.* iii. 75.)

Capito is often cited by other jurists, Proculus, Javolenus, Paulus, and once by Labeo: they always call him Ateius. Capito's reputation as a lawyer was very great. He wrote on Pontifical Law at least five books, as appears from Gellius (iv. 6), and numerous books of Conjectanea (Gellius, xx. 2; xiv. 7). He also wrote a single book De Officio Senatorio, from which Gellius gives an extract (iv. 10), and a book De Jure Sacrificiorum (Macrobius, *Saturn.* iii. 10). Gellius (xiii. 12) also quotes a letter of Capito, in which he speaks highly of Labeo's legal knowledge. There are no excerpts from Capito in the Digest.

From the time of Labeo and Capito we date the formation of two opposed sects or schools of law among the Romans. The nature of this opposition is collected from the words of Pomponius (*Dig.* i. tit. 2). Labeo was a man of greater acquirements than Capito and of a bolder temper. He applied to his legal studies the stores of knowledge that were open to him, and thus was led to many new views. Capito stuck close to what had been transmitted by his predecessors: he was one of those who appealed to authority. So far as concerns general principles, we cannot condemn the method of either of these great jurists. Each has its merit, but either of them, if carried too far, may be injurious to jurisprudence. He who handles the matters of law in an enlarged and comprehensive manner may improve jurisprudence; but if he does not well know what the law is, and if he is more eager to change what is established than to maintain its stability, he may destroy the edifice on which he is labouring. He who merely studies the laws of his country as they exist, and is satisfied if he can find authority for anything, however inconsistent with fair dealing and the general interests of society, may be a good lawyer of a kind, but he is a bad citizen. The Roman jurisconsulti were mainly engaged in writing on law and giving their opinions (responsa) to all persons who consulted them. Their business was not that of the modern advocate, who has to make the best of his client's case. The opposition then between Labeo and Capito, between him whose method, if judiciously practised, would lead to a progressive improvement of law, and him whose method would stop all such improvement, if strictly adhered to, hardly constitutes a ground of like comparison between lawyers in this country. Numerous questions divided the respective followers of Labeo and Capito; but it is not always easy to discover in the questions, so far as we know them, sufficient to enable us to trace the two opposing principles of the founders of the schools to their just consequences. Much has been written on this matter; and a great deal has been said for which there is little or no evidence.

The followers of Labeo were called Proculiani, from Proculus, one of the successors of Labeo. Those who attached themselves to the school of Capito were called Sabiniani, or sometimes Schola Cassiana, from Massurius Sabinus and C. Cassius Longinus. For further remarks on the subject of the two schools the reader may consult Puchta, *Cursus der Instit.*, i. 98.

LABIA'TÆ. [LAMIACEÆ, P. C.]

LA'BIDUS. [MUTILLIDÆ, P. C. S.]

LABYRI'NTHODON, a genus of fossil reptiles from the new red-sandstone strata. (Owen.) [SALAMANDROIDES, P. C.]

LACE-BARK-TREE. [DAPHNE, P. C.]

LACMUS. [LITMUS, P. C.]

LACTU'CA, a genus of plants belonging to the natural order Compositæ, the suborder Ligulifloræ, the tribe Cichoraceæ and the subtribe Lactuceæ of De Candolle. It has a cylindrical imbricated involucre with the scales membranous at the margin and few-flowered; the receptacle naked; the achenium compressed, wingless, with a long filiform beak, the pappus hair-like in several rows.

L. virosa, Acrid Lettuce, has leaves with a prickly keel, horizontal, oblong, auricled and clasping, mucronate, dentate or sinuated, the beak white, equalling the fruit, which is black. This plant is found on hedges, old walls, and the skirts of fields throughout Europe. It yields a milky juice, which when procured and dried has the name Lactucarium. [LACTUCARIUM, P. C.] This substance is also procured from the garden lettuce (*L. sativa*), and in the London Pharmacopœia the *L. sativa* is the only plant recognised for supplying this substance. Dr. Christison remarks, 'the London College however, and many cultivators, are wrong in restricting themselves to the garden lettuce, for the preparation of lactucarium. From information communicated to me several years ago by Mr. Duncan, chemist and druggist in this city (Edinburgh), who has often made lactucarium on a large scale, it appears that the *Lactuca virosa* yields a much larger quantity, and that the produce is of a superior quality. Nor is there any reason for dreading the narcotic properties of the wild lettuce, the scientific name of which has given rise to an exaggerated notion of its activity. The results obtained by Mr. Duncan have been since confirmed by those of Schultz in Germany; who found that a single plant of the garden lettuce yields only 17 grains of lactucarium on an average, while a plant of wild lettuce yields no less than 56 grains.'—Mr. Duncan has made the observation also that, 'although the milkiness of the juice increases till the very close of the time of flowering, namely in the wild-lettuce till the month of October in this climate, the value of the lactucarium is deteriorated after the middle of the period of inflorescence; for subsequently while the juice becomes thicker a material decrease takes place in the proportion of bitter extract contained in it.' For an account of *Lactuca sativa* and its uses as a salad, see

LETTUCE. This plant appears to have been cultivated amongst the Greeks, and also used in medicine. It is the θρίδαξ of Dioscorides, ii. 165, also of Theophrastus. Several varieties of the garden-lettuce were used both among the Greeks and Romans as salads.

L. scariola, Prickly Lettuce, has the leaves with a prickly keel, perpendicular, arrow-shaped at the base and clasping, sinuate, the beak white, equalling the pale fruit. It is found plentifully in waste places in many parts of Europe, but is a rare plant in Great Britain. It has a stem from 2 to 5 feet high, leafy and panicled. Its juice is not so acrid as that of *L. virosa*, but possesses the same properties. It is found on the higher hills of Greece, and is probably the θρίδαξ ἀγρία and θριδακίνη of Dioscorides. The θριδακίνη of Theophrastus, i. 8, and vii. 3, and of Galen, lib. 2, according to Fraas is the *L. coriacea* of Schultz.

There are two other British species of lettuce: *L. saligna*, with a white elongated beak, twice as long as the fruit, the upper leaves entire, acuminate, and *L. muralis*, with the beak much shorter than the fruit. [On the Cultivation of the Lettuce, see LETTUCE, P. C.]

(Babington, *Manual of British Botany*; Fraas, *Synopsis Plantarum Floræ Classicæ*; Christison, *Dispensatory*.)

LADING, BILL OF. [BILL OF LADING, P. C.]

LAGENA'RIA (from 'lagena,' a bottle), a genus of plants belonging to the natural order Cucurbitaceæ. The flowers are monoecious, the calyx campanulate, with subulate segments shorter than the tube. The corolla is white, with obovate petals spreading below the edge of the calyx. It has five triadelphous stamens, the fifth one distinct; three subsessile granulated stigmas, obovate compressed seeds tumid at the margin, 2-lobed at the apex.

L. vulgaris, common Bottle-Gourd, is a musky-scented plant, and clothed with a soft down. It has a climbing stem with tendrils from 3- to 4-cleft. The flowers are stellated, spreading, and in clusters; the fruit in shape like a bottle, when ripe of a pale yellow colour, sometimes six feet in length. When dried it becomes hard, and is used to contain water; it is then of a pale bay colour. In its wild state this plant produces a poisonous fruit, and Dr. Royle states that a very intelligent native doctor informed him that cases of poisoning have occurred from eating the bitter pulp in the district where it grows. Some sailors also are said to have died from drinking beer that had been standing in a flask made from one of those gourds. These injurious effects seem however to be removed by cooking, for Don says that the poor people among the Arabians eat it boiled with vinegar, or fill the shells with rice and meat, and so make a kind of pudding of it. The pulp of the fruit is often employed in poultices: it is bitter and purgative, and may be used instead of colocynth. This species grows abundantly in Egypt and Arabia: the Arabians call it Charrah; it thrives wherever the mountains are covered with a fit soil. There are three other species enumerated by Don growing in Guinea and the East Indies.

L. idolatrica is held in great veneration by the Hindus in their religious ceremonies.

(Don, *Gardener's Dictionary*; Lindley, *Flora Medica*.)

LAGETTA. [DAPHNE, P. C.]

LAGU'RUS (from λαγώς, a hare, and οὐρά, a tail), a genus of plants belonging to the natural order Gramineæ. It has a spiked panicle 1-flowered, scarious glumes ending in a long fringed seta. The outer paleæ end in two long setæ and with a dorsal geniculated twisted awn.

L. ovatus is the only species, and has a stem from four to twelve inches in height. The leaves are broad and lanceolate, the spikes ovate and pubescent. It is found in sandy places in Guernsey and on the Continent of Europe.

(Babington, *Manual of British Botany*; Koch, *Flora Germanica*.)

LAING, MALCOLM, an historian, was born in Orkney, where he possessed a small patrimonial estate, in 1762. He received the rudiments of education at Kirkwall, and afterwards studied at Edinburgh, where he was one of the most active members of the 'Speculative Society,' an association in which many young men who became distinguished in after life first tried their prowess. In 1785 he joined the Scottish bar. He does not appear to have obtained much practice as a lawyer, and the only conspicuous occasion in which he was professionally employed seems to have been in the defence of some of the parties tried for sedition in Scotland between 1793 and 1795. He is one of the many instances where lawyers have in their works displayed peculiarly high forensic abilities, without, for some inscrutable reason, being able to rise in their profession. His first known literary effort was editing the last volume of Henry's 'History of Britain,' in 1793, after the author's death. He was charged with having spoiled the harmony of the work, as Henry's opinions were all in favour of despotic principles, while the additions made by Laing were of a democratic tendency. In 1800 he published 'The History of Scotland, from the Union of the Crowns on the accession of James VI. to the throne of England, to the Union of the Kingdoms in the reign of Queen Anne.' This was published along with two other works, the names of which appearing on the title of the History, are very characteristic of Laing's propensity to enter on disputed points in history or criticism with the spirit of a lawyer. The History as published in two volumes was accompanied by 'Two Dissertations, historical and critical, on the Gowry Conspiracy, and on the supposed Authenticity of Ossian's Poems.' Neither of these subjects came within the scope of his History—the former related to a period thirteen centuries earlier. To the second edition of his History, published in 1804, he added 'A Preliminary Dissertation on the Participation of Mary Queen of Scots in the Murder of Darnley.' He was a sagacious, honest, and able historical critic, but certainly too much inclined to take up a side in any question and to keep perpetually in view the circumstance that he was bound to defend that side. His style was harsh and formal, and sometimes obscure, from a pedantic adoption of the mode of the historical writers of his age, which evidently was not natural to him. He was for some time member of parliament for Orkney, and enjoyed the confidence and esteem of Fox. He died in 1818. His brother Samuel Laing, who has written some interesting travels, succeeded to his property.

LAMBERT, JOHN HENRY, a distinguished philosopher of Germany, was a descendant from a family which had been compelled to quit France in consequence of the persecutions caused by the revocation of the Edict of Nantes, and he was born at Mühlhausen in Upper Alsatia, August 29, 1728. He was sent to a school in the town, where he acquired the rudiments of a classical education; but the want of means obliged his father, who was by trade a tailor, to withdraw him from thence at an early age.

At home, however, the youth availed himself of every means in his power to preserve the knowledge he had acquired of the Latin tongue; and a great part of each night was spent in reading such of the Roman authors as he could procure, or in studying arithmetic and geometry: the money for the purchase of the books, and even of the candles by whose light they were read, being obtained, it is said, by the sale of drawings which he found time to execute.

A taste for literature and science in a young person so situated did not fail to attract notice; but the only immediate advantage which Lambert derived from that taste arose from the neatness which the practice of transcribing had given to his hand-writing: this qualification procured for him an appointment as a clerk in the office of a solicitor; and he was afterwards employed, in a like capacity, by an iron-master of the neighbourhood. At seventeen years of age he became the secretary of Dr. Iselin at Basle; and during the five years in which he held this situation he omitted no opportunity of extending his literary attainments. He then, also, began to acquire a knowledge of philosophy and logic by the study of the works of Locke, Malebranche, and Wolf; and he zealously cultivated the mathematical sciences, in which alone, it is observed, he found that the processes of investigation lead directly to truth.

In 1749 his patron recommended him to M. de Salis, who was then the President of the Swiss Confederacy, as a tutor to his children; and, having obtained the appointment, he went to reside with the family of that statesman at Coire. Being thus placed in a situation congenial with his taste, and having access to a considerable library—enjoying, moreover, the opportunity of conversing with learned men—he was enabled, while communicating instruction to his pupils, to study the Greek, Italian, and French languages; and particularly to advance his knowledge of optics, astronomy, and philosophy. He was admitted at this time a member of the Physico-Medical Society of Basle, to whose 'Acts' he afterwards contributed several memoirs on mathematical and physical subjects.

In 1756, Lambert accompanied two of the sons of M. de Salis to the University of Göttingen; and, proceeding from thence to Holland and France, he returned in 1758 to Coire. At Paris he had an opportunity of conversing with some of the celebrated men of the age, particularly D'Alembert and

Messier; by the former of whom he was afterwards recommended to the King of Prussia, Frederick III. He quitted the family of Count Salis in 1759, and, having been chosen a member of the Electoral Academy of Bavaria, he went to reside at Augsburg. In 1763 he was employed as one of the Commissioners in settling the boundaries between the territories of the Valais and the duchy of Milan; and in the following year, in consequence of an invitation from the King of Prussia, he proceeded to Berlin, where he passed the remainder of his life. He was elected a member of the Berlin Academy of Sciences, to whose 'Mémoires' he made many valuable contributions; and he was also appointed Chief Councillor in the department of Buildings, on the establishment of a commission for superintending the improvements of the kingdom.

While in Holland, Lambert published, at the Hague, a tract, entitled 'Les Propriétés de la Route de la Lumière,' &c. (8vo., 1758), in which he examines the path of a ray of light refracted in the atmosphere, and points out some corrections which should be made, on account of refraction, in determining the heights of mountains; and in the following year he published at Zürich one which was designated 'Freye Perspective.' But one of the most important of Lambert's works is his 'Photometria, sive de Mensura et Gradibus Luminis, Colorum, et Umbræ,' which was published both at Leipzic and at Augsburg in 1760. In this treatise the author states, from his own experiments, the quantities of light reflected from the exterior and interior surfaces of glass, and he gives formulæ for representing them. He compares the brightness of illuminated objects with that of the body which enlightens them; and he discusses the brightness of the image formed by a luminous object in the focus of a burning glass. He calculates the degrees of illumination on the different planets; and he describes instruments for measuring the intensities of differently coloured light.

In 1761 he published at Augsburg a valuable work entitled 'Insigniores Orbitæ Cometarum Proprietates,' 8vo., in which are contained a formula for determining, in a parabolic orbit, the perihelion distance in terms of two radii vectores and the difference between the anomalies, and one in which, the orbit being any conic section, the interval between two times of observation is expressed in terms of the two radii and the chord which joins their extremities. This is usually called 'Lambert's Theorem,' and it was certainly discovered by him, though Euler had, long before, given a like theorem for a parabolic orbit. In the same year Lambert published at Augsburg a small work entitled 'Logarithmische Rechenstœde,' in which are proposed some improvements on Gunter's 'Scale;' and one entitled 'Kosmologische Briefe ueber die Einrichtung des Weltbaus,' 8vo., in which he considers that the action of gravity extends to the fixed stars; and he expresses a conjecture that the solar system may be only a system of satellites with respect to some celestial body.

In 1764 was published, at Leipzig, in 2 vols. 8vo., Lambert's philosophical work entitled 'Neues Organon;' this is divided into four parts, of which the first contains the rules of thinking, and the second is on truth considered in its elements; the third is on the external characters of truth; and the fourth, on the means of distinguishing the real from the apparent. A sort of supplement to this work was published by him at Riga in 1771, in two volumes 8vo.; it is entitled Architektonik,' and treats of the metaphysics of mathematics; the subjects being Unity, Number, Dimensions, Continuity, Limits, and Infinity.

The first mathematical work which Lambert published after he went to reside at Berlin was his 'Beyträge zum Gebrauche der Mathematik und deren Andwendung' (3 vols. 8vo., 1765 to 1772). This contains some profound investigations relating to the theory of numbers, and a tract on trigonometry, with notices on what is called tetragonometry; in it are given also some remarkable propositions relating to the projections of the sphere. In the first of those years he published 'Description d'une Table Ecliptique formant un Tableau vrai de toutes les Eclipses, tant de la Lune que de la Terre;' and in 1770 appeared his 'Zusätze zu den Logarithmischen und Trigonometrischen Tabellen,' 8vo. He was joined with Bode, Schultze, and Lagrange in the publication (1776), under the direction of the Academy of Berlin, of a series of Astronomical Tables.

Lambert also wrote a tract on 'Hygrometry,' which was published at Augsburg in 1770; and he left one on Pyrometry, which was published at Berlin, in 1779, that is after his death; this last contains a biography of the author, by Everhard. Besides these works Lambert wrote numerous papers on scientific subjects, which were published in the 'Acta Helvetica' and in the 'Mémoires' of the Academy of Berlin. Among the 'Acta' are his 'Tentamen de Vi Caloris ejusque Dimensione;' a series which goes by his name, and which was afterwards generalised by Lagrange, and a 'Memoir on Vibrating Strings.' The 'Mémoires' of the Academy contain his papers on the Incommensurability of the Circumference of a Circle to its Diameter; on Human Strength; on Hydraulic Wheels; on Windmills; and on Friction. He moreover prepared two papers in which he had discussed all the known observations on Jupiter and Saturn; and these were published in the same 'Mémoires' two years after his death.

Lambert was endowed with a strong memory and a fertile and well regulated imagination: his manners were simple, and he is said, in his dress, to have disregarded the fashions of the time; but he was both esteemed and beloved by those who knew him intimately. He died Sept. 25, 1777, being then only forty-nine years of age. All the manuscripts left by him were purchased by the Academy of Berlin, and were subsequently published by John Bernoulli, a grandson of the celebrated John Bernoulli of Basle.

(The 'Berlin Mémoires.' *Biographie Universelle.*)

LA'MI, GIOVA'NNI, born at Santa Croce, in Tuscany, in 1697, studied law at Pisa, took a doctor's degree, and afterwards repaired to Florence, to exercise his profession. But his fondness for literature, and especially classical and ecclesiastical erudition, interfered with his professional pursuits, and he became an author. His first work was in defence of the Nicene Creed concerning the Trinity, and against Leclerc and other Socinian writers. Lami contended that the Nicene dogma concerning the Trinity was the same as that held by the early promulgators of Christianity in the Apostolic times. His work is entitled 'De recta Patrum Nicenorum Fide,' Venice, 1730. Lami travelled with a Genoese nobleman to Vienna, where he resided some time, and he afterwards visited France, whence he returned to Florence in 1732, where he was made librarian of the Riccardi library, and Professor of Ecclesiastical History in the Florence Lyceum. At Florence he published his work 'De Eruditione Apostolorum,' Florence, 1738, which is a sort of continuation of his former work. The Socinians having assumed that the notion of the Trinity had been derived from the 'Logos' of Plato, Lami undertook to prove, among other things, that the apostles and their first disciples were too ignorant of profane learning to be acquainted with the writings of the Greek philosophers. Lami's work also contains much miscellaneous and recondite erudition concerning the early ages of Christianity. The author treats of the style of dress, and of the manners of the primitive Christians, of the amanuenses of the apostles, and of the early translators of the Gospels and Epistles, of the apocryphal books attributed to the apostles and their disciples, and lastly he gives an historical account of the old MSS. of the Gospels, Epistles, and other parts of the New Testament which existed in the libraries of Florence.

In 1740, Lami began to publish a literary journal, entitled 'Novelle Letterarie,' which he carried on till the year 1760, at first with the assistance of Targioni, Gori, and other learned Tuscans of his time, with whom he afterwards quarrelled, and he then continued the work alone. This publication was the source of some annoyance to him, both from private animosity and from the jealousy of the censorship.

Lami made a selection of inedited works, or fragments of works, from the MSS. of the Riccardi library, of which he was keeper, and published it in a series entitled 'Deliciæ Eruditorum,' 18 vols. 8vo., Florence, 1736—69. He also edited the works of the learned John Meursius in 12 vols. folio. He wrote short biographies of many illustrious Italians of his age: 'Memorabilia Italorum Eruditione præstantium quibus vertens Sæculum gloriatur,' 2 vols. 8vo., Florence, 1743—7. He published in Greek the letters of Gabriel Severus, Archbishop of Philadelphia in Asia Minor, and of other Prelates of the Greek Church: 'Gabrielis Severi et aliorum Græcorum Recentiorum Epistolæ,' 8vo., Florence, 1754. He had undertaken to write a history of the Eastern Churches from the Council of Florence of 1439; a subject which he observed had been much neglected by writers of ecclesiastical history; but this undertaking was interrupted by Lami's death, which took place in 1770. He was buried in the church of Santa Croce; and the following sentence was engraved on his tomb: 'Doctissimo Polyhistori ætatis suæ nulli secundo.' He left all his property to the poor. Fabbroni and Fontanini wrote his biography. Besides the works already mentioned, Lami wrote satires both in Latin and in Italian, especially directed against the Jesuits, whom he strongly disliked. He also published, 1, 'Lezioni di Antichità Toscane,' 2 vols. 4to., 1766. 2, 'Richardi Romuli Richardii Vita,' Florence, 1748. 3, 'Catalogus Codicum MSS. qui in Bibliotheca Riccardiana Florentiæ adservantur,' with copious illustrations, fol., 1756, and other minor writings.

(Corniani, *I Secoli della Letteratura Italiana*, and the works of Lami above quoted.)

LA'MIUM, a genus of plants belonging to the natural order Labiatae. It has a 2-lipped corolla, the upper lip arched, lower lip trifid. The lateral lobes minute, tooth-like, or obsolete, rarely elongated. The anthers approach in pairs, and forming a cross, burst longitudinally. The calyx is 5-toothed and bell-shaped, the teeth nearly equal. This genus includes the dead, blind, and dumb nettles of our peasants, so called from their resemblance to the Urticæ in many points, except their stings.

L. amplexicaule has roundish cordate obtuse leaves, the lower ones stalked, the upper ones sessile and clasping; the teeth of the calyx are longer than the tube at length connivent, the lateral lobes of the lower lip of the corolla toothless; the nuts small, and of an obovate oblong shape. It is found in sandy and chalky fields in Great Britain, the North of Africa, and Middle Asia.

L. intermedium has reniform, cordate, obtuse leaves, and is distinguished by the teeth of the calyx being longer than their tube, hispid, and always spreading. The lateral lobes of the lower lip of the corolla with a short tooth, the nuts twice as large as those of the former species, and of an oblong shape. This species is common in Scotland, Sweden, and the North of Germany.

L. purpureum has a pale purple corolla, spotted with red, the lateral lobes of the lower lip having 2 teeth. The nuts oblong, or about twice as broad as long. It is found in Great Britain and Sweden, where, according to Linnæus, it is boiled and eaten. It was formerly used in medicine, but is not now prescribed.

L. incisum has but one tooth in the lateral lobes of the lower lip of the corolla. It is a British plant, and is likewise found in France, Germany, and Sweden.

L. album is distinguished by having the calyx teeth as long as the tube, all separated by acute angles, the upper one distant from the others. The corolla has 3 teeth, and is large and white. It was once used medicinally, but is now disregarded. Like *L. purpureum*, this species is eaten in Sweden as a pot-herb. It is found in Great Britain and the southern parts of Europe.

L. maculatum has the calyx teeth longer than their tube, the three upper ones separated from the others by broad obtuse angles; the lateral lobes of the lower lip of the corolla with one tooth. It is found in Great Britain and the continent of Europe.

L. striatum has deeply cut ovate leaves, the corolla 3 times as large as the calyx, which is glabrous. It is a native of Greece in waste places, and is supposed by Fraas to be the λευκὰς ὀρεινή of Dioscorides, 3, 103.

There are several other species of Lamium, growing chiefly in the southern parts of Europe. They are not worth cultivation for ornament, but will easily grow in any soil or situation, and are to be propagated either by division or by seed.

(Don, *Gardener's Dic.*; Babington, *Man. Brit. Bot.*; Fraas, *Synopsis Plantarum Florae Classicae*.)

LAMNA, a genus of squaloid fishes. Fossil in the chalk, London clay, &c., and recent.

LAMOTTE. [MOTTE, LA, P. C.]

LAMP. [LIGHTS, ARTIFICIAL, P. C. S.]

LANCASTER, COUNTY PALATINE OF. [PALATINE COUNTIES, P. C.]

LAND-TAX. [TAXATION, P. C.]

LANDLORD AND TENANT. [TENANT AND LANDLORD, P. C.]

LANGBAINE, GERARD, D.D., born in Westmoreland about 1608, was successively a servitor, scholar, and fellow, of Queen's College, Oxford; and he held the places of keeper of archives to the university and provost of his college for a good many years before his death, which happened in 1658. He was a studious and timid man, who contrived to steer through the political storms of his time without giving serious offence to any party. He edited Longinus, and published several works of his own, chiefly on church questions. But his chief usefulness was in his unprinted collections, which included several catalogues of manuscripts, often referred to by Warton and others.

GERARD LANGBAINE, his son, was born at Oxford in 1656, and, after having received an elementary education, was apprenticed to a bookseller in London. An elder brother dying, he was recalled home, and entered, in 1672, a gentleman commoner of University College. He betook himself however to idleness and low extravagance, and spent a great part of his property; but after a time he reformed, and retained of his earlier tastes none but his love for the theatres. He made a very large collection of old plays, amounting, as he says, to almost a thousand. He made use of these, first, in a republication of a catalogue of plays made by Kirkman, a bookseller, which appeared under the title of 'Momns Triumphans,' 1687, 4to. This work, speedily sold off, was improved into 'A New Catalogue of English Plays,' 1688, 4to. Still further additions and amendments produced his 'Account of the English Dramatick Poets,' 1691, 8vo., 1699 (by Gildon), 1719 (by Giles Jacob, for Curl). The criticism contained in this work is shallow, prejudiced, and obsequious. The author pronounces Sir Robert Howard to be an admirable poet, and prefers Shadwell's plays to Dryden's. But, in relating facts and describing editions, he scrupulously sets down what was before him; and although the information he gives is very incomplete, his work is the most trustworthy of our catalogues of the kind, and has been of very great service. In the British Museum is a copy of it with valuable notes by Oldys. He published also an appendix to a catalogue of graduates.

LANGELAND, ROBERT. [LONGLAND, ROBERT, P.C.]

LANGSDORFIA. [RHIZANTHEÆ, P. C. S.]

LANIERE, NICOLAS, a painter, engraver, and musician, who was a favourite with Charles I. He was born in 1568, and was an Italian by birth. Laniere, says Walpole, 'understood hands,' by which he means that he was well conversant with the handling of various masters, and was a fit person to employ in the purchase of pictures, and for which purpose Charles employed him. Walpole supposes he was employed in the purchase of the gallery of the Duke of Mantua, for which Charles gave 20,000*l.*—it comprised the Triumph of Cæsar, by Mantegna. [HAMPTON COURT PICTURE GALLERY, P. C. S.]

Laniere was a better musician than a painter. He was appointed in 1626 Charles's chapel-master, for which he had a salary of 200*l.* per annum: he was also closet-keeper to Charles. There is in Ben Jonson's works a masque, which was performed in 1617 at the house of Lord Hay, for the entertainment of the French ambassador, and for which Laniere both painted the scenes and composed the music. He also set to music the hymn which was written by Thomas Pierce for the funeral dirge of Charles I.

Laniere lived to see the dispersion of the collection which he himself had been mainly instrumental in forming. He purchased four pictures at the sale of Charles's effects, for 230*l.*: others were purchased by his brothers Jerome and Clement. Laniere appears to have been a general dealer in pictures, and, according to Sanderson (*Graphice*, p. 16), to have been not over scrupulous, for that writer accuses him of passing copies as originals: the colours were obscured by soot, and he cracked the pictures by rolling them up face inwards. He purchased many pictures for Charles, and marked them with a rosette or a small figure resembling six radiating leaves—the mark is given by Walpole. Walpole buries Laniere on November 4, 1646, overlooking the somewhat glaring inconsistency of making him write the music to Charles's funeral dirge three years after his own burial: the date is not a misprint, because Walpole adds his age—seventy-eight years; still it ought probably to be 1649 or 1656. The date of Laniere's birth (1568) is correct, because in an engraving dated 1636 he writes himself at the juvenile age of sixty-eight—'à l' eta sua giovanile di sessanta-otto anni.' Vandyck painted Laniere's portrait during his first visit to England, and it was this picture which induced Charles I. to request Sir Kenelm Digby to invite Vandyck back again after his departure. There is a portrait of Laniere by himself in the Music School at Oxford, with palette and brushes in his hands, and some music-notes on a piece of paper.

(*Essay towards an English School; English Connoisseur*, &c.; Walpole, *Anecdotes of Painting*, &c.)

LANKESTER, JOSEPH. [SCHOOL, PRIMARY, P. C.]

LANNES, JEAN, Duke of Montebello and Marshal of France, was born at Lectoure in Guienne, on the 11th of April, 1769, a year rendered remarkable by the birth of Napoleon, the Duke of Wellington, and Marshals Ney and Soult. He was born of humble parents, and was at first brought up to the trade of a dyer, which he quitted in 1792 to join a battalion of volunteers raised in the department of Gers, of which he soon became sergeant-major. His first campaign was with the army employed on the frontiers of the Pyrenees, where his resolute character and soldier-like deportment obtained him a great ascendancy over his comrades. His military talents were soon discovered and appreciated, and by the suffrages of the army be rose so rapidly in command, that at the close of the year 1793 he had attained the rank of 'chef de brigade,' which nearly corresponds to that of major among the English troops. After the political crisis of the 9th Thermidor (July 27th), 1794, he partook in the disgrace of the Generals Bonaparte and Massena on account of their connection with the younger Robespierre; he then retired to Paris, where he formed an acquaintance with those two distinguished commanders, whose future glories he was destined to share. His calm and daring character especially attracted the notice of Bonaparte, who employed him in the affair of the Sections [Bonaparte, P.C.], and he afterwards with him joined the army of Italy. After the victories of Montenotte and Millesimo, April 26th, 1796, where he greatly distinguished himself, he was made colonel of the thirty-second demi-brigade, in the place of the gallant Rampon, who was raised to the rank of general. Among his many daring exploits in this celebrated campaign, at the crossing of the river Po, he was the first with a few grenadiers to arrive at the opposite bank; and likewise, on the bridge of Lodi, he was foremost in effecting the perilous passage. In 1797 he became general of brigade, in which capacity he served with distinction till the signing of the treaty of Campo Formio. [Campo Formio, P. C.] He afterwards formed part of the expedition to Egypt, where he rose to the rank of a general of division, and maintained his high reputation. He greatly contributed to the victory gained by the French at Aboukir, and was dangerously wounded at the siege of Acre.

When Bonaparte determined upon leaving Egypt, Lannes was one of the generals chosen to accompany him to France [Bonaparte, P. C.; Kleber, P. C. S.], where he rendered him material assistance in the revolution of the 18th Brumaire (November 9th), 1799, and as a recompense for his services on that occasion he was named commander of the Consular guard. He was afterwards employed in the south of France, at the head of the ninth and tenth military divisions, to suppress the insurgent Jacobins. From thence he was recalled by the First Consul, in the year 1800, to join the expedition to Italy, and he shared the dangers and labour which the French army underwent in crossing the Great St. Bernard. In this passage Lannes commanded the advanced guard, and on the 17th of May he arrived at Châtillon, where he attacked and defeated a corps of 5000 Austrians. On the 12th of June was fought the important battle of Montebello, in which the Austrians were signally defeated, and five thousand prisoners and six pieces of cannon were taken. The impression made on the mind of Napoleon of Lannes' skill and courage on this occasion was so great, that, some years afterwards, Montebello was the title chosen for the dukedom to which he was raised. After the battle of Marengo, in which he likewise greatly distinguished himself, he received a sabre of honour, and was selected to present to the government at Paris the standards that had been taken from the Austrians.

In 1801 he was sent to Lisbon by the First Consul in the capacity of minister plenipotentiary of France, a character for which his previous habits scarcely fitted him. The blunt frankness of a soldier, joined to his natural impetuosity of disposition, but ill accorded with the close reserve of conduct so essential in a diplomatist. This very defect however proved of service to the cause in which be was employed, and his determined bearing obtained from the feeble government of Portugal every measure which Napoleon at that time required. Several characteristic traits of General Lannes' behaviour at the court of Lisbon are to be found in the interesting Memoirs of the Duchess of Abrantes (Madame Junot), whose husband was sent to supersede him as ambassador.

On his return from Portugal in 1804, Napoleon, who was now emperor, created him Marshal of the Empire, and afterwards Duke of Montebello. In the Austrian campaign of 1805 Lannes was appointed to the chief command of the left wing of the French army, and was present at the battle of Wertingen, and at the taking of Braunau (October 29th, 1805). In the great and decisive battle of Austerlitz, December 2nd, 1805, where he manifested his usual courage and gave proof of increased skill and judgment, he had two of his aides-de-camp killed by his side.

In the Prussian campaign of 1806 and 1807 he performed many brilliant achievements: at the siege of Danzig he rendered, together with Oudinot, material assistance to Marshal Lefebvre, who commanded the besieging army, and he narrowly escaped death at the battle of Jena. [Lefebvre, P. C. S.] In June, 1807, a few months subsequent to the battle of Eylau, an unsuccessful attempt was made by Lannes upon the intrenched camp of Heilberg, and it occasioned a serious dispute between him and the Grand Duke of Berg (Murat), which gave rise to an incident showing the freedom with which he was accustomed to address Napoleon, whom, on this occasion, be openly accused of manifesting an undue partiality to his brother-in-law. The scene of bitter altercation between the emperor and his lieutenant is described with dramatic effect by the Duchess of Abrantes (*Mém.*, ix. 369-372), who however, according to Alison, erroneously states it to have taken place immediately after the battle of Eylau.

In the year 1808 Lannes accompanied Napoleon in the Peninsular campaign, and had the command of the third corps of the army. In crossing the mountains near Mon Dragon he met with an accident which might have proved fatal but for the skill of that eminent surgeon Baron Larrey (*Mém. de Larrey*, tom. iii. p. 243). In the battle of Tudela (November 23rd, 1808), at which Lannes was present, the Spaniards under Castaños were completely defeated, and seven standards, thirty pieces of cannon, and upwards of three thousand prisoners fell into the hands of the French. Lannes was afterwards appointed to the chief command of the army besieging Saragossa, and it was there especially that the influence of his military talents was felt and appreciated. For fifty days without intermission the French army had fruitlessly fought and laboured; he found the soldiers suffering from privations of every kind and deeply dispirited. They complained to him that, though the nature of the siege required at least fifty thousand men, they were only twenty thousand; that not more than a fourth part of the town was in their possession, and that, unless reinforcements arrived, they must perish under the ruins they had themselves occasioned. The details of this remarkable siege are eloquently and graphically described in General Napier's valuable History of the Peninsular War, vol. ii. c. 2, and also in art. Saragossa, P. C. On the 21st of February, 1809, the city was entered by a general assault, and from twelve to fifteen thousand of its courageous defenders, who were reduced to the lowest state of weakness by the sufferings and privations they had endured, laid down their arms. After the fall of Saragossa, Lannes returned to France, with the intention of spending some time upon his estate in the neighbourhood of Paris, but after a few weeks the second war with Austria broke out, and he was again called to share the fortune of his master on the field of battle.

In this campaign he had the command of the second corps of Napoleon's army, composed of fifty thousand men. At the battle of Eckmühl [Eckmühl, P. C.], April 22nd, 1809, his services proved of the greatest value. It was the intention of the French emperor to cut off the communications of the Austrians with the Iser and the Inn, and, by throwing them back upon Bohemia, to prevent them from defending Vienna. For this purpose he commenced the attack by advancing the right wing of his army under Lannes, together with part of Davoust's corps, to attack the Austrian left. This movement, which Lannes most skilfully conducted, was perfectly successful, and the enemy was driven back in confusion. His bravery also displayed itself in subsequent parts of this important battle, and he contributed greatly to the final issue, which was favourable to the French. The day after this engagement, in the assault on Ratisbon, Lannes, who conducted the operations, gave proof of a similar prowess to that which distinguished Bonaparte when he triumphantly bore the French standards on the bridge of Arcola. [Arcola, P. C.] Having perceived a large house which was situated against the ramparts of the town, he had caused several guns to play against it, and a breach was formed by which access might be gained to the summit. A heavy fire however was kept up from the ramparts, which rendered the crossing of the glacis extremely hazardous to the besiegers, and for some time no soldier could be found sufficiently bold to face the danger. The marshal at length, impatient at the delay, seized a scaling-ladder, and hastened forward through the thickest part of the shower of the enemy's balls. He was instantly followed by his men, whom the gallant spectacle of their leader's courage had animated, and, by this daring and decisive measure, the breach was quickly passed, and the town was gained.

The last but not least noble exploits of this distinguished general were the defence of the village of Essling, in the sanguinary battle which has been named from it, and the grand attack on the Austrian centre, which, though unsuccessful in its results, was conducted by Lannes with great skill and courage. When the French had been compelled to retire to the island of Lobau, their wearied bands were attacked by fresh troops, which the Archduke Charles brought up in constant succession in order to dislodge them from their position. Lannes, with the intention of resisting this attack, posted those of his soldiers on whom he could place most reliance in the rear of the columns, and supporting them with the troops which the emperor had sent to his assistance, seconded by Masséna, he checked the advancing numbers of the Austrians. The French had reserved their fire till the enemy had approached within a few yards of them, and then commenced a most deadly struggle. At that critical moment Lannes had dismounted from his horse, that he might be less exposed to the sweeping fire of the Austrian artillery, when he was struck by a cannon-ball, which carried away the whole of his right leg and the foot and ankle of the left. Napoleon was directing the position of some batteries, when he beheld the almost lifeless body of his heroic marshal borne off from the battle. The last scene in the life of Lannes has been very differently related, and some of these relations bear the impress of improbability and exaggeration. The description given of it by Alison, which is chiefly derived from the accurate narratives of Pelet, Savary, and Thibaut, is that which appears most consonant with truth. As Napoleon approached the litter which contained the shattered remains of his heroic companion, Lannes had still sufficient strength remaining to seize his hand, and, with a voice weakened by loss of blood, to bid him a last adieu. 'Live,' said he, 'for the sake of the world, and bestow a few thoughts on one of your best friends, who is shortly to be no more.' Beside the litter of his early friend, of the sharer of his perils, and the partaker of his fortunes, knelt and wept the conqueror of Europe. 'Lannes,' he exclaimed, 'do you know me? it is the emperor, it is Bonaparte, it is your friend; you will surely yet be preserved to us.' 'To live in order to serve you and my country is my wish,' he replied, 'but in an hour I shall be no more.' On no occasion had Napoleon evinced such deep emotion. 'Nothing,' he observed to Masséna, 'but so terrible a calamity could have withdrawn me for a moment from the care of the army.' Critical indeed were the circumstances in which that army was then placed, and the fate of Napoleon's empire was depending on the issue; but seldom can ambition, even amid its highest efforts, stifle the genuine emotions of the heart. For nine days Lannes lingered in the most agonizing sufferings, during which he was constantly visited by the emperor, and on the 31st of May, 1809, he expired. At the same time had fallen with him the brave General St. Hilaire, whom, like Bayard, the army had styled 'the knight without fear and without reproach.'

Lannes, unlike many of Napoleon's generals, had acquired a constantly increasing military reputation. In the first part of his career courage predominated over judgment; but experience was daily producing in his mind a more just equilibrium between those two qualities so essential to a commander. 'I found him a dwarf,' said the emperor to Las Cases, 'and I lost him a giant.' And in another conversation with this faithful companion of his exile, he remarked of this marshal that 'he had great experience in war, having been in fifty-four battles and three hundred combats. He was cool in the midst of fire; possessed of a clear penetrating eye, ready to take advantage of any opportunity which might present itself. Violent and hasty in his temper, even in my presence, he was however ardently attached to me.' His chief fault was a carelessness of the future, too common among the soldiers of that period; a large sharer in the rewards which Napoleon so lavishly bestowed upon his generals, he was as prodigal of his means as of his blood. But to his credit it must be remarked, that a considerable portion of his gains went to the relief and support of his poorer companions in arms.

Lannes had married Mademoiselle Louise de Ghéhénuec, a young woman of exquisite beauty and prepossessing manners. When she became a widow, Napoleon evinced by the most assiduous attention to her the high respect he bore for the memory of her distinguished husband. She was afterwards appointed a lady of honour to the Empress Maria Louisa. The present Duke of Montebello, Lannes' eldest son, has married an English lady, Ellen, the daughter of Charles Jenkinson, Esq.

The Military Life of Lannes, written by Mons. René Perin, was published at Paris, in 1810.

(Alison, *Hist. of Europe*, vol. iii. and vii.; Las Cases, *Mémorial de St. Hélène*, vol. ii.; *Mémoires de la Duchesse d'Abrantes*; 'Court and Camp of Napoleon,' Murray's *Family Library*; *Dict. Hist. des Batailles*, 4 vols., Paris, 1818; *Biographie Universelle*, &c., deuxième partie, Paris, 1829; *Biographie Moderne*, Paris, 1815; Napier, *Hist. of the Peninsular War*.)

LANTERN. [SKYLIGHT, P. C.]

LANTERN, MAGIC. [MAGIC LANTERN, P. C. S.]

LANZARO'TE, one of the Canaries, lies about seventy miles from Cape Juby on the western coast of Africa, between 28° 52′ and 29° 15′ N. lat., and 13° 30′ and 14° W. long. It is separated from the island of Fuerteventura, which lies south of it, by a strait which is from four to six miles wide, and called La Bocayna. Lanzarote extends in a north-east and south-west direction about thirty-one miles, with a breadth varying between five and ten miles. The area is estimated at 325 square miles, or about forty miles more than the county of Middlesex.

North of Lanzarote are five small islands: the largest are Alegranza and Graciosa, which are inhabited, and produce barilla and orchilla; the others are only rocks. The strait which separates Graciosa from Lanzarote is called El Rio; it is in most parts rather more than a mile wide, and is the most spacious and only safe port for large ships in the Canaries, but useless as a harbour for trade, because the coast of Lanzarote rises here with basaltic cliffs almost perpendicularly to the height of 1500 feet. The mountain mass to which these cliffs belong contains an extinct volcano, called La Corona, whose edges rise to the elevation of 1958 feet above the sea. From this point the rocky mass gradually descends southward, and is furrowed by a few wide valleys which open to the south-west, and in which palm-trees and fig-trees abound. It terminates in an extensive sandy plain, which surrounds Teguise, the capital of the island. West of this place the country is covered by numerous hills surrounded by fields of lava. All these hills have a conical form, consist of scoria and ashes, and have craters. These hills were formed by a terrible eruption which took place in 1730. Such masses of lava were thrown out by them, that one-third of the island, and that the most fertile portion, was converted into a stony waste. The streams of lava ran into the sea, owing to which the whole western shore is precipitous in the extreme, with the exception of one little bay called Janubio, where was once a harbour for small vessels, which by the eruption was converted into a salt-water lake. The eastern shores are neither so steep nor so high, and there are many tracts of fertile ground. The highest land, called Montana Blanca, liest to the east of the lava tract, nearly in the centre of the island; it rises to 2000 feet above the sea, and is cultivated to the summit.

The climate is exceedingly hot, especially during certain seasons, when the south-eastern winds, having passed over the Sahara, extend to the island: these winds frequently bring hosts of locusts with them. In spring and the early part of the summer northern and north-eastern gales are frequent; they last for several days, and blow with such violence as to prevent the growth of trees, which are only found in the valleys of the northern tract, where they are protected by the high ground north of them. Rain is scarce, and the crops are uncertain. A drought which lasted from 1768 to 1771 compelled nearly the whole population to emigrate; the water in the cisterns had entirely dried up. There is only one spring on the island, and even that is inaccessible.

Wheat, barley, Indian corn, and potatoes are extensively cultivated. In some parts are large vineyards; the grapes are of a superior flavour, and the wine of Lanzarote is preferred to that of the other islands. The most important production is the barilla, which is obtained from the Mesembryanthemum crystallinum: this plant is indigenous, but has also become the object of extensive cultivation. In several places orchilla is gathered. Cattle are numerous, but very small: they are only kept for agricultural labour. Very few horses and mules are kept; but there are many dromedaries and asses. There are many goats and sheep. There are few hogs. On the strait called El Rio salt is made, and a considerable quantity is exported to the other Canaries.

The population is estimated at about 18,000 individuals. They are strong built, and of a dark complexion. Many have black curly hair, and some features which prove that the antient Spanish settlers have intermarried with the Moors and negroes of Africa. The inhabitants are mostly occupied with cultivating the ground; but several families gain their livelihood by fishing. Three vessels on an average are annually sent to the coast of Africa, where the fishing-ground extends from Cape Bojador to Cape Blanco; each vessel makes between eight and nine voyages, and has a crew of from thirty to forty men. They take chiefly cod and bream, and salt them. Salt-fish constitutes the principal food of the population.

The capital is Teguise, a small place consisting of about two hundred houses scattered over a small hill. On the eastern shore is the harbour, called Puerto de Naos, a small but secure harbour, formed by several rocky islets; it has two entrances, the northern has a depth of twelve feet, and the eastern of seventeen and a half at low-water, with a nine-feet rise of tide. The town of Arrecife is situated immediately to the southward of the port. It has several large houses and spacious streets. The population is 2500.

No foreign goods are allowed to be imported. The island receives them from Teneriffe and Grand Canaria. But English and American vessels resort to Puerto de Naos to export barilla and orchilla. The exportation of the first-named article amounts annually to 3500 tons, and that of orchilla to two or three hundred hundredweight. The number of foreign vessels visiting annually the island is stated to vary between twenty-five and thirty. Lanzarote exports to Teneriffe and Palma considerable quantities of grain, brandy for the West Indies, cattle for slaughtering, and salt. The imports consist of timber and firewood, besides foreign articles. From the small port of Papagayo, near the southern extremity of the island, a large quantity of brandy is sent to Fuerteventura, whence dromedaries, sheep, and cattle are received in return.

Lanzarote was the first of the Canaries which submitted to the Spaniards. They took possession of it in 1404. In the sixteenth and seventeenth centuries it was frequently laid waste by the Moors from the coast of Africa. This circumstance, with the terrible eruption of 1730, and the great dearth in 1768 to 1771, prevented the inhabitants from improving their agricultural condition. But in the middle of the last century the culture of the barilla plant was introduced, and since that time the condition of the population has improved.

(Humboldt, *Voyage aux Régions Equinoxiales du Nouveau Continent*; Von Buch, *Physikalische Beschreibung der Canarischen Inseln*; Arlett, *Survey of some of the Canary Islands*, &c., in *London Geographical Journal*, vol. vi.; Mac Gregor. *Die Canarischen Inseln nach ihrem gegenwärtigen Zustande*.)

LAPO, ARNOLFO DI, the name by which a very celebrated and one of the most early of the Italian architects is known. He is so called by Vasari, and is said by him to have been the son of Lapo, a German, whose real name was Jacob, and who was sometimes called in Florence Jacopo Tedesco, but more frequently Lapo. This Lapo, who executed many works in Florence, died there, according to Vasari, in 1262.

Recent researches however have shown that Arnolfo and Lapo were not otherwise connected further than that they were contemporaries in Florence. Arnolfo was the son of Cambio, a native of Colle, and, according to Vasari, was born in 1232. Arnolfo did for building, says Vasari, what Cimabue did for painting: he was the pupil of Cimabue in design. He was the greatest architect of his time in Florence, and was the architect of many important works. The walls of Florence, which were erected in 1284, were planned by Arnolfo. He built the hall of Or. San Michele, the old corn-market; the loggia and piazza de' Priori; and in 1294 he laid the foundations and built the great church of Santa Croce, now celebrated for its many magnificent monuments of distinguished Florentines. But his greatest work is the church of Santa Maria del Fiore, or the Cathedral of Florence, of which he laid the foundations in 1298, or, according to some accounts, in 1294. He raised the walls of the whole church, and covered part of it in, but the vast dome is the addition of Brunelleschi; it stands however on the foundations of Arnolfo, who also, according to his model, had intended to erect a dome in the centre, though lower and of less dimensions than the enormous pile of Brunelleschi, which is one of the largest domes in the world, and but little less than the gigantic vault of St. Peter's, which is an imitation of it. [DOME, P. C.] The models of Arnolfo and Brunelleschi are now both lost. For the erection of this immense church, a tax of two-pence per head was levied annually upon the citizens of Florence, and they were encouraged also by indulgences to make donations to its building-fund. The external marble facing of the walls is the work of Arnolfo. The old municipal palace, the Palazzo della Signoria, which still exists as a part of the old palace of the Florentine princes, in the Piazza Granduca, was also built by Arnolfo. And there are works by him in other Italian cities: he executed in 1285 the marble tabernacle of the Basilica of San Paolo, without the walls, at Rome; and shortly before 1290 he designed and executed the monument of the Cardinal de Braye in the church of San Domenico at Orvieto.

Arnolfo died, according to Vasari, in 1300, aged therefore sixty-eight, and not sixty, as Vasari says, if the year of his birth as given by Vasari himself be correct. Arnolfo's portrait by Giotto is in the picture of the death of San Francesco, in the church of Santa Croce at Florence: it is one of the group of figures conversing together in the foreground.

(Vasari, *Vite de' Pittori*, &c.; Richa, *Delle Chiese di Firenze*; Rumohr, *Italienische Forschungen*.)

LAPPA, a genus of plants belonging to the natural order Compositæ, the sub-order Tubulifloræ, the tribe Senecionideæ, and the sub-tribe Carduineæ. It has an equal and many-flowered homogamous head, a globose involucre, with imbricated coriaceous scales. The receptacle is rather fleshy, flat, and with stiff fringes. The corollas are 5-cleft, regular, and with a 10-nerved tube. The stamens have papillose filaments, with anthers terminating in filiform appendages. The fruit is oblong, laterally compressed, smooth, and transversely wrinkled.

L. minor has a tapering fleshy root, an erect stem, 3 feet or more in height, solid, leafy, round, and with many wide-spreading branches. The leaves are stalked, broad, heart-shaped, and being 3-ribbed at the base, somewhat hoary and downy beneath. The florets are axillary, with their anthers and stigmas purple. When in flower the involucre readily breaks from the stalk, and is known in the country by the name of a Bur. It adheres to the coats of animals and the hair and clothing of those who pass by, and it is almost impossible to become free from it without breaking the scales asunder and scattering the fruit. The root is reckoned tonic, aperient, and diuretic. It has had some reputation in the form of a decoction in rheumatism and diseases of the skin. Sir Robert Walpole recommends it as a remedy in gout, and some have used it as an excellent substitute for sarsaparilla. The fruit is bitter and slightly acid, and has been prescribed as a diuretic. It grows in waste places throughout Europe and the West of Asia.

L. major and *L. tomentosa* are species which are found in Germany and Switzerland, but are not used in the arts or in medicine.

(Lindley, *Flora Medica*; Koch, *Synopsis Floræ Germanicæ*.)

LA'PSANA, a genus of plants belonging to the natural order Compositæ, the sub-order Liguliforæ, the tribe Achoraceæ, and the sub-tribe Lampsanæ. There is but one British species of this genus—

L. communis, Nipple-wort. It has dentate or lobed stalked leaves, the lower leaves lyrate; the involucres glabrous and angular; the stem panicled. The stem is from one to three feet in height, branched above, with yellow small-headed florets. It is found in waste uncultivated land, and derives its common name from its reputation in village medicine, as a soothing application to inflamed nipples, and is used in many of our provinces as an external application in wounds and ulcerations.

L. fœtida is a species of this genus, which grows in Switzerland and the regions of the Alps.

(Babington, *Manual of British Botany*; Koch, *Synopsis Floræ Germanicæ*.)

LAPSE. [BENEFICE, P. C.]

LARDIZA'BALA, a genus of plants belonging to the natural order Menispermaceæ, and named by Ruiz and Pavon after Michael Lardizala, of Uribe, a Spanish naturalist. It has diœcious or polygamous flowers. The sepals and petals disposed in a ternary order in 2 or 3 series. The stamens 6, monadelphous. Berries 3- or 6-celled, the cells many-seeded. The pulp of the fruit sweet and eatable. It has leaves 2-3 ternate; the leaflets oblong, acute, unequal at the base, a little toothed; two large unequally cordate bracts situated at the base of the peduncle. This plant is a twining shrub, a native of Chili in woods at Concepcion, also in Peru about Arauco It has an eatable fruit, which is gathered and sold in the markets of Chili and Peru. The pulp of the fruit is sweet and grateful to the taste. It is called in Peru *Aguil-boguil* and *Guilbogui*; and in Chili by that of *Coquilvochi*. *L. triternata* and *L. trifoliata* are climbing plants, natives of Chili and Peru, but their fruits are not eaten.

(Don, *Gardener's Dictionary*.)

LARREY, DOMINIQUE-JEAN, BARON, was born at Beaudeau, near Bagnères de Bigorre, in France, in July, 1766. He studied the elements of medicine and surgery at the hospital at Toulouse, under the direction of his uncle Alexis Larrey, who practised medicine in that city. In 1787 he went to study his profession in Paris, and obtained the appointment of surgeon to the frigate Vigilante, in which he visited North America. He returned to Paris at the commencement of the Revolution, and in 1792 joined the French army which was then carrying on its operations on the Rhine. Here he distinguished himself by the invention of the *ambulances volantes*, by means of which the wounded, being first dressed, were carried off the field of battle, even under the fire of batteries. He was at the siege of Toulon, where he became acquainted with Napoleon Bonaparte, who was then a lieutenant of artillery. In 1796 he was appointed a professor in the school of medicine and military surgery at Val de Grace. In 1798 he accompanied the French army with Napoleon to Egypt, and on his return published an historical and surgical account of the expedition, with the title 'Relation historique et chirurgicale de l'Expedition de l'Armée d'Orient en Egypte et en Syrie,' 8vo., Paris, 1803. From this time he was advanced to various honourable positions; after the battle of Wagram he was made a Baron of the Empire, and in 1812 he was made surgeon-in-chief of the imperial army. 'He liked,' says Mr. Arnott, in the Hunterian oration for 1841, 'to be called by the title of nobility which he had earned, nor was this a childish vanity; for he knew that neither the chance of birth nor the favour of a court had made him a baron, but that the dignity had been bestowed by a discriminating hand which never conferred honours upon incompetency or inefficiency.'

An anecdote is related of Larrey which shows his courage, and proves that he did not obtain the good graces of the Emperor by any sacrifice of character. After the battles of Bautzen and Würchen it was suggested to Bonaparte that the number of the wounded had been increased by voluntary mutilation. He immediately ordered that the suspected, to the number of 1200, should be separated from the rest to be examined by the surgeons, and if found guilty they should be shot. Nobody doubted the guilt of the parties, and great anxiety was shown to put the sentence into execution, when Larrey demanded time to examine the suspected persons accurately, and he reported that all the accused were innocent. He addressed a report to this effect to Napoleon, expecting that his dismissal would follow. The contrary was the case, for Napoleon sent him a letter in return with a present of 6000 francs, and the warrant of a pension of 3000 to be paid from his own privy purse. Napoleon bequeathed to Larrey at his death 10,000 francs, at the same time expressing his conviction that 'Larrey was the most virtuous man he had ever known.'

Larrey published many works besides that above referred to, which contain a great mass of valuable surgical observations. One of his earliest publications was his 'Dissertation sur les Amputations des Membres à la suite des coups de feu, étayée de plusieurs operations,' Paris, 1796. In this work he demonstrated the necessity of immediate amputation after gun-shot wounds, and clearly pointed out the cases in which it was indicated. The propriety of such a practice had been previously suggested, but it is to Larrey that we are indebted for carrying it largely into effect. It was at one time the practice of surgeons, in all cases of mortification, to wait, previously to performing amputation, for the line of demarcation to form between the diseased and sound parts. Larrey proved that in cases of gun-shot wounds, the best practice consisted in operating immediately after the receipt of the wound.

In addition to these works he published 'Mémoires de Chirurgie militaire et Campagnes,' 8vo., Paris, 1812; 'Recueil de Mémoires de Chirurgie,' 8vo., Paris, 1821. A multitude of papers scattered throughout the medical and surgical journals of France, the Bulletins of the Academy of Paris, and other volumes, on almost every department of surgery, bear testimony to his industry and talent, and the enlightened principles on which he based the practice of his profession. Some of these have been translated into most of the languages of Europe, and have obtained for Larrey a first position amongst modern surgeons. He died at Lyon, on the 25th of July, 1841.

(*London Medical Gazette*, 1841; Kallisen, *Medicinisches Schriftsteller-Lexicon*; *Lancet*, 1841.)

LASER. [SILPHIUM, P. C.]

LASERPITIUM (the name of the antient Silphium), a genus of plants belonging to the natural order Umbelliferæ. It has a calyx with a 5-toothed rim; the petals obovate, emarginate, with an inflected lobe; the fruit compressed from the back, or somewhat taper, 8-winged, that is, the half-fruits with five primary filiform ridges, and four winged secondary ones; a vitta in the channel below each secondary ridge. The species are herbaceous plants, with 2-3-pinnate leaves, and entire toothed or cut segments; many-rayed showy umbels; the involucres many-leaved; the flowers white, rarely yellow.

L. glabrum, glabrous Laserwort, has bipinnate leaves, quite glabrous in every part; the leaflets obliquely cordate, here and there mucronate and toothed; leaves of the involucre setaceous; wings of the fruit equal, rather curled. This plant is a native of mountainous districts of Europe in dry and stony places. It attains a height of one or two feet on the Alps, but in cultivation is a much larger plant. The root is filled with a gum-resin, which is acrid, bitter, and even somewhat caustic. It is said to be a violent purgative. The French call it *Turbith aux Montagnes* and *Faux Turbith*.

L. Siler has bipinnate quite glabrous leaves; leaflets lanceolate or oval, quite entire, mucronate, sometimes confluent, and then 3-lobed; the leaves of the involucre and involucels linear-lanceolate, slightly awned, acuminate, the wings of the fruit narrow. It is a native of the mountains of the middle and south of Europe. The root is extremely bitter, and yields an aromatic resinous substance which has been supposed to be the Silphion or Laser of the antients. [SILPHIUM, P. C.; LASER, P. C.] *L. Siler* is supposed by Fraas to be identical with the λιγυστικόν of Dioscorides, 3, 51. Sibthorp found this plant in Greece. *L. gummiferum*, a native of Portugal and Spain, also yields a gum-resin. There are several other species of Laserpitium described, and many of them yield a gum-resin, which is one of the secretions of the order to which they belong.

(Lindley, *Flora Medica*; Don, *Gardener's Dictionary*; Fraas, *Synopsis Plantarum Floræ Classicæ*.)

LASTREA, a genus of Ferns, belonging to the tribe Aspidieæ. It has a reniform indusium attached by the sinus, the veins distinct after leaving the midrib, and not uniting with those of the adjoining pinnule.

The following species of this genus are described in Babington's 'Manual of British Botany:' *L. Thelypteris* (Marsh Fern); *L. Oreopteris* (Sweet Mountain Fern); *L. Filix Mas* (Male Fern); *L. cristata*; *L. rigida*; and *L. dilatata*. For the properties, &c. of the more important of these species see ASPIDIUM, P. C. S.

LATHE. [TURNING, P. C., p. 418; EARTHENWARE, P. C., p. 244; POTTERY, P. C., pp. 472, 473.]

LATHY'RUS. [VICIEÆ, P. C.]

LAVATE'RA (in honour of the two Lavaters), a genus of plants belonging to the natural order Malvaceæ. It has numerous styles, a double calyx, the outer one being three-leaved, the inner five-leaved; the capsules orbicular and many-celled; the cells circularly arranged, and one-seeded.

L. arborea (Tree Mallow) has a woody stem, the leaves seven-angled, plaited, and downy; the pedicels aggregate, axillary, one-flowered, and much shorter than the petiole. It is a native of Italy, Spain, Portugal, the north of Africa, and the Canary Islands, on maritime rocks; also in Britain, in the Isle of Wight, on Portland Island, in Cornwall, and Devonshire. It is the Μαλάχη of Theophrastus (*Hist. Pl.*, i. 5; i. 14).

L. Neapolitana has an herbaceous scabrous erect stem, with roundish seven-nerved leaves, and seven blunt crenated lobes; the pedicels axillary and aggregate, the involucel shorter than the calyx, the lobes of the calyx acuminated. The flowers are blue with obcordate petals. This species is a native of Naples, by the sea-side, and is much cultivated in our own gardens as an ornamental plant.

L. Olbia has a shrubby stem, rather scabrous, from distant fascicles of hairs; the leaves are soft, woolly, five-lobed, the upper ones three-lobed, with the middle lobe elongated; the uppermost leaves are oblong, almost undivided, the flowers solitary and sessile. It is a native of Provence, in hedges about D'Hières.

None of the species of Lavatera are of any importance or value, excepting as ornamental plants. Many of them are hardy, easily cultivated, and well adapted for shrubberies. The greenhouse and frame species will thrive well in a mixture of loam and peat, or any light soil; they may be planted out during the summer against a south wall, and if protected in the winter by a mat, will generally survive throughout the year. The perennial species grow in any kind of soil, and may be propagated either by dividing the plants at the root or by seeds. The annual and biennial kinds should be sown in the open border during the spring. The species chiefly worth cultivation in gardens are *L. Olbia*, *flava*, *unguiculata*, *Neapolitana*, *Cretica*, *Lusitanica*, and *trimestris*.

(Don, *Gardener's Dictionary*; Babington, *Manual Brit. Bot.*; and Fraas, *Synopsis Plantarum Floræ Classicæ.*)

LAW, CRIMINAL. The object of the English as of every other system of Criminal Law is the prevention of injuries by the terror of punishment; but it is not every injury the commission of which the law thinks fit to prevent by such means; in most cases it is satisfied with the redress of injuries after they have been committed, by either restoring the party injured to his right, where that is possible, or by giving him compensation in damages. In law, an injury is any violation of a legal right or omission of a legal duty: a crime, then, may be defined to be such a violation of a legal right or omission of a legal duty as subjects the person guilty of it to punishment. Such acts or omissions for which the law affords redress only have, in England, been usually denominated civil injuries as contradistinguished from crimes. It is to be observed however, that, in strictness, every crime includes an injury, in respect of which some individual or the public may be entitled to redress. In felony, indeed, such injury is said to be merged in the crime; but this doctrine appears to have originated in the circumstance of all felonies having, with one or two exceptions, been originally punishable with death and having worked a forfeiture of all the offender's property, and so rendered redress impossible.

Crimes, according to the English law, are divisible into two great classes, which depend upon the mode of proceeding peculiar to each, viz. into

1st. Such as are punishable on indictment or information (the common law methods of proceeding).

2ndly. Such as are punishable on summary conviction before a justice or justices of the peace or other authorized persons, without the intervention of a jury (a mode of proceeding derived entirely from special statutory enactments).

It is proposed, in the first place, to treat of offences punishable on indictment or information, and afterwards to shortly refer to those punishable on summary conviction.

Offences punishable on Indictment or Information.

Indictable offences are distributable into four classes or divisions, viz.: Treasons, Præmunires, Felonies, and Misdemeanors. Persons who commit the offences which constitute the last-mentioned division may also be prosecuted by criminal information instead of being indicted.

The distinction between these classes is, for the most part, a merely arbitrary one, without any apparent reference to rule or principle, the consequence of which is that offences in their nature wholly undistinguishable are, in many instances, separated and subjected to punishments widely disproportionate, and to forms of procedure widely dissimilar. In fact, the only real distinguishing feature between one class of crimes and another, at the present day, is to be found in certain peculiarities of punishment and procedure incident to each. Formerly, however, the classes of crimes were marked by distinctive characteristics; but they have subsequently, either by artificial constructions of the courts or by legislative enactment, been made to embrace offences of a very different nature from those originally included within them. For instance, the crime of treason, whether high or petit, implied a violation of the allegiance due from an inferior to a superior. In the case of high treason, so called 'by way of eminent distinction,' it was the violation of the allegiance due from a subject to his liege lord and sovereign; and in case of petit treason, which was limited to the murder of a husband by his wife, a master by his servant, or an ecclesiastic by his inferior who owed him faith and obedience, it was the breach of the allegiance of private and domestic faith.*

The characteristic above pointed out can no longer be traced in many of the various constructive treasons which have been from time to time created by the courts. It will be sufficient here to give a single illustration of the mode in which the law of treason has been stretched to reach cases totally inconsistent with its original design. By one of the clauses of the statute of treasons (25 Edw. III. c. 2) it is declared to be treason *to levy war against the king*. A riotous assembly attempting by force to redress a public grievance, as, for example, to pull down *all* inclosures or to burn *all* meeting-houses, has been held to be *a levying of war* within the meaning of this clause, although there has been no direct intention or design whatever against either the state or the person of the king. This construction is said to depend upon the *generality* of the design. If the intention be to pull down *particular* inclosures or meeting-houses only, the offence is a mere riot, and in quality a simple misdemeanor. Although the generality of the design may be a reason for awarding a higher punishment in the former than in the latter case, there appears to be no foundation in reason or principle for construing an offence, which but for such generality would be a misdemeanor only, to amount to the crime of treason in levying war against the king. The Criminal Law Commissioners (4th, 5th, and 6th Reports) have recommended that this offence should no longer be considered to fall within the statute of treasons. They propose that the only assemblings or risings of the people which should amount to a levying of war against the king should be such as are against the person of the king, or against any army or force appointed by him in opposition to his authority, or with intent to do him bodily harm, or impose any restraint upon his person, or to depose him, or to dispossess or deprive him of any portion of his dominions or regal authority, or with intent by force or constraint to compel him to change his measures or counsels, or to put any force or constraint upon or to intimidate or overawe both houses or either house of parliament; and that no assembling or rising of the people should by reason of any illegality or generality of purpose be deemed to be a levying of war against the king, unless it be with one or other of the several intentions before mentioned. Such riotous and tumultuous meetings as have no such intention in view they recommend should be denominated felonies or misdemeanors merely, according to the circumstances by which they are attended.

Again, the term 'Præmunire' was originally applied to offences which consisted in the introduction of any foreign jurisdiction, more especially the authority of the See of Rome, into the kingdom; but has subsequently, to use the language of Mr. Serjeant Hawkins (*Pleas of the Crown*, b. 1, c. 19), 'been applied to other heinous crimes, for the most part having relation to the offences originally coming under the notion of præmunire, but in some instances none at all.' The Habeas Corpus Act (31 Car. II. c. 12) contains an instance of the latter mode of application. By the 12th section of that act it is made a Præmunire to send any inhabitant of England, Wales, or the town of Berwick-upon-Tweed, a prisoner beyond the seas in defiance of its provisions to the contrary.

The term 'Præmunire' was adopted from the first word of the original writ on which the subsequent proceedings were founded: '*Præmunire* (for *præmoneri*) *facias* A. B. quod sit coram nobis,' &c. [PRÆMUNIRE, P. C.] The Criminal Law Commissioners propose to abolish præmunires as a class of crimes. (Seventh Report.)

The crime of felony had its origin in very remote times, and was founded upon feudal principles. Its incidents were not formerly, as they are now, of a merely arbitrary nature, peremptorily annexed to certain criminal acts without reference to rule or principle. The crime originally consisted in a violation of the feudal contract by the misconduct of the lord or of the tenant; and where committed by the tenant, occasioned as a consequence the forfeiture of his feud to the lord. (4 Black. *Comm.*, p. 96; 4th and 7th *Repts. of Crim. Law Commrs.*)

Those crimes, therefore, which induced such forfeiture, and, by a small deflection from the original sense, those which induced the forfeiture of goods also, were denominated felonies; and afterwards, by long use the term *felony* came to signify the actual crime itself, and not the penal consequence. 'So that, upon the whole,' to use the words of Mr. Justice Blackstone (4 *Comm.*, p. 95), 'the only adequate definition of felony seems to be that which is before laid down, viz. an offence which occasions a total forfeiture of either lands or goods, or both, at the common law; and to which capital or other punishment may be superadded according to the degree of guilt.' Where the punishment is less than capital, the offender loses his goods only; where capital, his lands as

* Petit Treason was abolished by the 9 Geo. IV. c. 31, s. 2, and the offence constituting it declared to be murder only.

well as his goods. The crimes which occasioned such forfeiture were originally, with one or two exceptions, capital; but at the present day there are offences for which no greater punishment can be inflicted than imprisonment for a term not exceeding three years, which are felonies, and consequently occasion the forfeiture of all the offender's goods and chattels; whilst other crimes, for which the punishment may be as high as transportation for fourteen years, and in four instances *must be* for life, are misdemeanors only, and work no forfeiture. It is apparent from this that the present law is very defective, and that the amount of punishment is no longer the test of distinction between a felony and misdemeanor. It is proposed by the Criminal Law Commissioners (*Seventh Rep.* p. 16) to remedy this by making the liability to transportation the test of distinction, *i. e.* that all offences liable to a less punishment than transportation should be misdemeanors only.

The term 'Misdemeanor' is used in the English system of Criminal Law to denote such indictable offences as are of a lower degree than felony.

We shall now point out the peculiarities of punishment which distinguish one class of crimes from another at the present day. In order to this, the penal consequences incident to the whole body of offences constituting each class will be first stated, and then in what respects those consequences differ from each other. The classes will be taken in the same order as above.

1. *Treasons.*—Treasons, with one exception mentioned below, are capital: but whether capital or not, the offender, *upon conviction*, forfeits to the crown the personal estate of every description, whether in action or possession, or settled by way of trust, which the offender has otherwise than as an executor (*Cro. Car.* 566), or a trustee, or a mortgagee (4 & 5 Wm. IV. c. 23, s. 3) at the time of conviction; and in the case of capital treasons, *upon attainder by judgment of death or outlawry*, the blood of the offender is corrupted, but not so as to obstruct descents to such offender's posterity, when they are obliged to derive a title through such offender to a remoter ancestor (3 & 4 Wm. IV. c. 106, s. 10), and all the freehold lands and tenements of inheritance in fee-simple or fee-tail, and all other hereditaments (except copyholds), whether in possession, reversion, or remainder; and all the rights of entry on freehold lands and tenements which the offender has (otherwise than as a trustee or mortgagee, 4 & 5 Wm. IV. c. 23, s. 3) at the time of the offence committed or at any time afterwards, and also the profits of all freehold lands and tenements which the offender has in his or her own right for life, so long as such interest shall subsist, and, if the offender be a male, his wife's dower, are forfeited to the crown (4 Black. *Comm.*, 381; 26 Hen. VIII. c. 13, s. 5; 33 Hen. VIII. c. 20, s. 2; and 5 & 6 Edw. VI. c. 11, ss. 9 and 13); and all the copyhold estates belonging to the offender at the time of the offence committed are forfeited to the lord of the manor (*Com. Dig.* Copyhold (M) 1.). The above penal consequences are general to all capital treasons, unless, as is sometimes the case, the act which creates the particular treason expressly exempts from some of them. The before-mentioned non-capital treason renders the party guilty of it liable to those only of the above consequences which accrue upon conviction, since the others follow only upon the party's being attainted, that is, sentenced to death or outlawed, which latter, in the case of capital treasons and felonies, is of the same effect as being sentenced to death. The existence of this non-capital treason would appear to be the result of inadvertence. By the Forgery Consolidation Act (11 Geo. IV. & 1 Wm. IV. c. 66) it was declared to be treason and punishable with death to forge the great and other royal seals and the sign manual. By the 2 & 3 Wm. IV. c. 123, the punishment of death was repealed for forgery in all but the two cases of wills and powers of attorney to transfer stock (it has been since taken away in these cases also by the 7 Wm. IV. & 1 Vict. c. 84); but the *quality* of the offences enumerated in the Forgery Consolidation Act was left without alteration; so that to forge the royal seals, &c. would appear to be still treason, though no longer a capital offence.

The judgment of death in the case of treason is that the offender, if a male, be drawn on a hurdle to the place of execution, and be there hanged by the neck until dead; and that afterwards the head be severed from the body of such offender, and the body be divided into four quarters, to be disposed of as her Majesty shall think fit (54 Geo. III. c. 146); and, if a female, that the offender be drawn to the place of execution and be there hanged by the neck until dead (30 Geo. III. c. 48, s. 1). The queen, however, may, by warrant under her sign manual, countersigned by a principal secretary of state, direct, where the offender is a male, that he shall not be drawn, but taken in such manner as in the warrant shall be expressed to the place of execution, and that he shall not be hanged, but be beheaded, whilst alive, instead (54 Geo. III. c. 146, s. 2).

2. *Præmunires.*—The penalties of præmunire, as shortly summed up by Sir Edward Coke (1 *Inst.* 130 a.), are, 'that from the conviction the defendant shall be out of the king's protection, and his lands and tenements' (*i. e.* in fee-simple or for life, but not in tail beyond his life interest therein), 'goods and chattels, forfeited to the king: and that his body shall remain in prison at the king's pleasure, or, as other authorities have it, during life.' These penalties were first imposed by the stat. 16 Rich. II. c. 5 (commonly called the Statute of Præmunire); and it is by reference to that statute that all subsequent præmunires have been made punishable. It was formerly supposed that a person convicted of præmunire, being put out of the king's protection, might be killed with impunity, as being the king's enemy; but by the 5 Eliz. c. 1, ss. 21 and 22, it was enacted that it should not be lawful to kill any person attainted in a præmunire, saving such pains of death or other hurt or punishment as theretofore might, without danger of law, be done upon persons sending or bringing into the realm, &c. any process, &c. from the See of Rome. Præmunires, although they occasion a forfeiture of the offender's lands and goods, are not felonies. To constitute a felony the offence must have worked a forfeiture at the common law; but in the case of præmunire the forfeiture is made a part of the punishment by statute merely, which is not sufficient. (4 Black. *Comm.*, pp. 94 and 118.)

3. *Felonies.*—All felonies, as stated above, were originally, with one or two exceptions, punishable with death; but the offender, unless the felony was excluded from the benefit of clergy, was entitled, for a first offence, to be discharged from the capital punishment upon praying that benefit. [BENEFIT OF CLERGY, P. C.] But now, since the passing of the 7 & 8 Geo. IV. c. 28, no felony is punishable with death unless it was excluded from the benefit of clergy before or on the 14th Nov. 1826, or has been or shall be made punishable with death by some statute passed since that day. Where not capital, felonies are punishable either in the manner prescribed by the statute or statutes specially relating to such felonies, or, where no punishment has been or may hereafter be specially provided, with transportation for seven years, or imprisonment for any term not exceeding two years, with the addition, if the court shall think fit, of whipping, where the offender is a male, hard labour and solitary confinement, or any of them. (7 & 8 Geo. IV. c. 28, ss. 7 and 8.) Such confinement must not however be for a longer period than one month at a time, or three months in a year. (7 Wm. IV. & 1 Vict. c. 90, s. 5.) In the case of *all* felonies, whether capital or not, the offender immediately *on conviction* forfeits to the crown all the personal estate of every description, whether in action or possession, or settled by way of trust, which he has otherwise than as an executor (*Cro. Car.* 566), or a trustee or mortgagee (4 & 5 Wm. IV. c. 23, s. 3), at the time of conviction (Bac. *Abrid.*, 'Forfeiture' (B); Co.-Litt. 391 u); and in the case of all capital felonies, *upon attainder by judgment of death or outlawry*, forfeits to the crown the profits of all estates of freehold (4 Black. *Comm.*, 385), and of things not lying in tenure (Bac. *Abrid.*, 'Forfeiture' (A)), and to the lord of the manor the profits of all estates of copyhold (Hawk. *P. C.* b. 2, c. 49, s. 7; Lord Cornwallis's case, 2 Vent. 38-9), which the offender has, otherwise than as a trustee or mortgagee (4 & 5 Will. IV. c. 23, s. 3), at the time of the offence committed, during his life; and his blood is corrupted (but not so as to obstruct descents to the posterity of such offender where they are obliged to derive a title through him to a remoter ancestor (3 & 4 Will. IV. c. 106, s. 10), and after his death his copyholds which he holds in fee-simple are forfeited to the lord of the manor. (Scriven *On Copyholds*, 523, note (d).) And also in the case of murder, all his freehold lands and tenements in fee-simple escheat (subject to what is called the crown's year, day and waste) to the lord of the fee. (54 Geo. III. c. 145; Co.-Litt. 391 a; 4 Black. *Comm.* 385.)

The judgment of death in the case of all capital felonies, except murder, is that the offender be hanged by the neck until dead (2 Hale's *P. C.* 411); and, in the case of murder, it is the same, with the addition that the offender's body shall be buried within the precincts of the prison in which he shall have been confined after conviction. (2 & 3 Will. IV. c. 75, s. 16; 4 & 5 Will. IV. c. 26.) The court however is empowered, if it shall think that the offender is a fit subject to be recommended to the royal mercy, to abstain from pronouncing judgment of death upon him, and to order such judgment to be entered of record instead; and the judgment so recorded has the same effect as if pronounced and the party were reprieved. (4 Geo. IV. c. 48, ss. 1 & 2; 6 & 7 Will. IV. c. 30, s. 2.)*

4. *Misdemeanors.*—The punishment in the case of misdemeanors, where none is specially provided by statute, is generally fine and imprisonment.

From what has been stated, it will be seen that the circumstance, so far as punishment is concerned, which distinguishes misdemeanors from all the other classes of offences, is the absence of forfeiture as a necessary consequence of conviction. The distinction between præmunires and felonies (which term, it should be remarked, in its largest sense, includes treasons, on account of the forfeiture which that class of crimes occasions) is, that the forfeiture which ensues upon a conviction of the former is, as before observed, in pursuance of statutable provisions; whereas in the latter case it is a common law consequence of the offence, and follows as a matter of course whenever a crime is declared to be a felony. There appears to be no distinction as regards punishment, independently of special statutable enactment, between non-capital felonies (the term is used here in its ordinary restricted sense) and the non-capital treason above described; but the difference between felonies and treasons when punishable with death is very considerable. In the case of felonies the offender, upon attainder, *forfeits* to the crown the profits only of such freehold and copyhold lands as he had at the time of committing the offence, during his life, and after his death, his copyholds in fee-simple are forfeited to the lord of the manor; and even where attainted of murder, though his freehold estates in fee-simple fail after his death, it is not as a consequence of the law of forfeiture, but because they escheat for want of heirs capable of succeeding to them, owing to his blood being corrupted by the attainder; and it is on account of such estates escheating and not being forfeited that they go to the lord of the fee (that is, subject to the crown's year, day and waste), and not to the crown, unless there appears to be no intermediate lord between the offender and the crown, in which event the crown takes as ultimate lord of the fee. In the case of treason, however, the offender upon attainder, instead of forfeiting to the crown the profits merely of such freehold lands as he had at the time of committing the offence, during his life, forfeits all freehold estates of inheritance, as well those in fee-tail as those in fee-simple, and not only such as he had at the time of the commission of the offence, but those also which he may acquire at any time afterwards; and instead of forfeiting to the crown the profits of his copyholds during his life, and to the lord of the manor his copyholds in fee-simple only, he forfeits at once to the lord of the manor *all* the copyholds belonging to him at the time the offence was committed. Where the offender is a male, his wife's dower is also forfeited to the crown, which is not the case in felony. It is to be observed that the crown is now empowered (see 59 Geo. III. c. 94) to restore the whole or any part of any lands or hereditaments to which it becomes entitled by escheat or forfeiture to the family of the offender, a provision which has greatly mitigated the harshness of the law of forfeiture. The Criminal Law Commissioners however recommend the entire abolition of the confiscation of property as a necessary incident to convictions for treason or felony. (*Seventh Report on Criminal Law.*) The difference between the judgment of death for treason and that for felony requires no comment.

Besides the above peculiarities of punishment, these different classes of offences are distinguished by particular forms of procedure; but it will be more convenient to refer to these when describing our general system of criminal procedure.

Having pointed out the leading characteristics of the various classes into which indictable crimes are divisible by the law of England, it is now proposed to state shortly what are the different offences comprised under each of those classes. In this view the offences belonging to each class are arranged under their several punishments. The classes are taken in the same order as before. It will be proper, however, in the first instance, to show what persons are capable of committing crimes, to notice one or two provisions of general application, for the purpose of preventing repetition, and to make a few explanatory observations.

According to the law of England, all persons above the age of seven years, except such as by reason of unripeness, weakness, unsoundness, disease, or delusion of mind, are incapable of discerning, at the time they do an act, that the act is contrary either to the law of God or the law of the land, are criminally responsible for such act; but temporary incapacity wilfully incurred by intoxication or other means is no excuse. An infant of the age of seven and under fourteen years, however, is to be presumed to be incapable of committing a crime until the contrary be proved. Duress, also, inducing a well-grounded fear of death or grievous bodily harm, will excuse a person acting under such duress in all cases except treason and murder; and a married woman committing any offence, except those last mentioned, if her husband be present at the time, shall be presumed to have acted under his coercion, and be entitled to an acquittal, unless it appear that she did not so act. A married woman also shall not be liable to conviction for receiving her husband or any other person in his presence and by his authority.

The following provisions are of general application. By the stat. 7 Will. IV. & 1 Vict. c. 90, s. 5, it is enacted that no court shall direct any offender to be kept in solitary confinement for any longer period than one month at a time or than three months in the space of one year. Whenever, therefore, in the following statement solitary confinement is mentioned as part of the punishment for any offence, the periods during which it may be inflicted are to be understood as regulated by the above provision.

By the statute 7 Will. IV. & 1 Vict. c. 85, s. 11, power is given to the jury on the trial of any person for any felony whatever, where the crime charged shall include an assault against the person, to acquit of the felony, and to find a verdict of guilty of assault against the person indicted, if the evidence shall warrant such finding; and thereupon the court may imprison the person so found guilty of an assault for any term not exceeding three years, with or without hard labour or solitary confinement, or with both.

By the stat. 1 Geo. IV. c. 57, s. 3, it is provided that where the punishment of whipping on *female* offenders formed, before the passing of that act, the whole or part of the sentence to be pronounced, the court may pass sentence of confinement to hard labour for any time not exceeding six months nor less than one month, or of solitary confinement, in lieu of the sentence of being whipped. In all cases, therefore, where whipping is mentioned to be part of the punishment, without its being restricted to males, the above provision operates.

By the 3 & 4 Vict. c. 111, made perpetual by 5 & 6 Vict. c. 85, members of joint-stock or other banking companies, consisting of more than six persons, committing offences against or with intent to injure or defraud such co-partnerships, are made liable to the same punishments as if they had not been or were not members of such co-partnerships

In the following statement the general description only is given of any particular offence. It is to be observed, however, that where a crime is defined by statute, the enactment in most cases comprises, in fact, many other offences distinct from the general one, though in nature connected with it. For the details of such enactments, reference must be made to the statutes cited at the end of each offence. With respect to these statutes, those which define the crime, as well as those which declare the punishment, are referred to wherever the statutes are distinct, and these are arranged as regards any particular crime in the order of date; and generally, but not universally, where statutes of both descriptions are referred to, those by which the crime is defined stand the first in order. The following statement contains no offence contained in any merely temporary act, or in any local or private act, of a date subsequent to the period since which such acts have been printed separately from the public general acts.

I. Treasons.—(*Capital.*)

The following treasons are punishable with death,* viz:—

1. Compassing the death of the king (which term includes a queen regnant) or of his queen, or their eldest son and heir;

* See R. v. Hogg, 2 M. & Ro. 381, where it was held that since the passing of the 6 & 7 Will. IV. c. 30, death may be recorded in the case of murder as well as other capital felonies, notwithstanding the exception contained in the 4 Geo. IV. c. 48.

* To conceal or keep secret any treason committed or intended to be committed is termed misprision of treason, and is punishable with loss of the profits of lands during life, forfeiture of goods, and imprisonment for life. (See 1 & 2 Phil. and Mary, c. 10, s. 8.)

violating the king's companion, (*i. e.* his wife during the coverture,) or the king's eldest daughter unmarried, or the wife of the king's eldest son and heir; levying war against the king in his realm, or being adherent to the king's enemies in his realm, giving them aid and comfort in the realm or elsewhere, and being thereof attainted of open deed; or slaying the chancellor, treasurer, or the king's justices of the one bench or the other; justices in eyre or justices of assize, or any other justices assigned to hear and determine, being in their places doing their offices.* (25 Edw. III. st. 5, c. 2.)

2. Endeavouring to prevent the person next in succession to the crown, according to the Acts of Settlement, from succeeding thereto. (1 Anne, st. 2, c. 17, s. 3.)

3. Affirming, by writing or printing, that any other person has a right to the crown otherwise than according to the Acts of Settlement and the Acts for the Union of England and Scotland; or that the crown, with the authority of parliament, is unable to limit the descent of the crown. (6 Anne, c. 7, s. 1.)

4. Compassing or intending the death or destruction, or any bodily harm tending to death or destruction, maim or wounding, imprisonment or restraint of the person of the king; or to deprive or depose him from the crown; or to levy war against him, within the realm, in order to compel him to change his measures or counsels, or in order to overawe the parliament; or to move any foreigner to invade any of the British dominions; such compassing or intention being expressed by publishing some printing or writing, or by some overt act or deed. (36 Geo. III. c. 7, s. 1, made perpetual by 57 Geo. III. c. 6.)

5. Being married to, or being concerned in procuring the marriage of any issue of her present majesty whilst such issue are under eighteen (in case the crown shall have descended to any such before that age), without the consent in writing of the regent and the assent of both Houses of Parliament. (3 & 4 Vict. c. 52, s. 4.)

6. Knowing any person to have committed any of the before-mentioned capital treasons, receiving, relieving, comforting or assisting him, or aiding his escape from custody.

7. Bringing into the realm papal bulls or other writings or instruments from the See of Rome; or publishing or putting in use any such bulls, writings or instruments.† (13 Eliz. c. 2, ss. 2 and 3.)

Besides the last-mentioned offence, there also existed till very recently several other capital treasons relating to the See of Rome; but these were repealed by the 7 & 8 Vict. c. 102.

TREASON.—(*Non-Capital.*)

The following treason (the one already alluded to) is punishable with transportation for life or not less than seven years, or with imprisonment for any term not exceeding four nor less than two years, with or without hard labour or solitary confinement, or with both, viz:—

1. Forgery of the great seal, her majesty's privy seal, any privy signet of her majesty, the royal sign manual, the seals appointed to be used in Scotland, and the great and privy seals of Ireland. (11 Geo. IV. & 1 Wm. IV. c. 66, s. 2; 2 & 3 Wm. IV. c. 123; 3 & 4 Wm. IV. c. 44, s. 3; 7 Wm. IV. & 1 Vict. c. 84, ss. 2 and 3.)

II. PRÆMUNIRES.

The following are the offences coming under this denomination still in force:—

1. Derogating from the queen's courts. (27 Edw. III. st. 1, c. 1, s. 1.)

2. Deans and chapters omitting to elect a bishop; and archbishops or bishops to consecrate the person so elected, after receiving the queen's congé d'élire. (25 Hen. VIII. c. 20, s. 7; repealed by 1 & 2 Philip and Mary, c. 8, and revived by 1 Eliz. c. 7.)

3. Molesting the possessors of abbey lands contrary to the provisions of 1 & 2 Philip and Mary, c. 8. (1 & 2 Phil. and Mary, c. 8, s. 40.)

4. Obtaining any stay of proceedings, other than by arrest of judgment or writ of error, in suits for monopolies. (21 Jac. I. c. 3, s. 4.)

* By the 11 Hen. VII. c. 1, it is enacted that no person who attends upon *the king for the time being*, in his person, and does him true and faithful service of allegiance, or is in other places by his commandment, in his wars, in this land or without, shall for such deed and true allegiance be convicted or attainted of treason.

† The repeal of this offence is recommended by the Commissioners for revising and consolidating the Criminal Law. See their Report on Penalties and Disabilities in regard to Religious Opinions, dated the 30th May, 1845.

5. Procuring any stay of proceedings, other than by the authority of the court, in actions brought against persons for making provision or purveyance for the crown. (12 Car. II. c. 24, s. 14.)

6. Asserting maliciously and advisedly, by speaking or writing, that both Houses or either House of Parliament has a legislative authority without the crown. (13 Car. II. c. 1, s. 3.)

7. Sending any subject of the realm a prisoner beyond the seas in defiance of the Habeas Corpus Act. (31 Car. II. c. 2, s. 12.)

8. Asserting, maliciously and directly, by preaching, teaching or advised speaking, that any person, other than according to the Acts of Settlement and Union, has any right to the throne of these kingdoms, or that the queen and parliament cannot make laws to limit the descent of the crown. (6 Anne, c. 7, s. 2.)

9. Knowingly and wilfully solemnizing, assisting or being present at, any marriage forbidden by the Royal Marriage Act. (12 Geo. III. c. 11, s. 3.)

10. Aiding, comforting or maintaining persons who bring into the realm papal bulls or other writings or instruments from the See of Rome, to the intent to uphold the jurisdiction or authority of the pope.* (13 Eliz. c. 2, s. 4.)

III. FELONIES.—(*Capital.*)

The following felonies are punishable with *death*, viz.:—

1. Destroying ships of war or her majesty's arsenals, dock-yards, naval, military or victualling stores, or other ammunition of war, &c. (12 Geo. III. c. 24, s. 1.)

2. Murder. (9 Geo. IV. c. 31, s. 3.)

3. Unnatural offences. (9 Geo. IV. c. 31, s. 15.)

4. Attempts to murder by administering poison, or by wounding, or by any other means where bodily injury dangerous to life is caused. (7 Wm. IV. & 1 Vict. c. 85, s. 2.)

5. Burglary, aggravated by striking an inmate. (7 Wm. IV. & 1 Vict. c. 86, s. 2.)

6. Robbery, aggravated by wounding the person robbed. (7 Wm. IV. & 1 Vict. c. 87, s. 2.)

7. Piracy, aggravated by endangering the life of any person on board of the vessel in respect of which the piracy is committed. (7 Wm. IV. & 1 Vict. c. 88, s. 4.)

8. Setting fire to a dwelling-house, any person being therein. (7 Wm. IV. & 1 Vict. c. 89, s. 2.)

9. Destroying vessels with intent to murder, or whereby human life is endangered. (7 Wm. IV. & 1 Vict. c. 89, s. 4.)

10. Exhibiting false lights, &c. with intent to bring ships into danger, or unlawfully doing anything tending to the destruction of ships in distress. (7 Wm. IV. & 1 Vict. c. 89, s. 5.)

Besides the above offences, that of wilfully and without lawful excuse having or being possessed of any forged stamp used in pursuance of any Act relating to any duties on gold or silver plate made or wrought in Great Britain, for the purpose of marking or stamping such plate, appears to be still punishable with death.

That offence is contained in 55 Geo. III. c. 185, s. 7, by virtue of which enactment it was formerly also a capital crime to forge or utter the stamps provided for marking any such plate, or to fraudulently remove such stamps from one piece of such plate to another, or privately and secretly to use such stamps with intent to defraud the king. The punishment of death for these last-mentioned offences was repealed, however, by 11 Geo. IV. & 1 Wm. IV. c. 66, s. 1 (as to the forging and uttering), and by 4 & 5 Vict. c. 56, s. 1 (as to the removing and fraudulently using); but by some inadvertence (for it is clear that it can never have been intended) the offence of being possessed, without lawful excuse, of forged stamps for marking gold or silver plate (the least criminal of all the acts specified in 55 Geo. III. c. 185, s. 7) is still left capital.

There are two other enactments of capital offences, which also do not appear to have been repealed. The 2 Geo. II. c. 25, s. 2, and the 12 Geo. III. c. 48, s. 1, make it capital for offenders convicted under the provisions of those statutes, to escape or break out of prison; and these enactments do not seem to have been wholly repealed, either expressly or by implication. The Criminal Law Commissioners (7th Report) say, 'Although many Acts have been passed which punish prison-breach by penalties not capital, yet these seem to be confined to particular gaols and prisons, and not to

* The repeal of this offence is recommended by the Commissioners for Revising and Consolidating the Criminal Law.

affect the general enactments above referred to, as regards offenders against their provisions confined in other prisons.'

(*Non-Capital.*)

Non-capital felonies are punishable as follows, viz., with

I. *Transportation for life*, and previously thereto imprisonment, with or without hard labour, for any term not exceeding four years.

1. Offenders transported from Great Britain being found at large, without some lawful excuse, before the expiration of their term of transportation. (5 Geo. IV. c. 84, s. 22; 4 & 5 Wm. IV. c. 67.)

II. *Transportation for life.*

1. Rape. (9 Geo. IV. c. 31, s. 16; 4 & 5 Vict. c. 56, s. 3.)

2. Carnally knowing and abusing girls under ten years of age. (9 Geo. IV. c. 31, s. 17; 4 & 5 Vict. c 56, s. 3.)

3. Forgery of the name or handwriting of the Receiver-General of Customs, or of the Comptroller-General of Customs, &c., to any draft, &c. on the Bank. (8 & 9 Vict. c. 85, s. 26.)

III. *Transportation for life*, or not less than fifteen years, or imprisonment for any term not exceeding three years, with or without hard labour or solitary confinement, or with both.

1. Piracy. (28 Hen. VIII. c. 15; 11 & 12 Wm. III. c. 7, ss. 8, 9, and 10; 4 Geo. I. c. 11, s. 7; 6 Geo. I. c. 19; 8 Geo. I. c. 24, ss. 1 and 3; 2 Geo. II. c. 28, s. 7; 18 Geo. II. c. 30; 7 Wm. IV. & 1 Vict. c. 88, ss. 3 and 5.)

2. Offences against the Riot Act.* (1 Geo. I. st. 2, c. 5, ss. 1 and 5; 7 Wm. IV. & 1 Vict. c. 91, ss. 1 and 2.)

3. Rescuing a murderer out of prison, or whilst going to or during execution. (25 Geo. II. c. 37, s. 9; 7 Wm. IV. & 1 Vict. c. 91, ss. 1 and 2.)

4. Seducing sailors or soldiers from their allegiance, or inciting them to mutiny. (37 Geo. III. c. 70, s. 1; 57 Geo. III. c. 7; 7 Wm. IV. & 1 Vict. c. 91, ss. 1 and 2.)

5. Administering oaths binding any person to commit treason or any capital felony. (52 Geo. III. c. 104, s. 1; 7 Wm. IV. & 1 Vict. c. 91, ss. 1 and 2.)

6. Any subject of her majesty, or any person residing in any of the queen's dominions, or in any place under the government of the East India Company, or upon the high seas, or within the Admiralty jurisdiction, carrying away &c. persons to make slaves of them. (5 Geo. IV. c. 113, s. 9; 3 & 4 Wm. IV. c. 73; 7 Wm. IV. & 1 Vict. c. 91, ss. 1 and 2.)†

7. Assembling armed, to the number of three or more, for the purposes of smuggling. (7 Wm. IV. & 1 Vict. c. 91, ss. 1 and 2; 8 & 9 Vict. c. 87, s. 63.)

8. Shooting at vessels belonging to the navy or in the revenue service, within 100 leagues of the coast; or shooting at revenue officers and others duly employed for the prevention of smuggling. (7 Wm. IV. & 1 Vict. c. 91, ss. 1 and 2; 8 & 9 Vict. c. 87, s. 64.)

9. Attempts to murder, by attempting to administer poison, or by shooting at or attempting to drown, suffocate, or strangle any person, although no bodily injury be effected. (7 Wm. IV. & 1 Vict. c. 85, ss. 3 and 8.)

10. Shooting at or attempting to discharge any kind of loaded arms at or wounding any person, with intent to do grievous bodily harm to such person, or to prevent lawful apprehension or detainer. (7 Wm. IV. & 1 Vict. c. 85, ss. 4 and 8.)

11. Sending explosive substances, &c. to any person, or throwing any corrosive fluid or other destructive matter upon any person, with intent to do grievous bodily harm, and whereby grievous bodily harm is done to any person. (7 Wm. IV. & 1 Vict. c. 85, ss. 5 and 8.)

12. Attempting to procure the miscarriage of women. (7 Wm. IV. & 1 Vict. c. 85, ss. 6 and 8.)

13. Robbery, aggravated by the offender being armed, by numbers, or by the use of personal violence to the person robbed. (7 Wm. IV. & 1 Vict. c. 87, ss. 3 and 10.)

14. Extorting property by threatening to accuse of unnatural crimes. (7 Wm. IV. & 1 Vict. c. 87, ss. 4 and 10.)

15. Setting fire to places of worship or houses, or to buildings or erections used for the purposes of trade, with intent to injure or defraud any person. (7 Wm. IV. & 1 Vict. c. 89, ss. 3 and 12.)

16. Setting fire to or otherwise destroying vessels, with intent to prejudice any person interested therein or in the goods on board the same, as an owner, part owner or underwriter. (7 Wm. IV. & 1 Vict. c. 89, ss. 6 and 12.)

17. Forcibly preventing a person endeavouring to save his life from a vessel in distress or wrecked. (7 Wm. IV. & 1 Vict. c. 89, ss. 7 and 12.)

18. Setting fire to coal-mines. (7 Wm. IV. & 1 Vict. c. 89, ss. 9 and 12.)

19. Setting fire to stacks of corn, grain, coal or wood, &c., or to any steer of wood. (7 Wm. IV. & 1 Vict. c. 89, ss. 10 and 12.)

IV. *Transportation for life*, or not less than fifteen years, or imprisonment for any term not exceeding three years.

1. Setting fire to farm buildings, or to buildings or erections used in farming land; or for the purpose of setting fire to such farm-buildings, setting fire to farm produce or implements being therein, with intent in any such case to injure or defraud any person.* (7 & 8 Vict. c. 62, ss. 1 and 2.)

V. *Transportation for life* or not less than ten years, or imprisonment for any term not exceeding three years, with or without hard labour or solitary confinement, or with both.

1. Burglary. (7 Wm. IV. & 1 Vict. c. 86, ss. 3 and 7.)

VI. *Transportation for life* or not less than seven years.

1. Personating soldiers or other persons entitled to prize-money, &c. on account of military services, or their representatives; or

2. Forging the name or handwriting of any person so entitled, or of any officer or servant of Chelsea Hospital, &c., or any writing concerning the payment of any such prize-money, &c. (2 Wm. IV c. 53, s. 49.)

VII. *Transportation for life* or for any term of years.

1. Taking oath (not being compelled thereto) binding the person taking the same to commit treason or any capital felony. (52 Geo. III. c. 104, s. 1.)

2. Personating soldiers or other persons entitled to pensions, &c. on account of military services, or their representatives; or,

3. Forging the name or handwriting of any person so entitled, or of any officer or servant of Chelsea Hospital, &c., or any writing concerning the payment of any such pensions, &c. (7 Geo. IV. c. 16, s. 38.)

VIII. *Transportation for life* or for fourteen or seven years.

1. Aiding the escape of prisoners of war from prison or from the queen's dominions, if at large upon parole. (52 Geo. III. c. 156, s. 1.)

2. Subjects of her majesty aiding, upon the high seas, the escape of prisoners of war after they have quitted the coast. (52 Geo. III. c. 156, s. 3.)

IX. *Transportation for life* or not less than seven years, or imprisonment for any term not exceeding seven years, with or without hard labour.

1. Stealing or embezzling her majesty's ammunition, naval or military stores. (4 Geo. IV. c. 53; 7 & 8 Geo. IV. c. 27.)

2. Sending letters threatening to kill any person, or to burn his house, stacks, &c.; or rescuing a person in custody for any such offence. (4 Geo. IV. c. 54, s. 3; 7 & 8 Geo. IV. c. 27.)

3. Bankrupt not surrendering, or not discovering all his estate, or embezzling or concealing any part thereof to the amount of 10*l*. or upwards, &c. (5 & 6 Vict. c. 122, ss. 32 and 93.)

X. *Transportation for life* or not less than seven years, or imprisonment for any term not exceeding four nor less than two years, with or without hard labour or solitary confinement, or with both.

1. Forgery of the seal or bonds of the South Sea Company (6 Geo. I. c. 4, s. 56; 11 Geo. IV. & 1 Wm. IV. c. 66, ss. 1 and 26); of receipts or warrants of the South Sea Company (6 Geo. I. c. 11, s. 50; 11 Geo. IV. & 1 Wm. IV. c. 66, s. 4; 2 & 3 Wm. IV. c. 123; 3 & 4 Wm. IV. c. 44, s. 3; 7 Wm. IV. & 1 Vict. c. 84, ss. 2 and 3); of seals, policies, &c. of the London and Royal Exchange Assurance Companies (6 Geo. I. c. 18, s. 13; 11 Geo. IV. & 1 Wm. IV. c. 66, ss. 1 and 26); of certain Annuity Orders made forth in pursuance of 6 Geo. I. cc. 11 and 17, 7 Geo. I. st. 1, c. 30, 8 Geo. I. c. 20, or 9 Geo. I. c. 12, or of any authority to transfer the same (9 Geo. I. c. 12, s. 4; 11 Geo. IV. & 1 Wm. IV. c. 66, ss. 1 and 26); of the name or handwriting of the Accountant-General, Registrar, or Clerk of the Report Office (of the Court of Chancery), or of any cashier of the Bank, to any instrument relating to the suitors' money or

* See also 17 Rich. II. c. 8; 13 Hen. IV. c. 7; 2 Hen. V. st. 1, c. 8. Also 33 Geo. III. c. 67, s. 1; 41 Geo. III (U K.) c. 19, s. 4, as to riots by keelmen.

† See also 3 & 4 Vict c. [illegible].

* Offenders, if males under eighteen years of age, may also be whipped in addition to any other punishment. (See s. 3.)

effects (12 Geo. I. c. 32, s. 9; 11 Geo. IV. & 1 Wm. IV. c. 66, ss. 1, 26, and 31); of Mediterranean Passes (4 Geo. II. c. 18, s. 1; 11 Geo. IV. & 1 Wm. IV. c. 66, ss. 1 and 26); of the common seal, bonds, &c. of the English Linen Company (4 Geo. III. c. 37, s. 15; 11 Geo. IV. & 1 Wm. IV. c. 66, ss. 1 and 26); of certificates, &c. of the Commissioners for the Reduction of the National Debt (32 Geo. III. c. 55, s. 9; 11 Geo. IV. & 1 Wm. IV. c. 66, s. 4; 2 & 3 Wm. IV. c 123; 3 & 4 Wm. IV. c. 44, s. 3; 7 Wm. IV. & 1 Vict. c. 84, ss. 2 and 3); of the seal, policies, &c. of the Globe Insurance Company (39 Geo. III. c. 83, s. 22; 11 Geo. IV. & 1 Wm. IV. c. 66, ss. 1 and 26); of the name or handwriting of the Treasurer of the Ordnance, &c., to any draft, &c. on the Bank (46 Geo. III. c. 45, s. 9; 11 Geo. IV. & 1 Wm. IV. c. 66, s. 4; 2 & 3 Wm. IV. c. 123; 3 & 4 Wm. IV. c. 44, s. 3; 7 Wm. IV. & 1 Vict. c. 84, ss. 2 and 3); of the name or handwriting of the Receiver-General of Stamps and Taxes, or of his clerk, or of the Commissioners of Stamps and Taxes, to any draft, &c. on the Bank (46 Geo. III. c. 76, s. 9; 11 Geo. IV. & 1 Wm. IV. c. 66, s. 4; 2 & 3 Wm. IV. c. 123; 3 & 4 Wm. IV. c. 44, s. 3; 4 & 5 Wm. IV. c. 60; 5 & 6 Wm. IV. c. 20; 7 Wm. IV. & 1 Vict. c. 84, ss. 2 and 3); of contracts, certificates, &c. relating to the redemption of the land-tax (52 Geo. III. c. 143, s. 6; 11 Geo. IV. & 1 Wm. IV. c. 66, ss. 1 and 26); of stamps on vellum, parchment, or paper * (52 Geo. III. c. 143, s. 7; 55 Geo. III. c. 184, s. 7; 11 Geo. IV. & 1 Wm. IV. c. 66, ss. 1 and 26); of debentures or certificates for the payment or return of money required by any Act relating to the Customs or Excise (52 Geo. III. c. 143, s. 10; † 11 Geo. IV. & 1 Wm. IV. c. 66, ss. 1 and 26); of stamps on gold or silver plate (55 Geo. III. c. 185, s. 7; 11 Geo. IV. & 1 Wm. IV. c. 66, ss. 1 and 26); of certificates of Commissioners for the issue of Exchequer-bills for carrying on public works and fisheries in the United Kingdom (57 Geo. III. c. 34, s. 63; 3 Geo. IV. c. 86, s. 54; ‡ 11 Geo. IV. & 1 Wm. IV. c. 66, ss. 1 and 26); of the name or handwriting of the Accountant-General, Barons, or Clerk of the Reports (of the Court of Exchequer), or of any cashier of the Bank, to any instrument relating to the suitors' money or effects (1 Geo. IV. c. 35, s. 27; 11 Geo. IV. & 1 Wm. IV. c. 66, ss. 1 and 26); of certificates or appointments relating to public salaries, pensions, and allowances (3 Geo. IV. c. 113, s. 23; 11 Geo. IV. & 1 Wm. IV. c. 66, ss. 1 and 26); of orders for payments in connection with public salaries, pensions, and allowances (3 Geo. IV. c. 113, s. 23; 11 Geo. IV. & 1 Wm. IV. c. 66, s. 4; 2 & 3 Wm. IV. c. 123; 3 & 4 Wm. IV. c. 44, s. 3; 7 Wm. IV. & 1 Vict. c. 84, ss. 2 and 3); of certificates of certain stock, transferable at the Banks of England and Ireland respectively (5 Geo. IV. c. 53, s. 22; 11 Geo. IV. & 1 Wm. IV. c. 66, ss. 1 and 26); of the name or handwriting of the receiver-general of Excise, or Excise comptroller of cash, &c. to any draft, &c. upon the Bank (7 & 8 Geo. IV. c. 53, s. 56; 11 Geo. IV. & 1 Wm. IV. c. 66, s. 4; 2 & 3 Wm. IV. c. 123; 3 & 4 Wm. IV. c. 44, s. 3; 7 Wm. IV. & 1 Vict. c. 84, ss. 2 and 3); of stamps upon or relating to cards or dice (9 Geo. IV. c. 18, s. 35; 11 Geo. IV. & 1 Wm. IV. c. 66, ss. 1 and 26); of certificates, &c. as to annuities grantable by the commissioners for the reduction of the national debt, or of instruments made by them relating thereto (10 Geo. IV. c. 24, s. 41; 11 Geo. IV. & 1 Wm. IV. c. 66, ss. 1 and 26; 2 & 3 Wm. IV. c. 59, s. 19; 7 Wm. IV. & 1 Vict. c. 84, ss. 1 and 3); of certificates snd other documents in order to obtain pay or prize-money, due in respect of services performed by any person in the navy (11 Geo. IV. & 1 Wm. IV. c. 20, ss. 83 and 88; 2 Wm. IV. c. 40, s. 35); of Exchequer-bills,§ Exchequer debentures, East-India bonds, bank-notes, bills of exchange, promissory notes and warrants or orders for the payment of money (11 Geo. IV. & 1 Wm. IV. c. 66, s. 3; 2 & 3 Wm. IV. c. 123, s. 1; 3 & 4 Wm. IV. c. 44, s. 3; 7 Wm. IV. & 1 Vict. c. 84, ss. 2 and 3); of transfers of any public stock transferable at the Bank or South Sea House, or of the capital stock of any body corporate, &c. established by charter or act of parliament (11 Geo. IV. & 1 Wm. IV. c. 66, s. 6 in part; 2 & 3 Wm. IV. c. 123, s. 1; 3 & 4 Wm. IV. c. 44, s. 3; 7 Wm. IV. & 1 Vict. c. 84, ss. 2 and 3); of deeds, bonds, court-rolls, receipts for money or goods, or accountable receipts, or orders for the delivery of goods (11 Geo. IV. & 1 Wm. IV. c. 66, s. 10); of entries in registers of marriages heretofore kept, or in registers of baptisms or burials heretofore or hereafter to be kept by the officiating minister of the parish, &c., or of marriage licences (11 Geo. IV. & 1 Wm. IV. c. 66, s. 20 in part; 6 & 7 Wm. IV. c. 86, ss. 43 and 49); of wills and other testamentary writings, and of powers of attorney to transfer any public stock transferable at the Banks of England or Ireland or the South-Sea House, or to receive any dividend in respect of any such stock (11 Geo. IV. & 1 Wm. IV. c. 66, ss. 3 and 6; 2 & 3 Wm. IV. c. 123, s. 2; 7 Wm. IV. & 1 Vict. c. 84, ss. 1 and 3); of certificates, &c. of the commissioners for granting relief to Trinidad, British Guiana, St. Lucie, and the island of Dominica (2 & 3 Wm. IV. c. 125, s. 65; 5 & 6 Wm. IV. c. 51; 7 Wm. IV. & 1 Vict. c. 84, ss. 1 and 3); of receipts or certificates of the Slave-Compensation Commissioners (5 & 6 Wm. IV. c. 45, s. 12; 7 Wm. IV. & 1 Vict. c. 84, ss. 1 and 3); of receipts for subscriptions towards the sum of four millions for funding Exchequer-bills (2 & 3 Vict. c. 97. s. 32).

2. Offending a third time* in uttering counterfeit gold or silver foreign coin not permitted to be current within this realm. (37 Geo. III. c. 126, s. 4; 11 Geo. IV. & 1 Wm. IV. c. 66, ss. 1 and 26.)

3. Personating seamen, marines, or other persons entitled to any allowance from the Compassionate Fund of the navy, in order to receive their pay or prize-money, or allowance from the Compassionate Fund. (11 Geo. IV. & 1 Wm. IV. c. 20, ss. 84 and 88.)

4. Taking false oath in order to obtain probate of the will or administration of the effects of deceased seamen or marines, or demanding their pay or prize-money by virtue of such will or administration, &c. (11 Geo. IV. & 1 Wm. IV. c. 20, ss. 85 and 88.)

5. Making false entries in the books of the Bank, or of the South Sea Company, or making transfers of stock transferable at either of those places, in the names of persons not being the true owners thereof. (11 Geo. IV. & 1 Wm. IV. c. 66, s. 5; 2 & 3 Wm. IV. c. 123, s. 1; 3 & 4 Wm. IV. c. 44, s. 3; 7 Wm. IV. & 1 Vict. c. 84, ss. 2 and 3.)

6. Personating the owner of any such last-mentioned stock, or of the capital stock of any corporate body, &c. established by charter or act of parliament, or of any dividend payable in respect of such stock, and thereby transferring or endeavouring to transfer such stock, or receiving or endeavouring to receive such dividend. (11 Geo. IV. & 1 Wm. IV. c. 66, s. 6 in part, and 7; 2 & 3 Wm. IV. c. 123, s. 1; 3 & 4 Wm. IV. c. 44, s. 3; 7 Wm. IV. & 1 Vict. c. 84, ss. 2 and 3.)

7. Acknowledging any recognizance or bail, cognovit actionem, judgment, or deed to be enrolled, in the name of any person not privy thereto. (11 Geo. IV. & 1 Wm. IV. c. 66, s. 11.)

8. Destroying or injuring registers of marriages heretofore kept, or registers of baptisms or burials heretofore or hereafter to be kept by the officiating minister of the parish, &c. (11 Geo. IV. & 1 Wm. IV. c. 66, s. 20 in part; 6 & 7 Wm. IV. c. 86, ss, 43 and 49.)

9. Officers of the Bank or South Sea Company secreting, embezzling, or running away with securities or effects. (15 Geo. II. c. 13, s. 12; 24 Geo. II. c. 11, s. 3; 35 Geo. III. c. 66, s. 6; 37 Geo. III. c. 46, s. 6; 4 & 5 Vict. c. 56, s. 1.)

* As to the forgery of stamps on newspapers, the 6 & 7 Wm. IV. c. 76, s. 1, appears to make that offence punishable under 55 Geo. III. c. 184, s. 7, *i. e.* in the same manner as the forgery of stamps on v llum, parchment, or paper. See Lonsdale's 'Statute Criminal Law,' p. 81, note (c.); the language of the Act, however, is very obscure.

† The 52 Geo III. c. 143, s. 10, appears to be repealed, so far as relates to the Customs, by 6 Geo. IV. c. 105, s. 297; at all events is so by 3 & 4 Wm. IV. c. 50, s. 3. Also, as to certificates relating to the duties of Excise, see 41 Geo. III. [U. K.] c. 91, s. 5.

‡ See also 57 Geo. III. c. 124; 1 Geo. IV. cc. 60 and 81; 1 & 2 Geo. IV. c. 111; 4 Geo. IV. c. 63; 5 Geo. IV. cc. 36 and 77; 6 Geo. IV. c. 85; 7 Geo. IV. c. 30; 7 & 8 Geo. IV. cc. 12 and 47; 1 & 2 Wm. IV. c. 24; 4 & 5 Wm. IV. c. 72; 7 Wm. IV. & 1 Vict. c. 51; 1 & 2 Vict. c. 88; 3 & 4 Vict. c. 10; and 5 & 6 Vict. c. 9, s. 14.

§ It is doubtful whether the forgery of Exchequer-bills, made out in pursuance of the annual Appropriation Acts, be not still punishable with death, notwithstanding the repeal of that punishment in case of the forgery of other Exchequer-bills. In those acts a clause continues to be inserted, notwithstanding the repeal by 11 Geo IV. & 1 Wm. IV. c. 66, so far as relates to any forgery, of the 48 Geo. III. c. 1 (which made the forgery of Exchequer-bills directed to be issued under that Act, a capital offence), that all and every the clauses, provisions, powers, privileges, advantages, penalties, forfeitures, and disabilities, contained in the 48 Geo. III. c. 1, shall be applied and extended to the Exchequer-bills to be made out in pursuance of such Appropriation Acts, as fully and effectually, to all intents and purposes, as if the said several clauses or provisoes had been particularly repeated and re-enacted in the body of those acts (See Lonsdale's 'Statute Criminal Law,' p. 99, in note.)

* The punishment for offending a second time is imprisonment for two years, and the offender to find sureties for good behaviour for two years more, to be computed from the end of the first two years; and for offending a first time is imprisonment for six months, and the offender to find sureties for good behaviour for six months more, to be computed from the end of the first six months. (37 Geo. III. c. 126, s. 4.)

10. Privately or secretly using stamps provided in pursuance of any Stamp Act, with intent to defraud her Majesty of any duties granted by such act. (52 Geo. III. c. 184, s. 7; 55 Geo. III. c. 185, s. 7; 9 Geo. IV. c. 18, s. 35; 4 & 5 Vict. c. 56, ss. 1 and 4.)

11. Fraudulently tearing off or removing stamps from vellum, parchment, paper, gold or silver plate, &c., with intent to use them again. (55 Geo. III. c. 184, s. 7; c. 185, s. 7; 4 & 5 Vict. c. 56, ss. 1 and 4.)

12. Offenders transported from St. Helena coming into England before the expiration of their term of transportation. (6 Geo. IV. c. 85, s. 18; 4 & 5 Vict. c. 56, ss. 1 and 4.)

13. Riotously destroying places of worship or houses, or buildings connected with trade or the business of mines. (7 & 8 Geo. IV. c. 30, s. 8; 4 & 5 Vict. c. 56, ss. 1 and 4; 6 & 7 Vict. c. 10.)

XI. *Transportation for life* or not less than seven years, or imprisonment for any term not exceeding four nor less than two years.

1. Being possessed, without lawful excuse, of forged dies, &c., or of any vellum, parchment, or paper having thereon the impression of any forged die, &c.; or fraudulently using any stamp which shall have been removed from any other vellum, &c.; or getting out of or from any vellum, &c., any matter or thing thereon expressed, with intent to use the stamp then being thereon, for any instrument or thing liable to stamp duty, &c. (3 & 4 Wm. IV. c. 97, ss. 11 and 12; 4 & 5 Wm. IV. c. 60.)

2. Forgery of postage stamps; or privately or fraudulently using such stamps, or, without lawful excuse, being possessed of any paper or other material so privately or fraudulently stamped. (3 & 4 Vict. c. 96, s. 22.)

XII. *Transportation for life* or not less than seven years, or imprisonment for any term not exceeding four years, with or without hard labour or solitary confinement, or with both; and the offender, if a male, may be once, twice, or thrice publicly or privately whipped, in addition to such imprisonment.

1. Sending threatening letters with intent to extort money, &c. (7 & 8 Geo. IV. c. 29, ss. 4 and 8.)

2. Corruptly taking any reward for helping to property which has been stolen, &c. (unless the person so taking such reward cause the offender to be apprehended and tried for the same.) (7 & 8 Geo. IV. c. 29, ss. 4 and 58.)

3. Destroying or damaging goods of silk, woollen, linen, or cotton, &c., whilst in progress of manufacture, or any machine or implement used therein, or forcibly entering any place to commit any of those offences. (7 & 8 Geo. IV. c. 30, ss. 3 and 27.)

4. Breaking down sea-banks, &c., whereby any land shall be in danger of being overflowed or damaged; or destroying works on navigable rivers or canals. (7 & 8 Geo IV. c. 30, ss. 12 and 27.)

5. Destroying, &c., public bridges. (7 & 8 Geo. IV. c. 30, ss. 13 and 27.)

XIII. *Transportation for life* or not less than seven years, or imprisonment not exceeding four years, with or without hard labour or solitary confinement, or with both.

1. Counterfeiting the queen's current gold or silver coin. (2 Wm. IV. c. 34, ss. 3 and 19.)

2. Gilding or silvering or colouring counterfeit coin, or any pieces of metal, with intent to make them pass for the queen's current gold or silver coin; or colouring or altering genuine coin, with intent to make it pass for a higher coin. (2 Wm. IV. c. 34, ss. 4 and 19.)

3. Buying, &c., or putting off, &c., at a lower value than the same by its denomination imports, or importing into the kingdom, counterfeit coin intended to pass for the queen's current gold or silver coin, knowing the same to be counterfeit. (2 Wm. IV. c. 34, ss. 6 and 19.)

4. Having been convicted of uttering counterfeit coin intended to pass for the queen's current gold or silver coin,* or having been convicted of uttering such coin, and being possessed at the time of such uttering of more such coin, or having, on the same day or within ten days afterwards, uttered more such coin,† afterwards committing any of such offences. (2 Wm. IV. c. 34, ss. 7 and 19.)

5. Having been convicted of having in possession three or more pieces of counterfeit coin intended to pass for the queen's current gold or silver coin, with intent to utter the same,* afterwards committing the like offence. (2 Wm. IV. c. 34, ss. 8 in part and 19.)

6. Without lawful authority, making, buying or selling, or having in possession, &c. any instrument adapted for counterfeiting the queen's current gold or silver coin. (2 Wm. IV. c. 34, ss. 10 and 19.)

7. Without lawful authority, conveying out of the Mint instruments of coining, or any coin, bullion, &c. (2 Wm. IV. c. 34, ss. 11 and 19.)

8. Persons employed under the Post Office stealing, embezzling, secreting, or destroying post letters containing money, &c. (7 Wm. IV. & 1 Vict. c. 36, ss. 26, 41, 42.)

9. Stealing money, &c., out of post letters. (7 Wm. IV. & 1 Vict. c. 36, ss. 27, 41, 42.)

10. Stealing post letter-bags, or post letters from post letter-bags or from post-offices, or from the officers of the post-office, or from mails; or stopping mails with intent to rob or search them. (7 Wm. IV. & 1 Vict. c. 36, ss. 28, 41, 42.)

11. Receiving letters or other property the stealing, &c. whereof is felony under the Post-office Acts, knowing the same to have been stolen, &c. (7 Wm. IV. & 1 Vict. c. 36, ss. 30, 41, 42.)

12. Forgery of the name or handwriting of the Receiver-General of the General Post-office, &c. to any draft &c. on the Bank. (7 Wm. IV. & 1 Vict. c. 36, ss. 33, 41, 42.)

XIV. *Transportation for life* or not less than seven years, or imprisonment for any term not exceeding four years, with or without hard labour.

1. Taking away or detaining, from motives of lucre, an heiress, &c. against her will, with intent to marry or defile her, &c. (9 Geo. IV. c. 31, s. 19.)

XV. *Transportation for life* or not less than seven years, or imprisonment for any term not exceeding four years, with or without hard labour; or such fine as the court shall award.

1. Manslaughter. (9 Geo. IV. c. 31, s. 9.)

XVI. *Transportation for life* or not less than seven years, or imprisonment for any term not exceeding four years.

1. Persons employed in the Public Record Office certifying as true false copies of records in the custody of the Master of the Rolls. (1 & 2 Vict. c. 94, s. 19 in part.)

2. Forgery of the signature of any Assistant Record Keeper, for the purpose of counterfeiting a certified copy of a record, or of the Seal of the Public Record Office. (1 & 2 Vict. c. 94, s. 19 in part.)

XVII. *Transportation for life* or not less than seven years, or imprisonment for any term not exceeding three years, with or without hard labour or solitary confinement, or with both.

1. Breaking, entering and stealing in churches or chapels, or, having stolen therein, breaking out of the same. (7 & 8 Geo. IV. c. 29, s. 10; 5 & 6 Wm. IV. c. 81; 6 & 7 Wm. IV. c. 4.)

XVIII. *Transportation* for any term not exceeding *fifteen* nor less than ten years, or imprisonment for any term not exceeding three years, with or without hard labour or solitary confinement, or with both.

1. Stealing in a dwelling-house† to the value of 5*l.* or more. (7 & 8 Geo. IV. c. 29, s. 12; 2 & 3 Wm. IV. c. 62; 3 & 4 Wm. IV. c. 44, s. 3; 7 Wm. IV. & 1 Vict. c. 90, ss. 1 and 3.)

2. Breaking, entering, and stealing in a dwelling-house to any value. (7 & 8 Geo IV. c. 29, s. 12; 3 & 4 Wm. IV. c. 44, s. 2; 7 Wm. IV. & 1 Vict. c. 90, ss. 1 and 3.)

3. Cattle-stealing or killing-cattle, with intent to steal the carcass or skin or any part of the cattle so killed. (7 & 8 Geo. IV. c. 29, s. 25; 2 & 3 Wm. IV. c. 62; 3 & 4 Wm. IV. c. 44, s. 3; 7 Wm. IV. & 1 Vict. c. 90, ss. 1 and 3.)

4. Breaking, entering and stealing in buildings within the curtilage of a dwelling-house, but having no communication with the dwelling-house, either immediate or by means of a covered and inclosed passage leading from the one to the other. (7 & 8 Geo. IV. c. 29, ss. 13 and 14; 7 Wm. IV. & 1 Vict. c. 90, ss. 2 and 3.)

5. Breaking, entering and stealing in shops, warehouses or counting-houses. (7 & 8 Geo. IV. c. 29, s. 15; 7 Wm. IV. & 1 Vict. c. 90, ss. 2 and 3.)

* The punishment for uttering, in respect of a first offence, is imprisonment for any term not exceeding one year, with or without hard labour or solitary confinement, or with both.

† The punishment for uttering, accompanied by the aggravation above specified, is, for a first offence, imprisonment for any term not exceeding two years, with or without hard labour or solitary confinement, or with both.

* See below, the punishment for a first offence.

† For the purposes of this and the next offence no building, although within the curtilage of a dwelling-house, shall be deemed to be part of such dwelling-house, which would not be deemed to be so for the purpose of burglary; that is, no building between which and the dwelling-house there is not a communication, either immediate or by means of a covered and inclosed passage leading from the one to the other. See the 7 & 8 Geo. IV. c. 29, s. 13.

6. Stealing to the value of 10*s.* goods of silk, woollen, linen or cotton, &c., whilst exposed in any place during any stage of manufacture. (7 & 8 Geo. IV. c. 29 s. 16; 7 Wm. IV. & 1 Vict. c. 90, ss. 2 and 3.)

7. Stealing goods, from vessels, &c. in ports or upon navigable rivers or canals, &c., or from docks or quays, &c. adjacent thereto. (7 & 8 Geo. IV. c. 29, s. 17; 7 Wm. IV. & 1 Vict. c. 90, ss. 2 and 3.)

8. Maliciously killing, maiming or wounding cattle. (7 & 8 Geo. IV. c. 30, s. 16; 7 Wm. IV. & 1 Vict. c. 90 ss. 2 and 3.)

9. Maliciously destroying hop-binds growing on poles in hop plantations. (7 & 8 Geo. IV. c. 30, s. 18; 7 Wm. IV. & 1 Vict. c. 90, ss. 2 and 3.)

10. Stealing in a dwelling-house,* and by threats or menaces putting any inmate in bodily fear. (7 Wm. IV. & 1 Vict. c. 86, ss. 5 and 7.)

11. Robbery or stealing from the person. (7 Wm. IV. & 1 Vict. c. 87, ss. 5 and 10.)

12. Plundering vessels in distress, or wrecked, stranded, or cast on shore, or anything belonging to any such vessel. (7 Wm. IV. & 1 Vict. c. 87, ss. 8 and 10.)

13. Maliciously destroying any part of a vessel in distress, or wrecked, stranded or cast on shore, or anything belonging to such vessel. (7 Wm. IV. & 1 Vict. c. 89, ss. 8 and 12.)

XIX. *Transportation for fourteen* years.

1. Solemnizing matrimony at any other time than that prescribed by law, or without banns, unless by licence or under the provisions of the 6 & 7 Wm. IV. c. 85 (which allows marriages to take place before the Registrar of the district);† or pretending to be in holy orders and solemnizing matrimony according to the rites of the Church of England. (4 Geo. IV. c. 76, s. 21.)

2. Being possessed, &c. without lawful excuse, of forged bank-notes, &c. (11 Geo. IV. & 1 Wm. IV. c. 66, ss. 12 and 28.)

3 Without the authority of the Bank, making or being possessed of instruments for making, &c. paper used by the Bank for bank-notes, &c. (11 Geo. IV. & 1 Wm. IV. c. 66, s. 13.)

4. Without the authority of the Bank, engraving, making or being possessed of instruments for making, &c. bank-notes, &c., or any character or ornament resembling any part of a bank-note, &c. (11 Geo. IV. & 1 Wm. IV. c. 66, ss. 15 and 16.)

XX. *Transportation* for any term not exceeding *fourteen* years.

1. Aiding prisoners to escape, or in attempting to escape from prison, whether an actual escape be made or not. (4 Geo. IV. c. 64, s. 43.)

2. Rescuing offenders sentenced to be transported or banished. (5 Geo. IV. c. 84, s. 22.)

3. Forging certificates given under the Income Tax Act. (5 & 6 Vict. c. 35, s. 181, continued by 8 & 9 Vict. c. 4.)

XXI. *Transportation* for any term not exceeding *fourteen* nor less than seven years, or imprisonment not exceeding three years nor less than one year, with or without hard labour or solitary confinement, or with both.

1. Forgery of memorials or certificates of registry, &c. of lands in Yorkshire or Middlesex (2 & 3 Anne, c. 4, s. 19; 5 Anne, c. 18, s. 8; 6 Anne, c. 35, s. 26; 7 Anne, c. 20, s. 15; 8 Geo. II. c. 6, s. 31; 11 Geo. IV. & 1 Wm. IV. c. 66, ss. 23 and 26); or of extracts from registers of marriage, baptism, or burial, in order to sustain any claim to any allowance from the Compassionate Fund of the Navy, &c. (11 Geo. IV. & 1 Wm. IV. c. 20, ss. 87 in part and 88.)

2. Subscribing false petitions to the secretary of the Admiralty, or personating the representatives of deceased seamen or marines, in order to procure a certificate from the Inspector of Royal Marines, &c., thereby to obtain, without probate or letters of administration, any allowance from the Compassionate Fund of the Navy, &c. (11 Geo. IV. & 1 Wm. IV. c. 20, ss. 86 and 88; 2 Wm. IV. c. 40.)

3. Making false affidavits, &c. in order to procure any person to be admitted a pensioner as the widow of an officer of the royal navy, &c. (11 Geo. IV. & 1 Wm. IV. c. 20, ss. 87 in part and 88.)

* See the 7 & 8 Geo. IV. c. 29, s. 13, referred to in note* p. 169; it is doubtful, however, if the definition of the term "dwelling-house" there contained, apply to the above offence; though in all probability it would be held to do so, the above offence being contained in the one (see 7 & 8 Geo. IV. c. 29, s. 12) to which that definition was intended to apply.

† See below, the punishment for solemnizing marriages contrary to the provisions of 6 & 7 Wm. IV. c. 85.

4. Without authority, making or being possessed of instruments for making, &c. paper used by any other bank than the Bank of England. (11 Geo. IV. & 1 Wm. IV. c. 66, ss. 17 and 26.)

5. Without authority, engraving, making or being possessed of instruments for making, &c. the notes, &c. of any other bank than the Bank of England. (11 Geo. IV. & 1 Wm. IV. c. 66, ss. 18 and 26.)

6. Without authority, making or being possessed of instruments for making, &c. foreign bills, notes, &c. (11 Geo. IV. & 1 Wm. IV. c. 66, ss. 19 and 26.)

XXII. *Transportation* for any term not exceeding *fourteen* nor less than seven years, or imprisonment not exceeding three years nor less than one year.

1. Subscribing or publishing, &c. false petitions to the Inspector of seamen's wills in order to obtain a cheque or certificate in lieu of probate or letters of administration, in cases where deceased's assets do not exceed 32*l.* and 20*l.* respectively. (2 Wm. IV. c. 40, s. 33.)

XXIII. *Transportation* for any term not exceeding *fourteen* nor less than seven years, or imprisonment not exceeding three years, with or without hard labour or solitary confinement, or with both; and the offender, if a male, may be once, twice, or thrice publicly or privately whipped, in addition to such imprisonment.

1. Stealing by clerks or servants. (7 & 8 Geo. IV. c. 29, ss. 4 and 46.)

2. Embezzlement by clerks or servants. (7 & 8 Geo. IV. c. 29, ss. 4 and 47.)

3. Receiving property, the stealing or taking whereof is felony, knowing the same to have been stolen, &c. (7 & 8 Geo. IV. c. 29, ss. 4 and 54.)

4. Boatmen and others concealing, &c. and not reporting according to law, or obliterating the marks, &c. on, anchors or other articles found by them on the coast, &c. (provided the stealing of such articles on shore would amount to felony). (1 & 2 Geo. IV. c. 75, s. 1; and c. 76.)

XXIV. *Transportation* for any term not exceeding *fourteen* nor less than seven years, or imprisonment not exceeding three years, with or without hard labour or solitary confinement, or with both.

1. Impairing or lightening the queen's current gold or silver coin, with intent to make the same, when so impaired, &c., pass for the queen's current gold or silver coin. (2 Wm. IV. c. 34, ss. 5 and 19.)

2. Stealing post letter-bags from Post-office packets, or unlawfully taking letters out of or opening such bags. (7 Wm. IV. & 1 Vict. c. 36, ss. 29, 41 and 42.)

XXV. *Transportation* for any term not exceeding *fourteen* nor less than seven years, or imprisonment not exceeding three years, with or without hard labour.

1. Embezzlement by public officers. (2 Wm. IV. c. 4, s. 1.)

2. Forgery, &c. of assay marks on gold or silver wares; or fraudulently using genuine dies provided for marking such wares. (7 & 8 Vict. c. 22, s. 2.)

XXVI. *Transportation* for any term not exceeding *fourteen* nor less than seven years, or imprisonment not exceeding two years, with or without hard labour or solitary confinement, or with both.

1. Officer of the court certifying as true, &c. any false copy of a previous conviction, &c. of any offence relating to the coin, where a person shall be subsequently indicted for any such offence. (2 Wm. IV. c. 34, ss. 9 and 19.)

XXVII. *Transportation* for any term not exceeding *fourteen* years, or confinement not exceeding five nor less than three years, with hard labour.

1. Trading in slaves either directly or indirectly, or entering into contracts in connexion therewith; or forging certificates of valuation, sentences or decrees of condemnation or restitution, &c. (5 Geo. IV. c. 113, s. 10; 3 & 4 Wm. IV. c. 73.*)

XXVIII. *Transportation* for the term of *fourteen* years, or, in mitigation or commutation of such punishment, the offender to be publicly whipped, fined or imprisoned, or all or any one or more of them.

1. Obliterating, &c. the marks denoting her Majesty's property in any warlike or naval, ordnance or victualling, or other public stores, for the purpose of concealing her Majesty's property in such stores. (9 & 10 Wm. III. c. 41: 39 & 40 Geo. III. c. 89, ss. 4 and 7; 54 Geo. III. c. 60; 55 Geo. III. c. 127; 56 Geo. III. c. 138.)

* See also 3 & 4 Vict. c. 111.

XXIX. *Transportation* for *seven* years.

1. Obstructing the execution of process, &c. within the hamlet of Wapping, Stepney, or any other place within the limits of the weekly bills of mortality, wherein persons shall unlawfully assemble and associate for the sheltering themselves from their debtors, of which complaint shall have been made by a presentment of the grand jury at a general or quarter sessions of the proper county. (11 Geo. I. c. 22, ss. 1 and 2.)

2. Aiding the escape from officers of justice of prisoners in their custody for the purpose of being carried to gaol by virtue of a warrant of commitment for treason or felony, or the escape of felons on their way for transportation. (16 Geo. II. c. 31, s. 3.*)

3. Riotously assembling, to the number of five or more, to rescue offenders against the Acts relating to spirituous liquors; or assaulting persons who have given, &c. evidence, &c. against such offenders, &c. (24 Geo. II. c. 40, s. 28.)

4. Prisoners for debt not delivering in under the Lords' Act a true account of all their estate and effects, &c.† (32 Geo. II. c. 28, s. 17; 33 Geo. III. c. 5; 39 Geo. III. c. 50.)

5. Damaging, &c. buoys, &c. fixed to the anchors or moorings of vessels in the Thames, with intent to steal the same. (2 Geo. III. c. 28, s. 13)

6. Being convicted a second time‡ of unlawfully stopping or attempting to stop, or of otherwise preventing the conveyance of grain to or from any city, market-town or place in the kingdom. (11 Geo. II. c. 22; 36 Geo. III. c. 9, ss. 2 and 6.)

7. With intent to prevent the removal of grain, pulling down or otherwise destroying granaries, &c. (36 Geo. III. c. 9, s. 2.)

8. Forgery of the declarations of the return of premiums on policies or contracts of insurance. (54 Geo. III. c. 133, s. 10; 54 Geo. III. c. 144, s. 11.)

9. Forcibly rescuing offenders or goods seized under 6 Geo. IV. c. 80 (for repealing the duties on spirits distilled in England, &c.), or otherwise forcibly opposing the execution of the powers of that Act. (6 Geo. IV. c. 80, s. 143.)

10. Being found in company with more than four persons with smuggled goods, or in company with only one person within five miles of the coast, &c. with such goods, and armed or disguised. (8 & 9 Vict. c. 87, s. 65.)

11. Forgery of the superscription of a post letter with intent to avoid the payment of postage.§ (7 Wm. IV. and 1 Vict. c. 36, s. 34.)

XXX. *Transportation* for any term not exceeding *seven* years.

1. Forgery of the seal, &c. of the British Society for extending the Fisheries and improving the Sea Coasts of the Kingdom. (26 Geo. III. c. 103, s. 26.)

2. Administering oaths intended to bind the person taking the same to engage in any seditious purpose, &c., or to be of any association or confederacy formed for any such purpose, &c. (37 Geo III. c. 123, s. 1.)

3. Counterfeiting foreign gold or silver coin, not permitted to be current within the realm. (37 Geo. III. c. 126, s. 2.)

4. Bringing any such coin into the realm with intent to utter the same. (37 Geo. III. c. 126, s. 3.)

5. Boatmen, &c. conveying anchors, &c. which they know to have been swept for or otherwise taken possession of without being reported according to law, to any foreign port, &c., and there disposing of the same. (1 & 2 Geo. IV. c. 75, s. 15.)

XXXI. *Transportation* for *seven* years, or imprisonment for any period not less than two years.

1. Without lawful excuse, making or being possessed of any instrument for making the paper used for permits by the Commissioners of Excise, or being possessed of any such paper, or engraving, &c. any plate, &c. for making or printing the paper used for permits, &c. (2 Wm. IV. c. 16, s. 3.)

2. Without lawful excuse, making or being possessed of instruments for making the paper to be used for postage covers, or being possessed of any such paper, or by any means imitating or causing to appear in any paper the marks or threads, &c. to be used in postage covers. (3 & 4 Vict. c. 96, s. 29.)

XXXII. *Transportation* for *seven* years, or imprisonment not exceeding four years.

1. Forgery of certificates or bills of exchange mentioned in 2 & 3 Wm. IV. c. 106 (An Act for enabling Officers, &c. in the Army to draw for their Half-pay and Allowances). (2 & 3 Wm. IV. c. 106, s. 3.)

XXXIII. *Transportation* for *seven* years, or imprisonment for any term not exceeding three years nor less than one year, with hard labour.

1. Forgery of the seals, stamps or signatures of such certificates, official or public documents, proceedings of corporations, or joint stock or other companies, or certified copies of such documents or proceedings, as are receivable in evidence in Parliament or in any judicial proceeding, or tendering in evidence such certificates, &c. with false or counterfeit seals &c. thereto; or

2. Forgery of the signature of any equity or common law judge of the Superior Courts at Westminster, to any judicial or official document, or tendering in evidence any such document with a false, &c. signature of any such judge thereto; or

3. Printing copies of private acts or of the journals of either House of Parliament, which copies shall falsely purport to have been printed by the printers to the Crown or either House of Parliament, or tendering in evidence any such copy, knowing that the same was not printed by the persons by whom it so purports to have been printed. (8 & 9 Vict. c. 113, s. 4.)

XXXIV. *Transportation* for *seven* years, or imprisonment for any term not exceeding three years, with or without hard labour or solitary confinement, or with both.

1. Persons employed under the Post-Office stealing, embezzling, secreting or destroying post-letters. (7 Wm. IV. & 1 Vict. c. 36, ss. 26 and 42.)

XXXV. *Transportation* for *seven* years, or imprisonment for any term not exceeding two years nor less than one year, with or without hard labour or solitary confinement, or with both.

1. Forgery of the name or handwriting of witnesses attesting the execution of powers of attorney to transfer any public stock transferable at the Bank or South Sea House, or any capital stock of any body corporate, &c. established by charter or act of parliament, or to receive any dividend in respect thereof (11 Geo. IV. & 1 Wm. IV. c. 66, ss. 8 and 26); or of copies of registers of baptisms, marriages,* or burials, directed by law to be transmitted to the registrar of the diocese; or making false entries in such copies, &c. (11 Geo. IV. & 1 Wm. IV. c. 66, ss. 22 and 26.)

2. Clerks, &c. of the Bank or South Sea House, with intent to defraud any person, making out dividend warrants for a greater or less amount than the persons on whose behalf they are made out are entitled to. (11 Geo. & Wm. IV. c. 66, ss. 9 and 26.)

XXXVI. *Transportation* for *seven* years, or imprisonment for any term not exceeding two years, with or without hard labour or solitary confinement, or with both; and the offender, if a male, may be once, twice, or thrice publicly or privately whipped, in addition to such imprisonment.

1. Forgery of the stamps or seals on hides or skins (9 Anne, c. 11; 10 Anne, c. 99; 5 Geo. I. c. 2, s. 9; 52 Geo. III. c. 143, s. 1; 7 & 8 Geo. IV. c. 28, ss. 8 and 9); of the stamps or seals used for stamping or sealing cambrics or lawns, in pursuance of 4 Geo. III. c. 37, An Act for the better establishing a manufactory of Cambrics and Lawns at Winchelsea, in the County of Sussex, &c. (4 Geo. III. c. 37, s. 26; 52 Geo. III. c. 143, s. 1; 7 & 8 Geo. IV. c. 28, ss. 8 and 9); of the stamps or seals on silk (13 Geo. III. c. 56, s. 5; 52 Geo. III. c. 143, s. 1; 7 & 8 Geo. IV. c. 28, ss. 8 and 9; 1 Wm. IV. c. 17, s. 1); of the name or handwriting of the registrar of the Court of Admiralty or High Court of Appeals of Prizes, &c., to any instrument relating to the money or effects of the suitors of those courts (53 Geo. III. c. 151, s. 12; 7 & 8

* See also 1 & 2 Geo. IV. c. 88, s. 1, which, under certain circumstances, inflicts transportation for seven years, or imprisonment not exceeding three years nor less than one year, upon persons rescuing or aiding in rescuing prisoners apprehended for felony, whilst in the personal custody of a constable or other person. The statute regards the offender in such case as an accessory after the fact, and therefore guilty of felony.

† This offence appears to be incidentally repealed by 1 & 2 Vict. c. 110, s. 119, which enacts that after the passing of that act, no prisoner for debt shall petition any court for his discharge under the provisions of 32 Geo. II. c. 28, nor shall any creditor of any prisoner petition any court for the exercise of the compulsory power given against debtors under the provisions of that act.

‡ The first offence is punishable, on summary conviction, with imprisonment and hard labour for any term not exceeding three months nor less than one month.

§ There are still some cases to which this enactment is applicable

* As regards copies of registers of marriages, it would appear that this offence can now, since the passing of 6 & 7 Wm. IV. c. 86 (for registering births, deaths, and marriages, in England), be committed with respect to such copies only as were transmitted before that Act came into operation. It is still in full force however, as regards registers of baptisms or burials. (See the 49th sect. of 6 & 7 Wm. IV. c. 86.)

Geo. IV. c. 28, ss. 8 and 9); of quarantine certificates (6 Geo. IV. c. 78, s. 25; 7 & 8 Geo. IV. c. 28, ss. 8 and 9); of the name or handwriting of her Majesty's Commissioners of Woods, Forests, Land Revenues, Works and Buildings, to any draft, &c. for any money in the Bank, &c. on account of such commissioners, &c. (7 & 8 Geo. IV. c. 28, ss. 8 and 9; 10 Geo. IV. c. 50, s. 124; 2 & 3 Wm. IV. c. 1, s. 1); or of the process of inferior courts for the recovery of debts and damages in personal actions (7 & 8 Geo. IV. c. 28, ss. 8 and 9; 7 & 8 Vict. c. 19, s. 5 in part).

2. Obstructing the execution of process, &c. within Suffolk Place or the Mint, in the parish of St. George, in the county of Surrey. (9 Geo. I. c. 28, ss. 1 and 2; 7 & 8 Geo. IV. c. 28, ss. 8 and 9.)

3. Persons having preserved merchandise &c. belonging to vessels wrecked &c. within the jurisdiction of the Cinque Ports, selling or otherwise making away with the same, or in any manner altering the same with intent to prevent the discovery or identity thereof by the owners. (1 & 2 Geo. IV. c. 76, s. 8; 7 & 8 Geo. IV. c. 28, ss. 8 and 9.)

4. Quarantine officers deserting from their duty or permitting persons &c. to depart from lazarets &c., unless by permission under an order in council, &c.; or giving false certificates of vessels having duly performed quarantine. (6 Geo. IV. c. 78, s. 21; 7 & 8 Geo. IV. c. 28, ss. 8 and 9.)

5. Solemnizing marriages (except in the case of Quakers or Jews, or by special licence) in any other place than a church, chapel or registered office, or doing so in any such office in the absence of the registrar of the district, &c. (7 & 8 Geo. IV. c. 28, ss. 8 and 9; 6 & 7 Wm. IV. c. 85, s. 39.)

6. Superintendent registrars issuing certificates for marriage, or registering marriages, contrary to law; or registrars or superintendent registrars issuing licences for marriage, or solemnizing marriages, contrary to law. (7 & 8 Geo. IV. c. 28, ss. 8 and 9; 6 & 7 Wm. IV. c. 85, s. 40; 7 Wm. IV. & 1 Vict. c. 22, s. 3.)

7. Destroying, counterfeiting or inserting false entries in, the register-books directed to be provided by the act for registering births, deaths, and marriages in England; or forging the seal of the register-office. (7 & 8 Geo. IV. c. 28, ss. 8 and 9; 6 & 7 Wm. IV. c. 86, s. 43.)

8. Officer of the court uttering false certificates of indictments and convictions of a previous felony; or any other person signing &c., such certificates as such officer, &c. (7 & 8 Geo. IV. c. 28, ss. 9 and 11.)

9. Simple larceny. (7 & 8 Geo. IV. c. 29, ss. 3 and 4.)

10. Deer-stealing, &c., where the deer are kept in enclosed lands. (7 & 8 Geo. IV. c. 29, ss. 3, 4, and 26.)

11. Deer-stealing, &c. where the deer are kept in unenclosed lands (for a second offence*); or offending a second time in committing any other offence relating to deer for which a pecuniary penalty only is imposed, whether such second offence be of the same description as the first or not. (7 & 8 Geo. IV. c. 29, ss. 3, 4, and 26.)

12. Deer-stealers, &c. beating or wounding deer-keepers. (7 & 8 Geo. IV. c. 29, ss. 3, 4, and 29.)

13. Stealing oysters &c. from oyster-beds &c. (7 & 8 Geo. IV. c. 29, ss. 3, 4, and 36.)

14. Stealing or severing with intent to steal, ore, coal &c. from mines &c. (7 & 8 Geo. IV. c. 29, ss. 3, 4, and 37.)

15. Stealing or damaging with intent to steal, or maliciously destroying &c. trees, &c. growing in parks &c. or grounds belonging to dwelling-houses, if the value of the article stolen or the amount of injury done exceeds 1*l*., or growing elsewhere, if such value or amount exceeds 5*l*. (7 & 8 Geo. IV. c. 29, ss. 3, 4, and 38; and c. 30, ss. 19 and 27.)

16. Stealing, or damaging with intent to steal, or maliciously destroying &c. trees &c., wherever growing, if the stealing thereof, or the injury done is to the amount of a shilling at the least, and if the offender has been twice previously convicted.† (7 & 8 Geo. IV. c. 29, ss. 3, 4, and 39; and c. 30, ss. 20 and 27.)

17. Stealing, or damaging with intent to steal, or maliciously destroying &c. plants, vegetable productions &c. growing in gardens, conservatories &c., if the offender has been previously convicted of any of such offences.* (7 & 8 Geo. IV. c. 29, ss. 3, 4, and 42; and c. 30. ss. 21 and 27.)

18. Stealing, or breaking &c. with intent to steal, glass, fixtures &c. from buildings, or metal fences &c., belonging to dwelling-houses or fixed in any place dedicated to public use or ornament. (7 & 8 Geo. IV. c. 29, ss. 3, 4, and 44.)

19. Tenants or lodgers stealing chattels or fixtures let to be used with any house or lodging. (7 & 8 Geo. IV. c. 29, ss. 3, 4, and 45.)

20. Destroying &c. threshing-machines, or engines used in any other manufacture than those of silk, woollen, linen, or cotton goods, or of framework-knitted pieces, stockings, hose or lace. (7 & 8 Geo. IV. c. 30, ss. 4 and 27.)

21. Drowning mines, or obstructing airways, shafts &c. belonging to mines, with intent to damage or delay the working of them. (7 & 8 Geo. IV. c. 30, ss. 6 and 27.)

22. Destroying or damaging engines for working mines, or any buildings or erections used in conducting the business of mines. (7 & 8 Geo. IV. c. 30, ss. 7 and 27.)

23. Damaging vessels otherwise than by fire, with intent to render them useless. (7 & 8 Geo. IV. c. 30, ss. 10 and 27.)

24. Damaging sea-banks or the banks of rivers, canals or marshes, or injuring navigable rivers or canals, with intent and so as thereby to obstruct the navigation thereof. (7 & 8 Geo. IV. c. 30, ss. 12 and 27.)

25. Maliciously setting fire to crops of grain or pulse, plantations of trees, heath, fern, &c. (7 & 8 Geo. IV. c. 30, ss. 17 and 27.)

26. Offenders ordered to be confined in Parkhurst prison escaping or breaking prison, &c., after they have been already punished† for escaping therefrom, &c., or whilst in the custody of the person under whose charge they are confined. (7 & 8 Geo. IV. c. 28, ss. 8 and 9; 1 & 2 Vict. c. 82, s. 12.)

27. Rescuing offenders ordered to be confined in Parkhurst prison during their conveyance there or whilst in the custody of the person under whose charge they are confined. (7 & 8 Geo. IV. c. 28, ss. 8 and 9; 1 & 2 Vict. c. 82, s. 13.)

28. Persons having the custody of such offenders, allowing them to escape. (7 & 8 Geo. IV. c. 28, ss. 8 and 9; 1 & 2 Vict. c. 82, s. 13.)

29. Aiding in the escape of such offenders, or attempting to rescue them, although no rescue be made. (7 & 8 Geo. IV. c. 28, ss. 8 and 9; 1 & 2 Vict. c. 82, s. 13.)

30. Destroying, counterfeiting or making false entries in non-parochial registers of births, deaths, marriages, &c. (7 & 8 Geo. IV. c. 28, ss. 8 and 9; 3 & 4 Vict. c. 92, s. 8.)

31. Convicts confined in the Pentonville and Millbank prisons, being a second time‡ convicted of breaking prison or escaping during their conveyance to such prisons. (7 & 8 Geo. IV. c. 28, ss. 8 and 9; 5 & 6 Vict. c. 29, s. 24 in part; 6 & 7 Vict. c. 26, s. 22 in part.)

32. Rescuing or aiding in rescuing convicts during their conveyance to the Pentonville and Millbank prisons or during their imprisonment therein. (7 & 8 Geo. IV. c. 28, ss. 8 and 9; 5 & 6 Vict. c. 29, s. 25 in part; 6 & 7 Vict. c. 26, s. 23, in part.)

33. Persons having the custody of convicts in the Pentonville and Millbank prisons wilfully allowing them to escape: or any person aiding such convicts to escape, although no escape be made, or attempting to rescue such convicts, or aiding in any such attempt, though no rescue be made. (7 & 8 Geo. IV. c. 28, ss, 8 and 9; 5 & 6 Vict. c. 29, s. 25 in part; 6 & 7 Vict. c. 26, s. 23 in part.)

34. Acting as a bailiff of any inferior court for the recovery

* The first offence is punishable on summary conviction only, by fine not exceeding 50*l*. (See 7 & 8 Geo. IV. c. 29, s. 26.)

† The first two offences are punishable on summary conviction only; the first by fine not exceeding 5*l*. over and above the value of the trees, &c., or amount of injury done, and the second by imprisonment and hard labour not exceeding twelve calendar months. (See 7 & 8 Geo. IV. c. 29, s. 39; and c. 30, s. 20.)

* The first offence is punishable on summary conviction only, by imprisonment not exceeding six calendar months, with or without hard labour, or by fine not exceeding 20*l*. over and above the value of the plants &c., or the injury done. (See 7 & 8 Geo. IV. c. 29, s. 42; and c. 30, s. 2..)

† That is to say, by an addition, not exceeding two years, to the term of imprisonment for which they were subject to be confined at the time of their escape &c.; or if under sentence of transportation, in such manner as such persons escaping &c. are liable to be punished. (See sect. 12.) By the same section attempts to break prison or escape from Parkhurst prison are made punishable with imprisonment not exceeding twelve calendar months in addition to the punishment to which the offender was subject at the time of any such attempt.

‡ The punishment for a first escape or breach of prison is by an addition, not exceeding three years, to the term of their imprisonment. (5 & 6 Vict. c. 29, s. 24 in part; 6 & 7 Vict. c. 26, s. 22 in part.) By the same sections of those Acts attempts to break out of the Pentonville and Millbank prisons, or to escape therefrom, are punishable by an addition, not exceeding twelve calendar months, to the terms of the offenders' imprisonment. Also by sect. 21 of 5 & 6 Vict. c. 29, and sect. 19 of 6 & 7 Vict. c. 26, convicts in the Pentonville and Millbank prisons assaulting the governors or any of the officers or servants employed therein, are liable upon conviction to be imprisoned for any term not exceeding two years in addition to the term for which at the time of committing that offence they were subject to be confined, and, if males, may be ordered corporal punishment.

of debts or damages in personal actions, without lawful authority. (7 & 8 Geo. IV. c 28, ss. 8 and 9; 7 & 8 Vict. c. 19, s. 5 in part.)

35. Workmen in mines in Cornwall removing or concealing ore with intent to defraud the proprietors of such mines. (2 & 3 Vict. c. 58, s. 10.)

XXXVII. *Transportation* for *seven* years, or imprisonment for any term not exceeding two years, with or without hard labour; and the offender, if a male, may be once, twice, or thrice publicly or privately whipped, in addition to such imprisonment.

1. Child-stealing. (9 Geo. IV. c. 31, s. 21.)

XXXVIII. *Transportation* for *seven* years, or imprisonment for any term not exceeding two years, with or without hard labour.

1. Bigamy. (9 Geo. IV. c. 31, s. 22.)

XXXIX. *Transportation* for any term not exceeding *seven* years, or imprisonment for any number of years.

1. Cutting away or in any way injuring or concealing buoys, &c. belonging to vessels or attached to the anchors or cables of vessels, whether in distress or otherwise.* (1 & 2 Geo. IV. c. 75, s. 11.)

XL. *Transportation* for any term not exceeding *seven* years, or imprisonment not exceeding two years, with or without hard labour or solitary confinement, or with both.

1. Counterfeiting the queen's current copper coin; or, without lawful authority, making or being possessed of instruments for counterfeiting such coin; or buying or selling such coin at a lower value than it by its denomination imports. (2 Wm. IV. c. 34, ss. 12 and 19.)

XLI. *Transportation* for any term not exceeding *seven* years, or fine, imprisonment, and such corporal punishment by public or private whipping, as the court shall direct.

1. Slaughtering or flaying horses or other cattle without taking out the licence and giving the notice required by the Act for regulating slaughtering-houses, or doing so at any other time than within the hours limited by the Act, or not delaying to do so, when prohibited by the inspector. (26 Geo. III. c. 71, s. 8.)

IV. Misdemeanors.

Misdemeanors are punishable as follows, viz.: with

I. *Transportation* for *life*.

1. Being at large within the United Kingdom [after being sentenced to be banished under the provisions of the Roman Catholic Relief Act (10 Geo. IV. c. 7),] without some lawful excuse, after three calendar months from such sentence. (10 Geo. IV. c. 7, s. 36.)

II. *Banishment* for *life*.

1. Jesuits or members of Religious Orders or Societies of the Church of Rome, bound by monastic or religious vows, coming into the kingdom. (10 Geo. IV. c. 7, s. 29);† or

2. Having obtained the Secretary of State's licence to come, not departing within twenty days after the expiration of the time mentioned in such licence, &c. (10 Geo. IV. c. 7, s. 31.)

3. Within any part of the kingdom, becoming a Jesuit or member of any Society of the Church of Rome bound by monastic or religious vows. (10 Geo. IV. c. 7, s. 34.)

III. *Transportation* for the term of *fourteen* years, or, in mitigation or commutation of such punishment, the offender to be publicly whipped, fined or imprisoned, or all or any one or more of them.

1. Not being a contractor with the Commissioners of the Navy, Ordnance or Victualling Office for her Majesty's use, selling, receiving or being possessed of any warlike or naval, ordnance, victualling or other public stores, without being able to produce a certificate from the Commissioners of the Navy &c., expressing the occasion &c. of such stores being so in possession.‡ (9 & 10 Wm. III. c. 41; 9 Geo. I. c. 8, s. 3; 39 & 40 Geo. III. c. 89, ss. 1 and 7; 54 Geo. III. c. 60; 55 Geo. III. c. 127; 56 Geo. III. c. 138, s. 2.)

2. Being a second time convicted (not being a contractor with the Commissioners of the Navy &c.) of being possessed of &c. certain of her Majesty's or other public stores, the being possessed &c. of which would not otherwise, as the first offence, subject a person to transportation. (9 & 10 Wm. III. c. 41; 39 & 40 Geo. III. c. 89, ss. 5 and 7; 54 Geo. III. c. 60; 55 Geo. III. c. 127; 56 Geo. III. c. 138, s. 2.)

IV. *Transportation* for any term not exceeding *fourteen* nor less than seven years, or fine or imprisonment, or both, such imprisonment to be with or without hard labour or solitary confinement, or with both.

1. Bankers, merchants &c. converting to their own use money or securities intrusted to them to be applied for a specified purpose. (7 & 8 Geo. IV. c. 29, ss. 4 and 49.)

2. Bankers, merchants &c. converting to their own use chattels, securities &c. intrusted to them for a special purpose, but without authority to sell or negotiate &c. the same. (7 & 8 Geo. IV. c. 29, ss. 4 and 49.)

3. Factors or agents pledging goods or merchandise intrusted to them for sale, as a security for money &c. borrowed &c. by them. (7 & 8 Geo. IV. c. 29, ss. 4 and 51.)

V. *Transportation* for any term not exceeding *fourteen* nor less than seven years, or fine or imprisonment, or both.

1. Agents intrusted with goods making consignments &c. thereof, without the authority of their principals. (5 & 6 Vict. c. 39, s. 6.)

VI. *Transportation* for any term not exceeding *fourteen* nor less than seven years, or imprisonment with hard labour for any term not exceeding three years.

1. Being in any land, by night, to the number of three or more (any of them being armed), for the purpose of taking or destroying game* or rabbits. (9 Geo. IV. c. 69, s. 9.)

VII. *Transportation* for *seven* years.

1. Counterfeiting foreign copper or other coin of a less value than silver coin, not permitted to be current in this kingdom (for the second offence).† (43 Geo. III. c. 139, s. 3.)

VIII. *Transportation* for *seven* years, or fine or imprisonment, or both, such imprisonment to be with or without hard labour or solitary confinement, or with both.

1. Stealing, obliterating or destroying records or original documents belonging to Courts of Record, &c. (7 & 8 Geo. IV. c. 29, ss. 4 and 21.)

2. Stealing, destroying or concealing wills or other testamentary instruments, either during the life of the testator or after his death. (7 & 8 Geo. IV. c. 29, ss. 4 and 22.)

3. Stealing title-deeds. (7 & 8 Geo. IV. c. 29, ss. 4 and 23.)

4. Obtaining property by false pretences.‡ (7 & 8 Geo. IV. c. 29, ss. 4 and 53.)

IX. *Transportation* for *seven* years, or fine and imprisonment.

1. Forgery of permits, or knowingly accepting or receiving forged permits. (2 Wm. IV. c. 16, s. 4.)

X. *Transportation* for *seven* years, or the like punishment as for a misdemeanor at common law.§

1. Purchasing or receiving anchors &c. which have been swept for or otherwise taken possession of, whether the same have belonged to vessels in distress or otherwise, if such anchors &c. have not been reported &c. according to law. (1 & 2 Geo. IV. c. 75, s. 12; and c. 76, s. 10.)

XI. *Transportation* for *seven* years, or imprisonment with or without hard labour.

1. Assaulting officers on account of the exercise of their duty in the preservation of vessels in distress, &c. (9 Geo. IV. c. 31, s. 24.)

XII. *Fine of* 40*l*., or if the offender have not goods or chattels, lands or tenements to the value of 40*l*., then imprisonment by the space of one half-year;‖ and, besides the before-mentioned punishment, the offender may be imprisoned

* The 1 & 2 Geo. IV. c. 76, s. 6, contains a similar provision as regards buoys &c. within the jurisdiction of the Cinque Ports, but subjects the offender to transportation not exceeding fourteen years.

† This and the next two offences do not apply to members of Female Societies. (10 Geo. IV. c. 7, s. 37.)

‡ The mode in which the 39 & 40 Geo. III. c. 89, s. 1, imposes the above penalties in respect of these offences, is by enacting that persons who commit them shall be deemed *receivers of stolen goods*, knowing them to have been stolen, and shall, on being convicted thereof in due form of law, be transported beyond the seas, for the term of fourteen years, *in manner as other receivers of stolen goods are directed to be transported by the laws and statutes of this realm*; and then by sec. 7 empowers the court to mitigate or commute the punishment as above mentioned: the punishment of receivers has, however, been since altered by the 7 & 8 Geo. IV. c 29, ss. 54 and 55. It therefore becomes a question how far such alteration has modified the above punishment

* For the purposes of 9 Geo. IV. c. 69, the word "game" includes hares, pheasants, partridges, grouse, heath or moor game, black game, and bustards. (See sec. 13.)

† The punishment for a first offence is imprisonment not exceeding one year.

‡ See the 8 & 9 Vict. c. 109, s. 17, which declares that persons winning money, &c. by cheating at cards or other games, shall be guilty of obtaining such money, &c. by false pretences, and shall be punished accordingly.

§ The punishment for a misdemeanor at common law is fine and imprisonment.

‖ It is only when the offender is prosecuted under 5 Eliz. c. 9, that he is liable to this portion of these penalties. If prosecuted at common law he is punishable with fine and imprisonment; but may be sentenced to the other penalties stated above. The common law offence extends also to subornation of perjury in *any* judicial proceeding.

with hard labour for a term not exceeding seven years, or *transported* for a term not exceeding *seven* years; and, in addition to or in lieu of the before-mentioned punishments, may be imprisoned with hard labour for any term not exceeding the term for which he may be imprisoned as aforesaid; and the offender on conviction cannot thenceforth be received as a witness in any court of record, unless the judgment given against him be reversed.

1. Subornation of perjury in any of the Queen's Courts of Chancery or Courts of Record, or in any Leet, View of Frank-pledge, or Law-day, Ancient Demesne Court, Hundred Court, Court Baron, or in the Court or Courts of the Stannary in the counties of Devon and Cornwall; or suborning witnesses sworn to testify *in perpetuam rei memoriam*.* (5 Eliz. c. 9, ss. 3, 4, and 5; 29 Eliz. c. 5; 21 Jac. I. c. 28, s. 8; 2 Geo. II. c. 25, s. 2; 3 Geo. IV. c. 114; 7 Wm. IV. & 1 Vict. c. 23.)

XIII. *Fine of* 20*l.* and imprisonment for six months; † and besides the before-mentioned punishment the offender may be imprisoned with hard labour for a term not exceeding seven years, or *transported* for a term not exceeding *seven* years; and, in addition to or in lieu of the before-mentioned punishments, may be imprisoned with hard labour for any term not exceeding the term for which he may be imprisoned as aforesaid; and the offender on conviction cannot thenceforth be received as a witness in any Court of Record, unless the judgment given against him be reversed.

1. Perjury in any of the Courts mentioned above in the case of subornation of perjury, or by any person examined *ad perpetuam rei memoriam.* (5 Eliz. c. 9, ss. 6 and 7; 29 Eliz. c. 5; 21 Jac. I. c. 28, s. 8; 2 Geo. II. c. 25, s. 2; 3 Geo. IV. c. 114; 7 Wm. IV. & 1 Vict. c. 23.‡)

2. Seamen or marines attempting to obtain their pay by means of forged certificates of their discharge from the queen's ships, or from hospitals or sick-quarters. (11 Geo. IV. & 1 Wm. IV. c. 20, s. 89; 7 Wm. IV. & 1 Vict. c. 23.§)

3. Forgery of certificates of the Commissioners for executing the office of Lord High Admiral, of the purchase or sale of any naval or victualling stores. (2 Wm. IV. c. 40, s. 32; 7 Wm. IV. & 1 Vict. c. 23.)

4. Making false declarations or signing false notices for the purpose of procuring marriages; or

5. Forbidding the issue of any superintendent registrar's certificate, by falsely representing oneself to be a person whose consent to such marriage is required by law. (6 & 7 Wm. IV. c. 85, s. 38; 7 Wm. IV. & 1 Vict. c. 23; 3 & 4 Vict. c. 72, s. 4.)

6. Making false statements for the purpose of their being inserted in registers of births, deaths, or marriages. (6 & 7 Wm. IV. c. 86, s. 41; 7 Wm. IV. & 1 Vict. c. 23.)

XIV. *Transportation* for *seven* years, or imprisonment with hard labour for any term not exceeding three years.

1. Assaulting or obstructing persons duly employed for the prevention of smuggling. (8 & 9 Vict. c. 87, s. 66.)

XV. *Transportation* for *seven* years, or imprisonment with or without hard labour for any period not exceeding three years; and during such imprisonment the offender may be publicly or privately whipped ‖ as often and in such manner and form as the Court shall direct, not exceeding thrice.

1. Discharging or aiming fire or other arms, or discharging or attempting to discharge any explosive substance, at or near the person of the queen, or striking or attempting to strike at the person of the queen, or in any other manner throwing or attempting to throw anything at or upon her person, with intent to injure or alarm the queen or break the public peace, or whereby the public peace may be endangered; or having fire or other arms, or any explosive or dangerous matter or thing near the queen's person, with intent to use the same to injure or alarm her. (5 & 6 Vict. c. 51, s. 2.)

XVI. *Transportation* for *seven* years, or imprisonment for any term not exceeding two years, with or without hard labour or solitary confinement, or with both; and the offender, if a male, may be once, twice, or thrice publicly or privately whipped, in addition to such imprisonment.

1. Receiving property the stealing, taking, &c. whereof is made an indictable misdemeanor by 7 & 8 Geo. IV. c. 29, knowing the same to have been unlawfully stolen, taken, &c. (7 & 8 Geo. IV. c. 29, ss. 4 and 55.)

2. Boatmen and others concealing &c. and not reporting according to law, or obliterating the marks &c. on, articles found by them on the coast (provided the stealing of such articles on shore would be an indictable misdemeanor). (1 & 2 Geo. IV. c. 75, s. 1; and c. 76.)

3. Maliciously destroying the dams of fish-ponds or mill-ponds, or poisoning fish-ponds. (7 & 8 Geo. IV. c. 30, ss. 15 and 27.)

XVII. *Transportation* for *seven* years, or imprisonment with hard labour for any term not exceeding two years.

1. Taking or destroying game * or rabbits by night, in any land or on any public road, path &c., or at the openings, gates &c. from such land into such public road &c., or entering any such land, by night, with any instrument for that purpose (for the third offence).† (9 Geo. IV. c. 69, s. 1; 7 & 8 Vict. c. 29, s. 1.)

2. Assaults on gamekeepers by persons found committing any of the last-mentioned offences. (9 Geo. IV. c. 69, s. 2; 7 & 8 Vict. c. 29, s. 1.)

XVIII. *Transportation* for any term not exceeding *seven* years, or imprisonment not exceeding two years.

1. Being guilty of an unlawful combination or confederacy. (37 Geo. III. c. 123, s. 1; 39 Geo. III. c. 79, ss. 2 and 8; 52 Geo. III. c. 104, s. 1; 57 Geo. III. c. 19, s. 25.)

2. Being present at meetings for the purpose of drilling persons to the use of arms &c., such meetings being unauthorized by her Majesty or the lieutenant or two justices of the peace of the county or riding, by commission or otherwise; or drilling persons to the use of arms, &c. (60 Geo. III. & 1 Geo. IV. c. 1, s. 1.)

XIX. *Imprisonment* for *life*, loss of the offender's right hand, and forfeiture of his goods and chattels, and of the profits of his lands during life.

1. Assaulting any judge of the queen's courts of law or equity, or any justice of assize, oyer and terminer, or general gaol delivery, whilst acting in his official capacity; or striking any person in the presence of any such judge or justice.‡ (Hawk. *P. C.* b. i. c. 21, s. 3; *Seventh Report of the Criminal Law Commissioners*, pp. 49 and 160.)

XX. *Imprisonment* for *life* and forfeiture of the offender's goods and profits of his lands.

1. Rescuing prisoners being in the presence of any such judge whilst acting in his official capacity. (Hawk. *P. C.* b. i. c. 21, s. 5; *Seventh Report of the Criminal Law Commissioners*, pp. 49 and 160.)

XXI. *Imprisonment for life*, and forfeiture § of all goods and chattels real and personal.

1. Being a second time‖ convicted of publishing fond, fantastical or false prophecies, to the intent thereby to make any rebellion or other disturbance &c. within the queen's dominions.¶ (5 Eliz. c. 15, s. 3.)

XXII. *Imprisonment for life.*

1. Hearing and being present at any other form of common prayer &c. than is mentioned and set forth in the Book of Common Prayer, having been twice** previously convicted of the same. (5 & 6 Edw. VI. c. 1, s. 6; 13 & 14 Car. II. c. 4, s. 24.)

2. Clergymen of the Established Church using any other form of common prayer &c. than is set forth in the Book of Common Prayer, or speaking in derogation thereof, having been twice †† previously convicted of any such offence.‡‡ (1 Eliz. c. 2, s. 6; 13 & 14 Car. II. c. 4, s. 24.)

* See also 12 Geo. I. c. 29, s. 4 (made perpetual by 21 Geo. II. c. 3), as to subornation of perjury and perjury &c. by attorneys &c., for which the court may cause them, after an examination in a *summary way*, to be transported for seven years. The offence does not appear to be indictable.

† It is only when the offender is prosecuted under 5 Eliz. c. 9, that he is liable to this portion of these penalties. The punishment for the common-law offence is the same as for subornation of perjury; and perjury at common law may be in *any* judicial proceeding. Prosecutions are usually carried on for the offence as at common law, and not under the statute.

‡ There is a great number of public acts, besides those mentioned above, by which cases of false swearing are declared to be perjury, or to be punishable as perjury; but it would have occupied too much space to have inserted them here.

§ This and the next four offences subject the persons committing them to the penalties of perjury.

‖ It may be a question whether the 5 & 6 Vict. c. 51, s. 2, notwithstanding the provision of 1 Geo. IV. c. 57, quoted above, in the prefatory statement of provisions of general application, has not extended the punishment of whipping to the case of female offenders. (See *Seventh Report of Criminal Law Commissioners*, p. 46.) The above offence is a high misdemeanor.

* For the definition of game, see p. 173, note *.

† The two first offences are punishable on summary conviction.

‡ This and the next offence are punishable at common law.

§ This forfeiture, being by statute only, does not, as observed above, constitute the offence a felony.

‖ The punishment for the first offence is fine of 10*l.* and imprisonment for one year. (5 Eliz. c. 15, s. 2.)

¶ This offence may be considered to be virtually obsolete.

** The punishment for the first offence is imprisonment for six months, and for the second is one year.

†† The punishment for the first offence is imprisonment for six months, and for the second one year. (1 Eliz. c. 2, ss. 4 and 5.)

‡‡ Besides being imprisoned, the offender for the first offence forfeits the

3. Persons not having any spiritual promotion committing any such last-mentioned offence, after their first conviction.* (1 Eliz. c. 2, s. 8; 13 & 14 Car. II. c. 4, s. 24.)

4. In interludes, plays, &c. declaring or speaking anything in derogation &c. of the Book of Common Prayer, or compelling or causing any person or other minister to use any other form of common prayer &c. than is mentioned in the said book; or interrupting any person or other minister in saying common prayer &c. in the form mentioned in the said book, having been twice† previously convicted of any such offence.‡ (1 Eliz. c. 2, s. 11; 13 & 14 Car. II. c. 4, s. 24.)

XXIII. *Imprisonment* for any term not exceeding *twelve* nor less than six months, and the offender to be liable to such other punishment as may by law be inflicted in cases of high misdemeanors.§

1. Publishing in English newspapers anything tending to excite hatred of the queen, &c., as having been previously printed in some foreign paper which has not been so printed. (38 Geo. III. c. 78, s. 24.)

XXIV. *Fine* and *imprisonment*, with or without hard labour or solitary confinement, or with both.

1. Refusing to deliver up &c. post-letters which ought to have been delivered to any other person, or post-letters which shall have been found by the person so refusing, or any other person, &c. (7 Wm. IV. & 1 Vict. c. 36, ss. 31 and 42.)

XXV. *Fine* and *imprisonment*, and such corporal punishment by public or private whipping as the court shall direct.

1. Persons who keep or use slaughtering-houses or places, throwing into lime-pits, &c., or destroying or burying, the hides of cattle slaughtered, &c. by them; or,

2. Persons, generally, being guilty of any offence against the Act for regulating slaughtering-houses for which no punishment is expressly provided. (26 Geo. III. c. 71, s. 9.)

XXVI. *Fine*, *imprisonment*, or other corporal punishment.

1. Procuring or soliciting infants to grant annuities, &c. (53 Geo. III. c. 141, s. 8.)

XXVII. *Imprisonment* and *fine* and ransom‖ to the queen.

1. Being sufficient to travel, not being assistant to the justices, when warned to ride with them, in aid to resist riots, &c. (2 Hen. V. st. 1, c. 8.)

2. Contemning, despising or reviling the sacrament of the Lord's Supper. (1 Edw. VI. c. 1, s. 1; 1 Eliz. c. 1, s. 14.)

XXVIII. *Imprisonment* and *ransom* at the queen's will.¶

1. Forcible entry into lands and tenements. (5 Rich. II. st. 1, c. 8; 15 Rich. II. c. 2.)**

XXIX. *Imprisonment* and *fine* at the queen's will.††

1. Any of the clergy enacting or promulgating &c., any constitutions or ordinances, provincial or synodal, or any other canons, without the royal assent and licence. (25 Hen. VIII. c. 19, s. 1; 1 Eliz. c. 1, s. 6.)

XXX. *Fine* and *Imprisonment*,

1. Not assisting the justices to arrest persons holding lands &c. forcibly, after forcible entry made. (15 Rich. II. c. 2.)

2. Frauds by collectors or other officers intrusted with the receipt, custody or management of any part of the public revenues‡‡ (50 Geo. III. c. 59, s. 2); — of any part of the revenue of Excise. (7 & 8 Geo. IV. c. 53, s. 44.)

3. Persons concerned in the transmitting or delivery of writs for the election of members of parliament, wilfully neglecting or delaying to transmit or deliver any such writ &c. (53 Geo. III. c. 89, s. 6.)

4. Gaolers exacting fees from prisoners for or on account of the entrance, commitment or discharge of such prisoners, or detaining prisoners for non-payment of fees.* (55 Geo III. c. 50, s. 13.)

5. Furious driving, &c., by persons having charge of stage-coaches or public carriages, not being hackney-coaches drawn by two horses only, and not plying for hire as stage-coaches, whereby any person is injured. (1 Geo. IV. c. 4.)

6. Buying or selling offices, or keeping any place of business in any manner relating to the sale or purchase thereof.† (5 & 6 Edw. VI. c. 16; 40 Geo. III. c. 126, s. 3; 6 Geo. IV. c. 105, s. 10.)

7. Officers exacting fees from prisoners against whom no bill of indictment is found by the grand jury, or who are acquitted on their trial or discharged by proclamation for want of prosecution.‡ (55 Geo. III. c. 50, ss. 4 and 9.)

8. Officers of Customs or Excise by their misconduct causing waste, &c. in merchandise warehoused in warehouses under the Act for permitting goods imported to be secured in warehouses without payment of duty on first entry. (4 Geo. IV. c. 24, s. 72.)

9. By false certificates or representations endeavouring to obtain from Chelsea Hospital any pension, privilege or advantage.§ (7 Geo. IV. c. 16, s. 25.)

10. Setting spring-guns or man-traps, except within a dwelling-house, between sun-set and sun-rise, for the protection thereof. (7 & 8 Geo. IV. c. 18, ss. 1 and 4.)

11. Jesuits, or members of any religious order or society of the Church of Rome, bound by monastic or religious vows, within the United Kingdom, admitting any person to become a member of any such order or society.‖ (10 Geo. IV. c. 7, s. 23.)

12. Parish officers refusing to call meetings, &c. according to the provisions of the Act for the better Regulation of Vestries. (1 & 2 Wm. IV. c. 60, s. 11.)

13. Making false answers to any of the questions directed by the Reform Act to be put by the returning officer at elections of members of parliament, if required by any candidate, to any voter at the time of his tendering his vote. (2 & 3 Wm. IV. c. 45, s. 58.)

14. Refusing to attend, &c. the Poor Law Commissioners (4 & 5 Wm. IV. c. 76, s. 13); the Tithe Commissioners (6 & 7 Wm IV. c 71, s. 93); or the Copyhold Commissioners (4 & 5 Vict. c. 35, s. 94).

15. Forgery, &c. of protections from service in the navy. (5 & 6 Wm. IV. c. 24, s. 3.)

16. Making false declarations in cases where declarations are substituted for oaths by the Act for abolishing unnecessary Oaths. (5 & 6 Wm. IV. c. 62, s. 21.)

17. Executing &c. renewed ecclesiastical leases, knowing the recital required by law contained therein to be false. (6 & 7 Wm. IV. c. 20, s. 3.)

18. Making false statements in declarations required to be delivered to the Commissioners of Stamps and Taxes before being allowed to print and publish newspapers. (6 & 7 Wm. IV. c. 76, s. 6.)

19. Making, &c. false declaration of being qualified to be elected a member of the House of Commons. (1 & 2 Vict. c. 48, s. 7.)

20. Frauds in assignments of pensions for service in her Majesty's navy, royal marines or ordnance. (2 & 3 Vict. c. 51, s. 8.)

21. Making false declarations touching any of the matters contained in the Act for procuring Returns relative to Highways and Turnpikes.* (2 & 3 Vict. c. 40, s. 9.)

22. Officers of railways making false returns, under the

profits of all his spiritual benefices or promotions coming or arising in one whole year next after his conviction; and for his second and third offences, is to be deprived *ipso facto* of all his spiritual promotions. (1 Eliz. c. 2, ss. 4, 5, and 6.)

* The punishment for the first offence is imprisonment for one year. (1 Eliz. c. 2, s. 7.)

† The punishment for the first offence is forfeiture of 100 marks, or, if the offender do not pay the same within six weeks after his conviction, six months' imprisonment instead; and for the second offence is forfeiture of 400 marks, or, if the offender do not pay the same within six weeks after his conviction, twelve months' imprisonment instead. (1 Eliz. c. 2, ss. 9, 10, 12, and 13.)

‡ Besides being imprisoned for life, the person committing any of the above offences for the third time, forfeits all his goods and chattels; but this forfeiture, being by statute only, does not, as above observed, constitute the offence a felony.

§ The punishment for high misdemeanors at common law was fine, imprisonment, and infamous corporal punishment; but the punishment of the pillory has been wholly abolished.

‖ It would appear that where a person is to make fine and ransom, he is not to pay two different sums (Co.-Litt., 127 a); but, according to Dyer, p. 232, pl. 5, the ransom must be treble the fine at least.

¶ That is, the will of the queen as declared by her representatives, the judges, in her courts of justice.

** (See also 4 Hen. IV. c. 8; 8 Hen. VI. c. 9; 31 Eliz. c. 11; 21 Jac. I. c. 15.)

†† That is, as declared by the judges.

‡‡ The offender is also, on conviction, rendered for ever incapable of holding or enjoying any office under the crown.

* They are also, upon conviction, rendered incapable of holding their offices. The 55 Geo. III. c. 50, s. 13, did not extend to the Queen's Bench prison, the Fleet, or the Marshalsea and Palace Courts. But now, by 5 & 6 Vict. c. 22, s. 11, which consolidates the Queen's Bench, Fleet, and Marshalsea Prisons, and enacts that the Queen's Bench Prison shall, after the passing of that act, be called the Queen's Prison, all fees and gratuities payable by prisoners on their entrance or discharge &c. from the Queen's Prison (except such as shall be sanctioned by the Lords of the Treasury, for work and labour actually performed for such prisoners) are abolished, and any officer who exacts any such fees or gratuities, or detains any prisoner on account of the non-payment thereof, is rendered incapable of holding his office, and is guilty of a misdemeanor punishable by fine and imprisonment. See also the 8 & 9 Vict. c. 114, which explains and amends the 55 Geo. III. c. 50.

† The punishment for this and the next twenty-five offences (6 to 31 inclusive), is not assigned them by the statutes creating them: they are merely misdemeanors by the statutes, but as such the common law punishment of fine and imprisonment attaches.

‡ The offender, on conviction, is also rendered incapable of holding his office. See the 8 & 9 Vict. c. 114, which explains and amends the 55 Geo. III. c. 50.

§ The offender also forfeits all claim to pension or emolument on account of service, wounds, or disability.

‖ This offence does not apply to female societies. (10 Geo. IV. c. 7, s. 37.)

Act for regulating railways, to the committee of the Privy Council for Trade. (3 & 4 Vict. c. 97, s. 4.)

23. Making false returns of corn, under the Act regulating the importation of corn. (5 & 6 Vict. c. 14, s. 42.)

24. Making false entries in the Register Book of Copyrights. (5 & 6 Vict. c. 45, s. 12.)

25. Voters making false answers to returning officer at elections of members of parliament. (6 & 7 Vict. c. 18, s. 81.)

26. Actuaries or other persons holding appointments in savings' banks, receiving deposits and not paying the same over to the managers of such banks, &c. (7 & 8 Vict. c. 83, s. 4.)

27. The registrar of joint-stock companies or any person employed under him, demanding or receiving any gratuity or reward beyond the fees allowed by law. (7 & 8 Vict. c. 110, s. 22.)

28. Directors of joint-stock companies by whom certificates of shares are issued, making false statements on such certificates as to the date of the first complete registration of such companies. (7 & 8 Vict. c. 110, s. 26 in part.)

29. Persons knowing dogs or skins of dogs found in their possession, by virtue of a search warrant, to be stolen dogs, or the skins of stolen dogs (for the second offence*). (8 & 9 Vict. c. 47, s. 3 in part.)

30. Corruptly taking any reward for aiding persons to recover stolen &c. dogs. (8 & 9 Vict. c. 47, s. 6.)

31. Offences against the provisions of the 8 & 9 Vict. c. 100 (An Act for the regulation of the care and treatment of Lunatics), and the 8 & 9 Vict. c. 126 (An Act to amend the laws for the provision and regulation of Lunatic Asylums for counties and boroughs, and for the maintenance and care of Pauper Lunatics, in England), declared by those Acts to be misdemeanors.

32. Using contemptuous words or gestures of or against the queen.†

33. Unlawful assemblies.

34. Routs.

35. Riots.

36. Affrays.

37. Conspiracy.

38. Bribery.‡

39. Blasphemy.

40. Blasphemous or seditious libels.§

41. Unlawfully refusing to serve public offices.

42. Executing official duties before taking oath of office and giving security, where the same are required by law.

43. Wilfully disobeying any statute, by doing what it prohibits or omitting what it commands, whereby the public are or may be injured.

44. Wilfully disobeying any lawful warrant, order or command of her Majesty, or any court or person acting in a public capacity and duly authorized in that behalf, where no other penalty or mode of proceeding is expressly provided.

45. Obstructing officers in the execution of any public office or duty.

46. Excess or abuse of authority by public officers.

47. Extortion by public officers.

48. Fraudulent misapplication by public officers of property under their control as such officers.

49. Unlawfully, and contrary to oath of office, disclosing matter the knowledge of which has been acquired in an official capacity.

50. Assaulting &c. persons on account of anything done by them in connexion with any judicial proceeding.

51. Contempts of courts of justice or magistrates, by uttering insulting, opprobrious, or menacing words, or by acts or gestures expressed or done in the face of such courts or in the presence of such magistrates.

52. By force, or by violent or outrageous conduct, interrupting the proceedings of courts of justice.

53. The wilful omission by judicial officers to do their duty.

54. Oppression by judicial officers.

55. Judicial officers taking bribes.

56. Bribing or otherwise corruptly influencing judicial officers.

57. Persons procuring themselves to be returned as jurors, with intent to obtain a verdict or any undue advantage for any person interested in a trial.

58. Unlawfully preventing persons from serving as jurors.

59. Jurors determining their verdict by any mode of chance.

60. Witnesses refusing to be sworn or to give evidence in judicial proceedings.

61. Unlawfully preventing witnesses from giving evidence in judicial proceedings.

62. Endeavouring to procure the commission of perjury.

63. Publishing statements, pending suits or prosecutions, with intent to excite prejudice for or against any party to such suits or prosecutions.

64. Fabricating false evidence.

65. By disposing of dead bodies, without giving notice to the coroner, in cases where inquests ought to be taken, obstructing the taking of such inquests.

66. Gaolers and others, contrary to their duty, allowing dead bodies to remain unburied and to putrefy, without giving notice to the coroner, in cases where inquests ought to be taken.

67. Challenging or provoking to fight, or to commit a breach of the peace.

68. Open indecency in places of public resort or in view thereof.

69. Keeping gaming or other disorderly houses.*

70. Arresting or otherwise obstructing the burial of dead bodies.

71. Unlawfully disinterring dead bodies.

72. Buying or selling wives.

73. Selling unwholesome provisions.

74. Maliciously exposing persons labouring under contagious diseases in places of public resort.

75. Common nuisances.†

76. Corrupting wells or springs used by the public.

77. Innkeepers refusing to receive travellers, their inns not being fully occupied at the time, and a reasonable sum being tendered for accommodation.

78. Battery.

79. False imprisonment.

80. Assaults.

81. Persons maiming themselves, with intent to evade the discharge of any public duty.

82. Cheats.

83. Forgery, in cases where no punishment is provided by statute.

84. Concealing treasure-trove.

XXXI. *Forfeiture*, *fine* not exceeding 200*l.* and costs of suit, and also such further fine, and whipping and imprisonment, or any of them, in such manner and for such space of time as to the court shall seem meet.

1. Being possessed (not being a contractor with the Commissioners of the Navy, Ordnance or Victualling Office for her Majesty's use) of any of her majesty's stores called canvas, or bewper, otherwise called buntin, or of any cordage wrought with one or more worsted threads, or of any other public stores, the same not being charged to be new, or not more than one-third worn. (39 & 40 Geo. III. c. 89, s. 2; 54 Geo. III. c. 60; 55 Geo. III. c. 127; 56 Geo. III. c. 138, s. 2.)

2. Making, being possessed of, or concealing (not being a contractor as last mentioned) any warlike or naval stores, with the marks used to her Majesty's warlike, naval, or ordnance stores, or any other public stores. (9 & 10 Wm. III. c. 41; 9 Geo. I. c. 8; 17 Geo. II. c. 40; 39 & 40 Geo. III. c. 89, s. 2; 54 Geo. III. c. 60; 55 Geo. III. c. 127; 56 Geo. III. c. 138, s. 2.)

XXXII. *Fine* not exceeding 500*l.*, or imprisonment for any term not exceeding two years, or both.

1. Aiding the escape of convicts from New South Wales or Van Diemen's Land. (9 Geo. IV. c. 83, s. 34.)

XXXIII. *Imprisonment*, with or without hard labour, for such term as the court shall award.

* The first offence is punishable on summary conviction before two or more justices by payment of such sum, not exceeding 20*l.*, as to the justices shall seem meet.

† This and the following fifty-two offences (29 to 84 inclusive) are misdemeanors at common law, and as such, punishable with fine and imprisonment. (See the Seventh Report of the Criminal Law Commissioners, and the authorities there cited.)

‡ See 5 & 6 Vict. c. 102, s. 20.

§ These offences, when committed for a second time, were made punishable as high misdemeanors or by banishment, by 60 Geo. III. & 1 Geo. IV. c. 8; but 11 Geo. IV. & 1 Wm. IV. c. 73, repealed the latter portion of the punishment.

* The court may order hard labour for these offences. (3 Geo. IV. c. 114.) See 21 Geo. III. c. 49, s. 1, by which persons keeping places opened or used for public entertainment or amusement, or for public debating on Sundays, and to which persons are admitted by payment of money or tickets sold for money, are made punishable as in cases of disorderly houses, and incur the penalty of 200*l.* for every Sunday that such places are kept opened, recoverable by action of debt, &c.

† See 9 & 10 Wm. III. c. 7, s. 1, which makes the manufacture of squibs or fireworks (except by order of the Board of Ordnance or by the Artillery Company), or the fireing thereof in any public street, &c., a common nuisance.

1. Unlawfully and carnally knowing girls above the age of ten and under the age of twelve years. (9 Geo. IV. c. 31, s. 17.)

XXXIV. *Fine* or *imprisonment*, or both, such imprisonment to be with or without hard labour or solitary confinement, or with both.

1. Unlawfully taking or killing hares or conies, in the night time, in warrens. (7 & 8 Geo. IV. c. 29, ss. 4 and 30.)

2. Unlawfully taking or destroying fish in waters running through or in lands adjoining or belonging to dwelling-houses.* (7 & 8 Geo. IV. c. 29, ss. 4 and 34.)

3. Unlawfully destroying turnpike or toll gates or houses, &c. (7 & 8 Geo. IV. c. 30, ss. 14 and 27.)

4. Officers of the Post-Office opening or detaining post letters† (7 Wm. IV. & 1 Vict. c. 36, ss. 25 and 42); or stealing, embezzling, or destroying printed votes or proceedings in parliament, or newspapers, or other printed papers sent by the post, without covers or in covers open at the sides. (7 Wm. IV. & 1 Vict. c. 36, ss. 32 and 42.)

XXXV. *Fine* or *imprisonment*, or both, such imprisonment to be with or without hard labour.

1. Forgery of hackney-carriage plates (1 & 2 Wm. IV. c. 22, s. 25); of stage-carriage plates (2 & 3 Wm. IV. c. 120, s. 32); or of the licences or tickets of drivers of hackney-carriages, drivers or conductors of stage-carriages, or watermen (1 & 2 Vict. c. 79, s. 12).

2. Frauds in applying for hackney-carriage or stage-carriage licences. (1 & 2 Wm. IV. c. 22, s. 33; 2 & 3 Wm. IV. c. 120, s. 10.)

XXXVI. *Fine* or *imprisonment*, or both.

1. Compounding offences,‡ or otherwise offending against the provisions of the 18 Eliz. c. 5 (An Act to redress disorders in common informers). (18 Eliz. c. 5, s. 4; 27 Eliz. c. 10; 56 Geo. III. c. 138, s. 2.)

2. Resisting the execution of any legal process, execution, or extent, taken out by persons having debts owing to them from persons residing within the Whitefriars, Savoy, Salisbury Court, Ram Alley, Mitre Court, Fuller's Rents, Baldwin's Gardens, Montague Close, or the Minories, Mint, Clink, or Deadman's Place. (8 & 9 Wm. III. c. 27, s. 15; 56 Geo. III. c. 138, s. 2.)

3. Illegal brokerage. (53 Geo. III. c. 141, s. 9.)

4. Persons having the custody of offenders ordered to be confined in Parkhurst Prison, or Pentonville or Millbank Prison, carelessly allowing such offenders to escape. (1 & 2 Vict. c. 82, s. 13; 5 & 6 Vict. c. 29, s. 25 in part; 6 & 7 Vict. c. 26, s. 23 in part.)

5. Offences against tho Foreign Enlistment Act. (59 Geo. III. c. 69, s. 2.)

6. Unlawfully taking unmarried girls under the age of 16 years out of the possession of those who have tho lawful charge of them. (9 Geo. IV. c. 31, s. 20.)

7. Arresting clergymen on civil process while employed about the performance of divine service. (9 Geo. IV. c. 31, s. 23.)

8. Frauds by Excise officers in the granting of permits, or in the performance of their duties in relation to the same.§ (2 Wm. IV. c. 16, s. 15.)

9. Altering, destroying, counterfeiting, or trafficking in the register-tickets with which merchant seamen are required to provide themselves. (7 & 8 Vict. c. 112, s. 21.)

10. Making false answers to questions by the registrar of seamen, &c. with reference to the granting of such tickets. (7 & 8 Vict. c. 112, s. 22.)

11. Masters of merchant ships, without the sanction of the consul, &c., discharging or abandoning abroad persons belonging to their ships or crews, or, in case any such person should desert abroad, neglecting to notify the same in writing to such consul, &c. (7 & 8 Vict. c. 112, s. 46.)

12. Masters, mates, or other officers of merchant ships, wrongfully forcing on shore, or leaving behind on shore or at sea, persons belonging to their ships or crews, before the completion of tho voyage for which such persons were engaged, or the return of their ships to the United Kingdom.* (7 & 8 Vict. c. 112, s. 47.)

13. Masters of merchant ships omitting, when required by the consul, &c., on the complaint of three or more of their crew, to provide proper provisions, water, or medicines, or the requisite quantity thereof, or using any provisions, &c. which the consul, &c. shall have signified to be unfit for use or inappropriate. (7 & 8 Vict. c. 112, s. 57.)

XXXVII. *Imprisonment* for three years, and fine at the queen's pleasure.†

1. Champerty. (3 Edw. I. c. 25; 13 Edw. I. st. 1, c. 49; 28 Edw. I. st. 3, c. 11; 33 Edw. I. st. 2; 33 Edw. I. st. 3; 4 Edw. III. c. 11; 20 Edw. III. c. 4 and c. 5; 7 Rich. II. c. 15; 32 Hen. VIII. c. 9.)

2. Maintenance. (3 Edw. I. c. 28 and c. 33; 33 Edw I. st. 3; 1 Edw. III. st. 2, c. 14; 4 Edw. III. c. 11; 20 Edw. III. c. 4 and c. 5; 1 Rich. II. c. 4 and c. 7; 7 Rich. II. c. c. 15; 32 Hen. VIII. c. 9.)

XXXVIII. *Great forfeiture.*

1. Disturbing any to make free election. (3 Edw. I. c. 5.)

XXXIX. *To be adjudged* incapable and disabled in law to have or enjoy any office or employment, ecclesiastical, civil or military, or any part in them, or any profit or advantage appertaining to them; and if the offender at the time of being convicted enjoy or possess any office, place or employment, the same is made void.

1. Having been educated in or professed Christianity within this realm, asserting that there are more Gods than one, or denying the Christian religion to be true, or the Scriptures to be of Divine authority.‡ (9 & 10 Wm. III. c. 32, s. 1; 55 Geo. III. c. 160, s. 2.)

XL. *Imprisonment* and hard labour for any period not exceeding three years.

1. Insolvent debtors or petitioners for protection from process, omitting in their schedules any property, or retaining or excepting out of such schedules, as necessaries, property of greater value than 20*l.* with intent to defraud their creditors. (1 & 2 Vict. c. 110, ss. 99 and 121; 7 & 8 Vict. c. 96, s. 39.)

XLI. *Imprisonment* for any term not exceeding three years, with or without hard labour or solitary confinement, or with both.

1. Being possessed of three or more pieces of counterfeit coin, intended to pass for the Queen's current gold or silver coin, knowing the same to be counterfeit and with intent to utter the same. (2 Wm. IV. c. 34, ss. 8 in part and 19.)

XLII. *Imprisonment* with hard labour for any term not exceeding three years, either in addition to or in lieu of any other punishment or penalty which may be inflicted upon the offender.

1. Being armed, assaulting Excise officers whilst searching for or seizing commodities forfeited under any Act relating to the Excise or Customs, or whilst endeavouring to arrest offenders. (7 & 8 Geo. IV. c. 53, ss. 40 and 43.)

XLIII. *Imprisonment* for any term not exceeding three years, with or without hard labour.

1. Bankrupts or members of incorporated commercial or trading companies which shall be adjudged bankrupt, falsifying or destroying their books, &c., with intent to defraud their creditors. (5 & 6 Vict. c. 122, s. 34; 7 & 8 Vict. c. 111, s. 30.)

2. Publishing or threatening to publish libels, &c. with intent to extort money, &c. (6 & 7 Vict. c. 96, s. 3.)

XLIV. *Imprisonment* for one year and grievous fine at the queen's pleasure; or if the offender have not whereof, imprisonment for three years.

1. Misprision of felony by sheriffs, coroners, or other bailiffs. (3 Edw. I. c. 9.)

XLV. *Imprisonment* for one year and grievous fine; or if the offender have not whereof, imprisonment for two years.

1. Bailiffs not being ready, on the huo and cry, to arrest felons. (3 Edw. I. c. 9.)

* This offence does not extend to angling in the day-time; but persons doing so unlawfully are liable, on summary conviction, to forfeit any sum not exceeding 5*l.*

† This offence does not extend to (amongst other exceptions contained in the Act) the opening or detaining of letters in obedience to an express warrant in writing under the hand of one of the principal secretaries of state.

‡ Besides the above punishment, the offender, upon conviction, is for ever disabled to pursue or be plaintiff or informer in any suit or information upon any statute, popular or penal, and also forfeits 10*l.*, recoverable by action of debt or information.

§ The offender, on conviction, is also rendered incapable of holding any office or place in or relating to any of the revenues of the United Kingdom.

* See also 9 Geo. IV. c. 31, s. 30, which makes it a misdemeanor, punishable with imprisonment for such term as the court shall award, for masters of merchant ships to force on shore or refuse to bring home all such of the men whom they carried out as are in a condition to return.

† That is, as declared by the judges. This punishment is taken from 33 Edw. I. st. 3 (Statute of Champerty); but see the other Acts referred to. The repeal of the offences of Champerty and Maintenance is recommended by the Criminal Law Commissioners. (See their Fifth Report.)

‡ For a first offence the above penalties may be relieved against by renunciation of such erroneous opinions in the same Court where the offender was convicted, within four months after such conviction. (s. 3.)

If a person be a second time convicted of any of the above offences, he is to be imprisoned for three years, and to be disabled to sue, &c. in any court of law or equity, or to be guardian of any child, or executor or administrator of any person, or capable of any legacy or deed of gift, or to bear any office, civil or military, or benefice ecclesiastical, for ever within the realm. (s. 1.)

XLVI. *Imprisonment* with or without hard labour for any term not exceeding two years, and fine if the court shall think fit; and the offender may be required to find sureties for keeping the peace.

1. Assaults with intent to commit felony, or on any peace or revenue officer, or with intent to resist the lawful apprehension or detainer of any person, or in pursuance of any conspiracy to raise the rate of wages (9 Geo. IV. c. 31, s. 25); or on special constables.* (9 Geo. IV. c. 31, s. 25; 1 & 2 Wm. IV. c. 41, s. 11.)

XLVII. *Fine* and imprisonment not exceeding two years.

1. Being present at meetings unauthorised by her Majesty, &c., for the purpose of being drilled to the use of arms, or, at any such meetings, being so drilled. (60 Geo. III. & 1 Geo. IV. c. 1, s. 1.)

2. Maliciously publishing defamatory libels, knowing them to be false. (6 & 7 Vict. c. 96, s. 4.)

XLVIII. *Imprisonment* for any term not exceeding two years, with or without hard labour or solitary confinement, or with both.

1. Soliciting the commission of any felony or misdemeanor punishable by the Post-Office Acts. (7 Wm. IV. & 1 Vict. c. 36, ss. 36 and 42.)

XLIX. *Imprisonment* with hard labour for any term not exceeding two years.

1. Personating voters at elections of members of Parliament. (6 & 7 Vict. c. 18, s. 83.)

L. *Imprisonment* with or without hard labour for any term not exceeding two years.

1. Women, by secret burying, &c., endeavouring to conceal the birth of children of which they have been delivered. (9 Geo. IV. c. 31, s. 14.)

2. Bankrupt, within three months next preceding his bankruptcy, obtaining goods on credit under the false pretence of dealing in the ordinary course of trade. (5 & 6 Vict. c. 122, s. 35.)

3. Drunkenness or other misconduct of servants of railway companies.† (3 & 4 Vict. c. 97, s. 13.)

LI. *Imprisonment* for a term not exceeding two years.

1. Embarking on board slavers in the capacity of petty officers, seamen, &c. (5 Geo. IV. c. 113, s. 11; 3 & 4 Wm. IV. c. 73.)

2. Doing any thing to obstruct carriages on railways or to endanger the safety of persons conveyed upon the same. (3 & 4 Vict. c. 97, s. 15.)

LII. *Imprisonment* for one year, and such further punishment by fine or imprisonment, or both, as to the court shall seem most proper, and the offender to give sureties for good behaviour and to be further imprisoned until they be given.

1. Witchcraft, fortune-telling, &c., or pretending to discover where property supposed to be stolen or lost may be found. (9 Geo. II. c. 5, s. 4; 56 Geo. III. c. 138, s. 2.)

LIII. *Fine*, or *Imprisonment* not exceeding eighteen months, or both, with or without hard labour.

1. Dog-stealing (for the second offence‡). (8 & 9 Vict. c. 47, s. 2 in part.)

LIV. *Forfeiture* of goods and chattels, real and personal,§ and if the offender have not goods and chattels to the value of 20*l*., then, in addition, imprisonment for one year.

1. Maintaining the authority, spiritual or ecclesiastical, of any foreign prince or state claimed within this realm or any of the dominions under the queen's obeisance before the passing of the 1 Eliz. c. 1.‖ (1 Eliz. c. 1, ss. 27 and 28; 7 & 8 Vict. c. 102.)

LV. *Imprisonment* for any term not exceeding one year, with or without hard labour or solitary confinement, or with both.

1. Uttering counterfeit coin intended to pass for the queen's current copper coin, or being possessed of three or more pieces of such coin with intent to utter the same. (2 Wm. IV. c. 34, ss. 12 and 19.)

* Assaults on special constables may also be punished on summary conviction before two justices. (See 1 & 2 Wm. IV. c. 41.)

† This offence may be punished on summary conviction, with imprisonment not exceeding two calendar months, or fine not exceeding 10*l*., if the justice before whom complaint is made shall think fit to decide upon it, instead of sending the offender for trial at the Quarter-Sessions.

‡ The first offence is punishable on summary conviction before two or more justices with imprisonment not exceeding six calendar months, with or without hard labour, or with forfeiture not exceeding 20*l*. over and above the value of the dog, as to the justices shall seem meet.

§ This forfeiture, being by statute, does not, as above observed, constitute the offence a felony.

‖ The repeal of this offence is recommended by the Commissioners for revising and consolidating the Criminal Law. (See their Report on penalties and disabilities in regard to religious opinions, dated 30th May, 1845.)

LVI. *Imprisonment* for any term not exceeding one year, or fine, or both.

1. Maliciously publishing defamatory libels. (6 & 7 Vict. c. 96, s. 5.)

LVII. *Solitary imprisonment* for a space not exceeding twelve nor less than three calendar months.*

1. Persons having hired stocking-frames, unlawfully disposing of them without the consent of the owners. (28 Geo. III. c. 55, s. 2.)

2. Knowingly receiving or purchasing such stocking-frames so unlawfully disposed of. (28 Geo. III. c. 55, s. 3.)

LVIII. *Fine* of 100*l*. or imprisonment with hard labour for any term not exceeding one year, at the discretion of the court.

1. Making signals between sunset and sunrise from the 21st of September to the 1st of April, and between 8 p.m. and 6 a.m. at any other time of the year, for the purpose of giving any notice to persons on board smuggling vessels, whether such persons be or be not within distance to notice such signals. (8 & 9 Vict. c. 87, s. 60.)

LIX. *Fine* of 500*l*., and the offender to be rendered incapable of holding any office or place under the crown.

1. Judges and other officers or persons demanding or taking any money or other thing of value for anything done or pretended to be done under any Act relating to bankrupts, beyond what is allowed by such Acts. (1 & 2 Wm. IV. c. 56, s. 58.)

2. Masters in Chancery, or persons holding offices in the Court of Chancery, or under any of the officers thereof, demanding or taking any emolument or other thing of value, other than is allowed to be taken for anything done or pretended to be done relating to their offices or employments.† (3 & 4 Wm. IV. c. 94, s. 41.)

LX. *Imprisonment* for six months.

1. Mayors, bailiffs, or other chief officers of towns corporate, designedly hindering the election of other mayors, &c. in the same towns corporate.‡ (11 Geo. I. c. 4, s. 6.)

2. Brokers, not being trading goldsmiths or refiners of silver, buying or selling bullion or molten silver. (6 & 7 Wm. III. c. 17, s. 7.)

3. Persons suspected of buying or selling unlawful bullion, in whose possession such bullion shall be found, not proving upon their trial for melting the current coin of the realm, by one witness at the least, that the same was lawful silver and not current coin, nor clippings thereof. (6 & 7 Wm. III. c. 17, s. 8 in part.)

LXI. *Half a year's* imprisonment, and ransom at the queen's will.§

1. Marshals of the Queen's Bench suffering prisoners indicted for felony, who have removed the same indictment before the queen, to wander out of prison by bail or without. (5 Edw. III. c. 8.)

LXII. *Imprisonment* for any period not exceeding six months, and the offender, if a male, may be put to hard labour, or be once, twice or thrice privately whipped, in such manner as the court shall direct.

1. Maliciously damaging anything kept for the purposes of art, science, or literature, or as an object of curiosity, in any museum or other repository, which is at all times or from time to time open to the public or any considerable number of persons, either by permission of the proprietor or by payment of money, or any picture, statue, monument or painted glass in any place of public worship, or any statue or monument exposed to public view. (8 & 9 Vict. c. 44, s. 1.)

LXIII. *Imprisonment* for any time not exceeding six calendar months.

1. Making false declarations under the provisions of the Act for regulating the manner of making surcharges of the duties of assessed taxes.‖ (50 Geo. III. c. 105, s. 9.)

LXIV. *Fine* not exceeding 100*l*. and three months' imprisonment.

1. Procuring the consent of more than twenty persons to any petition or other address to the queen or either house of

* But see 7 Wm. IV. & 1 Vict. c. 90, s. 5, which limits the time for which the court may order solitary confinement to a period not longer than one month at a time, or three months in a year. It may be a question whether the above punishment is affected by that enactment, being expressly directed by act of parliament, and the court having no discretion.

† In the case of officers of the Court of Chancery, the statute also provides that they are to be removed from their offices or employments.

‡ Such offenders are also disabled to hold any office belonging to the same corporations.

§ For the meaning of ransom and queen's will, see above, p. 175, col. 1, notes ‖ ††.

‖ Besides the above punishment, the offender is also to be fined any sum not exceeding treble the amount of duty for which he shall have been charged, as the court shall order. (sec. 9.)

parliament, for alteration of matters established by law in church or state, without the previous order of three or more justices, or the majority of the grand jury of the county, where the matter arises at the assizes or quarter-sessions, or, if arising in London, of the lord mayor, aldermen, and commons, in common council assembled; or, upon pretence of presenting any petition or other address, being accompanied with excessive number of people, or at any one time with above ten persons.* (13 Car. II. c. 5, s 2.)

LXV. *Fine* not exceeding 20*l.*, or imprisonment with or without hard labour or solitary confinement, or with both, for any term not exceeding three calendar months, or both.

1. Unlawfully dredging for oysters. (7 & 8 Geo. IV. c. 29, ss. 4 and 36.)

LXVI. *Imprisonment* for any term not exceeding three months, or fine not exceeding 50*l.*

1. Offending against the provisions of the Act for regulating schools of anatomy. (2 & 3 Wm. IV. c. 75, s. 18.)

LXVII. *Fine* not less than 20*l.*, and imprisonment with or without hard labour.

1. Neglecting or disobeying the orders of the Poor Law Commissioners or assistant commissioners, having been twice previously convicted of so doing.† (4 & 5 Wm. IV. c. 76, s. 98.)

LXVIII. *Imprisonment* until the offender brings into court him which was the first author of the tale, and, if he cannot find him, such punishment as the council shall advise.

1. Scandalum magnatum. (3 Edw. I. c. 34; 2 Rich. II. st. 1, c. 5; 12 Rich. II. c. 11.)

LXIX. *Forfeiture* of 100*l.*

1. Members of incorporated commercial or trading companies against which a fiat in bankruptcy has issued (not being the persons ordered to prepare the balance sheet), or any other person, wilfully concealing the estate of such companies.‡ (7 & 8 Vict. c. 111, s. 17.)

LXX. *Fine* of 40*l.*

1. Disturbing any religious assembly allowed by law. (1 Wm. & Mary, c. 18, s. 18; 31 Geo. III. c. 32, s. 10;§ 52 Geo. III. c. 155, s. 12.)

LXXI. *Fine* or imprisonment.

1. Embracery. (6 Geo. IV. c. 50, s. 61.)

LXXII. *Fine* according to the trespass.

1. Illegal distresses. (52 Henry III. cc. 1, 2, 3, 4; 3 Edw. I. c. 16.)

LXXIII. *Fine* and ransom at the queen's will and pleasure.‖

1. Judges or clerks rasing rolls, changing verdicts, &c. whereby ensueth disherison of any of the parties.¶ (8 Rich. II. c. 4.)

2. Frauds by persons holding commissions to compound for the payment of first-fruits.** (26 Hen. VIII. c. 3, s. 4; 1 Eliz. c. 4, s. 24.)

LXXIV. *Grievous fine* to the queen.

1. Not being ready and apparelled at the summons of sheriffs and the cry of the country, to arrest felons, when need is, as well within franchise as without.†† (3 Edw. I. c. 9.)

LXXV. *Grevious punishment.*

1. Justices' marshals taking money wrongfully from successful suitors or jurors, prisoners or others attached upon pleas of the crown.‡‡ (3 Edw. I. c. 30.)

LXXVI. *Punishment* at the queen's will.§§

1. Extortion by sheriffs and other queen's officers. (3 Edw. I. c. 26; 1 Hen. IV. c. 11.)

LXXVII. *Fine* not exceeding 100*l.*, at the discretion of the court.

1. Offences against the Act for abolishing the truck system in certain trades. (1 & 2 Wm. IV. c. 37, s. 9.)

LXXVIII. *To be* at the queen's will of body, lands, and goods, thereof to be done as shall please her.

1. Justices being found in default in any of the points contained in the oath required to be taken by them. (18 Edw. III. st. 4; 20 Edw. III. c. 1.)

LXXIX. *Forfeiture* of twenty shillings for every offence.

1. Drovers, horse coursers, waggoners, butchers, higglers, or their servants travelling or coming into their inns or lodgings upon the Lord's Day.* (29 Car. II. c. 7, s. 2.)

LXXX. *Forfeiture* of 5*s.*

1. Persons of the age of fourteen or upwards, doing or exercising any worldly labour, business, or work of their ordinary calling on the Lord's Day (works of necessity and charity only excepted).† (29 Car. II. c. 7, s. 1.‡)

Besides the misdemeanors above enumerated, there are several offences against the Established Church which are indictable, but the penalties for which may be relieved against by complying with the provisions of what are commonly called the Toleration Acts. These offences consist of

1. The forbearing to resort to one's parish church on Sundays or other holy days, without some lawful or reasonable excuse for being absent, which constitutes the offender on conviction a recusant convict, and renders him liable to forfeit 12*d.* for every such offence, to the use of the poor of the parish where the offence is committed (1 Eliz. c. 2, s. 14), and, in addition thereto, to pay into the Exchequer after the rate of 20*l.* for every month which shall be contained in the indictment upon which he is convicted; and also, having been once convicted, to forfeit without further indictment or conviction 20*l.* to the queen for every month of so forbearing (29 Eliz. c. 6, s. 4; 3 Jac. I. c. 4, s. 8). He also, previously to the passing of the 7 & 8 Vict. c. 102, which repealed the Acts imposing them, became liable to numerous disabilities, amounting in effect to outlawry. A Roman Catholic who so forbore to resort to his parish church, became on conviction a Popish recusant convict, and liable to additional penalties and disabilities beyond those which attached to recusants convict. The offence has, however, been repealed by the before-mentioned Act of the 7 & 8 Vict. c. 102, as regards Roman Catholics.

2. The relieving, harbouring, or keeping recusants in the house, the penalty for every month of doing which is 10*l.* (3 Jac. I. c. 4, ss. 32 and 33). The 7 & 8 Vict. c. 102, also repealed this offence so far as it is related to Popish recusants.

3. Schoolmasters teaching in private families without licence from their archbishop, &c., and before subscribing a declaration of their conformity to the Liturgy; for doing which they are liable, for the first offence, to suffer three months' imprisonment, and for every second and other offence the like imprisonment, and to forfeit 5*l.* to the queen. (13 & 14 Car. II. c. 4, ss. 11 and 12; 1 Wm. and Mary, sess. 1, c. 8, s. 11.)

4. Popish bishops, priests, or Jesuits, saying mass or exercising any other of their functions within the queen's dominions, or Papists keeping school or educating youth within the same, whereby, upon conviction, they become liable to perpetual imprisonment. (11 & 12 Wm. III. c. 4, s. 3.) Roman Catholics were also liable to many other severe penalties for promoting or exercising their religion, until these were repealed by 7 & 8 Vict. c. 102. It will be seen that the two former of the above offences no longer apply to Roman Catholics. The two latter are, however, still in force with respect to them as well as all other classes of the queen's subjects.

The offence of forbearing to resort to church is repealed by the Protestant Dissenters' Toleration Acts (1 Wm. & Mary, sess. 1, c. 18, ss. 13 and 16; and 52 Geo. III. c. 155, ss. 4 and 14) in favour of Dissenters who go to some congregation for religious worship of Protestants allowed by law. Quakers, however, must also, in addition, make the declaration of fidelity, as it is called, and subscribe a profession of their Christian belief. By the provisions of the same Acts, the offence of relieving, harbouring, or keeping recusants is

* Lord Mansfield declared it to be the unanimous opinion of the court, that neither the Bill of Rights (1 Wm. & Mary, sess. 2, c. 2) nor any other Act had repealed 13 Car. II. c. 5, and that it was in full force.—R. *v.* Lord G. Gordon, Dougl., 571.

† The first and second offences are punishable on summary conviction only.

‡ Such offenders also forfeit double the value of the estate concealed.

§ The punishment by 1 Wm. & Mary, c. 18, s. 18 (the Dissenters' Toleration Act), and 31 Geo. III. c. 32, s. 10 (the R. Catholic Toleration Act), was 20*l.* only. As regards the former there is no doubt that 52 Geo. III. c. 155, which was passed for the relief of Protestant Dissenters, has superseded it; but it may be a question whether, notwithstanding the generality of its terms, it has superseded the provision of 31 Geo. III. c. 32, s. 10.

‖ For the meaning of ransom and queen's will and pleasure, see p. 175, col. 1, notes ‖ ††.

¶ The offender must also satisfy the party.

** The offender also forfeits his office of deputation.

†† If default be found in the lord of the franchise, the queen may seize his franchise.

‡‡ Such offenders are also to pay to the complainants treble the value of what they so receive.

§§ For the meaning of queen's will, see p. 175, col. 1, note ††.

* The above offence does not apply to the drivers of fish-carriages, or of horses returning from drawing fish-carriages, used for the conveyance of fish under the provisions of 2 Geo. III. c. 15, an Act for the better supplying the cities of London and Westminster with fish. (See section 7 of that Act.)

Persons committing this and the next offence may be proceeded against either by indictment or in a summary way before a magistrate

† As to other exceptions see 29 Car. II. c. 7, s. 3; 10 & 11 Wm. III. c. 24, s. 14; 3 Geo IV. s. 106, s. 16; 6 & 7 Wm. IV. c. 37, s. 14; 7 & 8 Geo. IV. c. 75, ss. 42-50; 1 & 2 Wm. IV. c. 22, s. 37.

‡ By the same section of 29 Car. II. c. 7, persons also who publicly cry or expose to sale any wares or chattels on the Lord's Day, are to forfeit the same.

repealed in favour of Quakers who make the declaration and subscribe the profession before alluded to, and of all other Protestant Dissenters who resort to some congregation for religious worship of Protestants allowed by law, or take the oaths of allegiance and supremacy, or (since the passing of the 3 & 4 Wm. IV. cc. 49 and 82, in case such Dissenters be Moravians or Separatists) make an affirmation to the effect of such oaths. The penalties imposed upon schoolmasters teaching without licence from the archbishop, &c. are repealed in favour of Protestant Dissenters who take the oaths of allegiance and supremacy (or, if Moravians or Separatists, make a declaration to the effect thereof, or, if Quakers, make the declaration of fidelity and profession of their Christian belief before alluded to), and make a declaration that they are Protestants, and that they believe in the Scriptures as received among Protestant churches. (1 Wm. and Mary, sess. 1, c. 18, s. 13; 8 Geo. I. c. 6; 19 Geo. III. c. 44, s. 2; 10 Geo. IV. c. 7, s. 1; 3 & 4 Wm. IV. cc. 49 and 82.) Popish bishops, &c. saying mass, &c., and Papists keeping school or educating youth, are relieved from the penalties for so doing, provided they take the oath appointed by the Roman Catholic Relief Act (10 Geo. IV. c. 7). See the 31 Geo. III. c. 32. ss. 3, 4, and 13; and 10 Geo. IV. c. 7, ss. 2 and 23.

Persons committing any of the before-mentioned offences against the Established Church, may, also, in general, prevent the consequences of the commission of such offences by conforming themselves to the Church. Members of the Established Church are not within the Toleration Acts, and the only mode, therefore, in which they can escape the penalties for those offences is by conforming to the law. Neither do those Acts apply to Jews.

There are also two offences, having, however, much more of a political than of a religious character, which subject the persons committing them to be adjudged Popish recusants convict, and as such to forfeit and be proceeded against. These are, refusing to take the oaths of allegiance and abjuration, or to make the affirmations or declarations allowed by law in lieu thereof, when tendered by two justices of the peace or other authorized persons (1 Geo. I. st. 2, c. 13, s. 10; 8 Geo. I. c. 6; 6 Geo. III. c. 53; 3 & 4 Wm. IV. cc. 49 and 82; 1 & 2 Vict. c. 77); and peers or members of either House of Parliament, sitting or voting therein or coming into the queen's presence, before they have taken the oaths of allegiance and supremacy, or taken or made the oath, affirmations or declarations allowed by law in lieu thereof. (30 Car. II. st. 2, ss. 2, 5, and 6; 8 Geo. I. c. 6; 31 Geo. III. c. 32, s. 20; 10 Geo. IV. c. 7, ss. 2, 4, and 23; 3 & 4 Wm. IV. cc. 49 and 82; 1 & 2 Vict. c. 77.) Peers and Members of Parliament are also liable in respect of the latter offence to many disabilities, and to a fine of 500*l.* in addition to the penalties consequent on being adjudged Popish recusants convict. The repeal of the four first-mentioned offences relating to the Established Church, is recommended by the Commissioners for revising and consolidating the criminal law. (See their Report on Penalties and Disabilities in regard to Religious Opinions, dated 30th of May, 1845.) The Commissioners also recommend that persons committing the two last-mentioned offences should no longer be adjudged and suffer as Popish recusants convict, but should be punished in a more direct manner; and that one form of an oath, and one of an affirmation, should be substituted for the numerous forms of the oaths of allegiance, supremacy and abjuration, and the modifications thereof now existing, to be so framed that the same may be taken by all classes of her Majesty's subjects without objection on religious grounds.

The whole of the law, written as well as unwritten, relating to the definition and punishment of the above offences, that is, the whole Criminal Law of England as regards indictable crimes and their punishments, has been collected and reduced into one body by the Criminal Law Commissioners (see their 7th Report), and is thus for the first time rendered accessible to the public at large. Before this reduction the Criminal Law had to be sought for in an immense mass of statutes, reported decisions, records, antient and modern, and text-books; and, on that account, could be known but to the few, and those principally engaged in the the practice or administration of the law. The digest so prepared by the Commissioners, and called by them 'The Act of Crimes and Punishments,' is comprised in twenty-four chapters, under the following heads:—

1. Preliminary Declarations and Enactments.
2. Treason and other offences against the State.
3. Offences against Religion and the Established Church.
4. Offences against the Executive Power, generally.
5. Offences against the Administration of Justice.
6. Offences against the Public Peace.
7. Offences relating to the Coin, and to Bullion, and Gold and Silver Plate.
8. Offences relating to the Public Propery, Revenue and Funds.
9. Offences against the Law of Marriage.
10. Offences relating to Public Records and Registers.
11. Offences against Public Morals and Decency.
12. Offences against Public Health.
13. Common Nuisances.
14. Offences relating to Trade, Commerce, and Public Communication.
15. Homicide and other offences against the person.
16. Libel.
17. Offences against the Habitation.
18. Fraudulent Appropriations.
19. Piracy and Offences connected with the Slave Trade.
20. Malicious Injuries to Property.
21. Forgery and other offences connected therewith.
22. Illegal Solicitations, Conspiracies, Attempts and Repetitions of Offences.
23. Definitions of Terms and Explanations.
24. Chapter of Penalties.

Upon the subject of punishments, the Commissioners recommend the abolition of forfeiture as an incident to convictions for treason or felony; are inclined to reject whipping as a mode of punishment, except in the case of discharging or aiming fire-arms, &c. at the queen (5 & 6 Vict. c. 51, s. 2), in which it has lately been imposed by the legislature as constituting a signal mark of ignominy; propose that three, or at the utmost four, years should be the longest term of imprisonment to be inflicted for any offence, whether treason, felony, or misdemeanor, in cases where imprisonment forms the whole or part of the punishment; and suggest a scale of penalties, consisting of forty-five classes, to be substituted for the numerous punishments contained in the above statement. This scale might be much further reduced but for the special nature of some offences, and if the recommendations of the Commissioners should be adopted. At present it is extremely difficult in some instances to determine what punishment an offence is liable to.

It may be expected that at no distant period the 'Act of Crimes and Punishments,' subject to such omissions as are recommended by the Commissioners, will become the law of the land. A bill embodying its provisions was introduced, at the end of the session of 1844, in the House of Lords by Lord Brougham, was read a second time, and went into committee *pro formâ*; but was ultimately withdrawn at the instance of the Lord Chancellor, who undertook to issue a commission for the purpose of revising it, that duty being too laborious for any government to grapple with, and if their Report should be favourable to its adoption, to found one or more government measures upon it, as should be thought most expedient. A commission (the one whose Report on Penalties and Disabilities in regard to Religious Opinions has been several times alluded to in the foregoing statement) was accordingly appointed for this, amongst other purposes, on the 22nd of February of the year 1845. Since, the members of the old commission (who also form part of the new one) have made a Report containing a digest of the law of procedure as regards indictable offences (a most difficult and laborious undertaking), and this also is to be revised by the new commission, and if passed into a law would be a work of inestimable value.

Besides the 'Act of Crimes and Punishments' and the Digest of the Law of Procedure, several other most important Reports emanated from the original Criminal Law Commission. It was upon their recommendation that the Acts of the 1st year of her present Majesty's reign, repealing the punishment of death in the case of between thirty and forty crimes, were founded. It was a Report of theirs which mainly contributed to the alteration of that harsh and inconsistent rule of our law which denied a prisoner his full defence by counsel upon a charge of felony. They also made a very elaborate and valuable Report upon the Consolidation of the General Statute Law, and a Report upon the subject of Juvenile Offenders—in all, the number of Reports which issued from the Commission between the period of its first appointment in 1823 and its termination in the year 1845 was Eight.

Procedure.

Where any of the before-mentioned crimes has been or is suspected to have been committed, the ordinary mode of bringing the accused to justice is as follows:—Unless he surrender himself, he is, in the first place, to be summoned by some magistrate, having jurisdiction, to appear before him, or, as is more generally the case, a warrant for his apprehension is to be procured from some such magistrate. In order to the issuing of a summons or warrant there must be an information laid on oath: the former may be directed either to the accused himself, or to some other person who is to summon him to appear; the latter to any constable or other person whom the magistrate pleases, and must signify the party to be arrested and the offence which is the cause of his arrest. After a summons duly issued and served upon the accused, he is to appear according to its directions, or in default the magistrate may issue his warrant to apprehend him. After a warrant duly granted, whether a summons has been proviously issued or not, the person to whom it is directed is to proceed to arrest the accused (and if for treason, felony, or breach of the peace, may do so on any day, and at any time of the day or night), and to take him to gaol or before some magistrate having jurisdiction, according to the import of the warrant, and that without any unnecessary delay. It is also lawful for a constable or private person who sees a felony committed, or attempted to be committed, or a dangerous wound given, to arrest the offender, without warrant; also any person whom be reasonably suspects of having committed a felony which has actually been committed, and persons found committing thefts or malicious injuries to property and some other offences. A constable may also, without warrant, arrest on a reasonable charge made of a felony committed or dangerous wound given, although it afterwards appear that none such had been actually committed or given; also for a breach of the peace committed in his view; but (except in the case of one of the motropolitan police, who may under certain circumstances do so upon a charge made of an aggravated assault [see 2 & 3 Vict. c. 47], not for one committed out of bis view. Justices of the peace, sheriffs, coroners, and all other peace officers, have, it would appear, the like power to arrest as constables. Where a party is arrested without warrant, he must be taken before a magistrate within a reasonable time.

On surrendering bimself or appearing in obedience to a summons, or being brougbt before a justice of the peace under a warrant, the justice is to proceed to take the examination of the accused and the information on oath of those who know the facts and circumstances of the case, and is to put so much thereof as is material into writing. If a *primâ facie* case be made out, the justice is to commit him to prison (unless he be entitled to be discharged on bail). If it appear that no crime has been committed, or that, if committed, the accused is innocent, be is to discharge him. Unless it be prohibited by act of parliament, the accused ought to be admitted to bail in the case of all misdemeanors. Where the charge is one of felony, and the accused is brought before a single justice of the peace, if the evidence be neitber sufficient to raise a strong presumption of guilt, nor to warrant the dismissal of the charge, the accused is to be detained until the case be taken before two justices at the least, who in such case may admit him to bail (7 Geo. IV. c. 64, s. 1), and, if one of them has signed the warrant of commitment, may admit him to bail, although he confess the matter laid to bis charge, or such charge do not appear to be groundless, or the circumstances be such as to raise a presumption of gullt (5 & 6 Wm. IV. c 33, s. 3). If the accused be brought before two justices in the first instance, they have the like power to bail him. Where a party is committed or bailed for any offence, the justice may bind by recognizance all persons wbo know or declare anything material touching it, to appear and prosecute, or give evidence against him. When held to bail or committed to prison, the accused is entitled to have delivered to him, on demand, copies of the examinations of the witnesses upon whose depositions he is so bailed or committed, on payment of a reasonable sum not exceeding 1½*d.* for each folio of 90 words. If, however, such demand be not made before the day appointed for the commencement of the assizes or sessions at which the accused is to be tried, he is not entitled to such copies unless the court be of opinion that the same may be delivered without delay or inconvenience to the trial (6 & 7 Wm. IV. c. 114, s. 3).

Before a prisoner can be put upon his trial for any treason or felony, it is necessary that a bill of indictment should be found against bim by a grand jury duly returned before some court which bas jurisdiction to try parties for crimes by means of a petty jury; or in the case of murder or manslaughter, he may be tried upon the coroner's inquisition. Where the offence witb which he is charged is a misdemeanor, be may be tried either upon a bill of indictment found, as in the case of treason or felony, or upon a criminal information filed against him in the name of the queen. For a præmunire, he is to be first indicted as in other cases, or may be proceeded against in the peculiar manner pointed out by 16 Rich. II. c. 5, commonly called the Statute of Præmunire. This latter mode may, however, be regarded as obsolete.

A bill of indictment is an accusation at the suit of the Crown, and being for the public benefit and security, may generally be preferred by any person; but it is not usual for parties to interfere unless they are individually aggrieved by the offence, or fill some office which renders it peculiarly incumbent on them to bring the offender to justice. [INDICTMENT, P. C.] So soon as the grand jury have presented the bill of indictment in court, indorsed 'a true bill,' the indictment is complete. If the grand jury find no true bill, the accused, where in custody, is to be at once set at large, without the payment of any fees on account of such discharge (14 Geo. III. c. 20; 55 Geo. III. c. 50; 8 & 9 Vict. c. 114). An indictment may also be framed upon the presentment by a grand jury, of their own knowledge that an offence has been committed; but this mode of prosecution is seldom adopted. For further particulars relating to Grand Juries see JURY, P. C.

A criminal information in the name of the Queen is a suggestion filed on record by the attorney-general or by the queen's coroner or master of the Crown Office, in the court of Queen's Bench, that a misdemeanor has been committed by an alleged offender. The attorney-general, or, during vacancy in that office, the solicitor-genoral, may at his discretion file a criminal information. In all othor cases it is in the discretion of the Court of Queen's Bench to grant or refuse leave to file such informations, and such leave will only be granted on motion made, grounded on proper affidavits, and in respect of misdemeanors of such magnitude or under such circumstances as, in the opinion of the court, call for its interference. After an information is filed, all the subsequent proceedings are, in general, the same as after an indictment found for a misdemeanor.

Persons committed for treason or felony who move in open court the first week of the term, or first day of the sessions of oyer and terminer or gaol delivery, to be brougbt to trial, may, if not indicted some timo in the next term or session after their commitment, be bailed by the judges of the Queen's Bench, or justices of oyer and terminer or goal delivery, unless it appear that tbe witnesses for the crown could not be produced the same term or sessions; and if not indicted and tried the second term or sessions after their commitment, or if acquitted upon their trial, shall be discharged from imprisonment (31 Car. II. c. 2, s. 7). [HABEAS CORPUS ACT, P. C.]

When the indictment is found, in cases of felony, the accused is bound to plead and try *instanter*, and if in custody, is to be brought to the bar and arraigned (which is the legal term for calling on a prisoner to answer to a charge of an indictable offence) as soon as convenient after such indictment is found; but in all cases of treason, except where the overt act is tbe assassination of the queen, the endangering of her life or person, or any attempt to injure her person (39 & 40 Geo. III. c. 93; 5 & 6 Vict. c. 51), and except the forgery of the great and other royal seals (7 & 8 Wm. III. c. 3, s. 13), the accused is to have a true copy of the indictment delivered to him ten days at the least before he is arraigned, and, *at the same time*, a list of the witnesses to be produced against him, and if indicted in any other court than the Queen's Bench, a list of the petit jury; but if indicted in the Queen's Bench, the list of the petit jury may be delivered to him at any time after his arraignment, so as it be delivered ten days before the day of trial (7 & 8 Wm. III. c. 3, s. 1; 7 Anne, c. 21, s. 11; 6 Geo. IV. c. 50, s. 21). If the accused plead, however, without claiming or having had delivered to him such copy or lists, he will be considered to have waived any objection on account of such non-delivery. In cases of misdemeanor, the accused is not bound to plead and try at the session at wbich the indictment is found, unless he has been in custody or out on bail to appear to answer for the offence with which he is charged, twenty days at the least, before such session (60 Geo. III. & 1 Geo. IV. c. 4, s. 3), but may traverse the indictment, that is, postpone its determination to the next session. He must usually, however, before he will be allowed to do so, appear personally in court (except in the

Queen's Bench, where he may appear by attorney) and plead. A party indicted for a misdemeanor, not having been in custody nor out on bail, twenty days before the session at which he is so indicted, may also, at the subsequent session, traverse to the one following, unless he has been in custody or out on bail or has received notice of such indictment, twenty days before such subsequent session (60 Geo. III. & 1 Geo. IV. c. 4, s. 5). If the accused, whether in case of felony or misdemeanor, be not in custody nor on bail when the indictment is found, or, being on bail, make default, his appearance may be compelled by process or by a bench warrant; and he may be prosecuted to outlawry. [OUTLAWRY, P. C.] No fee is to be demanded or taken from persons charged with or indicted for felony or misdemeanor, or as an accessory to felony, for their appearance to the indictment or information, or for allowing them to plead, or for recording their appearance or plea, or for discharging any recognizance taken from such persons, or any sureties for them (8 & 9 Vict. c. 114, s. 1).

In cases of treason, the accused is entitled, on application to the court, to have two counsel assigned him, who may have free access to him at all seasonable hours (7 & 8 Wm. III. c. 3, s. 1). The court may also, if it think fit, upon the accused's making affidavit that he is not worth 5*l.* beyond his wearing apparel, allow him to defend *in formâ pauperis*; in which case neither the officers of the court, nor those who are assigned to conduct his cause, may take any fees.

The prisoner, upon being arraigned or charged with the indictment, in cases of felony or misdemeanor, may either confess the charge to be true, in which event such confession is to be recorded and judgment awarded according to law, or may plead to the indictment or demur. By pleading, he puts in issue the facts of the charge; by demurring, he admits the facts, but contends that they amount to no offence indictable by law; as if a man were indicted for feloniously stealing game, without alleging that it was tame or confined: in which case, upon demurrer, he must be discharged. After demurrer, in cases of felony, decided against the prisoner, he is at liberty to plead over 'Not Guilty;' but, in cases of misdemeanor, the judgment for the Crown is final, for it operates as if the prisoner had been convicted by a jury. In either case, if the demurrer be decided for the prisoner, the judgment is that he be dismissed and discharged.

The pleas which may be pleaded by a prisoner are either to the jurisdiction of the court, and these must be pleaded before any other plea, or in abatement (for the omission of his addition under the statute of additions, or for misnaming him) or in bar; and pleas in bar are either special pleas or the general issue. Special pleas may allege a previous acquittal, conviction, or attainder of the same offence, or a pardon [PARDON, P. C.]; and, in the case of prosecutions for the non-repair of highways or bridges, the liability, if denied by the defendant, of the party who is liable for the repair of the same.

The general issue, or 'Not Guilty,' which is the plea employed in the infinitely greatest number of cases, puts in issue the whole question of the accused's guilt or innocence of the charge in all its bearings; and not only casts on the prosecutor the burden of making out every part of his charge, but entitles the accused to give in evidence every possible ground of justification or excuse which can form an answer to the indictment.

No advantage can now be obtained by a plea in abatement, as by the 7 Geo. IV. c. 64, s. 19, the court may, upon such plea, immediately cause the indictment to be amended, and call upon the party to plead to it so amended, as if no such plea had been pleaded. In cases of felony, if a special plea be found for the Crown, the prisoner may plead over 'Not Guilty;' but in cases of misdemeanor, the judgment for the Crown is final. In either case, if it be found for the prisoner, he is to be dismissed.

If, instead of pleading, the prisoner stand mute of malice, or will not answer directly to the indictment, the court may order a plea of 'Not Guilty' to be entered on his behalf, and such plea will have the same effect as if it had been actually pleaded by him (7 & 8 Geo. IV. c. 28, s. 2). But if a doubt arise whether he be mute of malice or dumb, a jury is to be impannelled to try the fact, and, if the latter be found, the court will use means to make the prisoner understand what is required of him; but if this be impossible, will direct a plea of 'Not Guilty' to be entered, and the trial to proceed. Should he upon arraignment be found to be insane by a jury impannelled for the purpose under the provisions of the 39 & 40 Geo. III. c. 94, so that he cannot be tried, the court may order such finding to be recorded and the prisoner to be kept in strict custody until her Majesty's pleasure be known.

When, however, the plea of 'Not Guilty' has been pleaded, the trial is to be had before some court having jurisdiction, by twelve jurors, generally of the county where the fact is alleged in the indictment to have been committed, called a petit jury, by way of distinction from the grand jury. The ordinary courts having jurisdiction to try indictable offences are the Queen's Bench, Courts of Oyer and Terminer, Gaol Delivery, and Quarter-Sessions, Borough Courts and the superior Criminal Courts of the Counties Palatine; but Courts of Quarter-Sessions and Borough Courts have no jurisdiction with respect to treason or any felony punishable with death or transportation for life, and several other offences (see 5 & 6 Vict. c. 38, s. 1). The trial is generally to be had in the county or district in which the offence was committed.

Upon the trial being called on, the jurors are to be sworn as they appear, to the number of twelve, unless they be challenged. As to challenges, whether on the part of the Crown or the prisoner, and as to petit juries generally, see JURY, P. C. It may here be observed, however, that the right of peremptory challenge, *i. e.* of challenging at mere pleasure, without showing any cause, which exists in cases of treason and felony, is one of the peculiarities before alluded to, which distinguish those classes of crimes from misdemeanors; and that the power to challenge peremptorily to the number of thirty-five jurors in cases of treason, and to the number of twenty only in cases of felony, is a distinguishing feature between treasons and felonies. When twelve jurors are procured free from exception, and have been sworn, or, if Quakers, Moravians, or Separatists, or persons who have been Quakers or Moravians, have made their solemn affirmation, in case of treason or felony, well and truly to try and true deliverance make between the queen and the prisoner whom they have in charge, and, in cases of misdemeanor, well and truly to try the issues joined between the queen and the defendant, the case, where counsel is retained for the prosecution, is to be opened by him, or, if two or more counsel are retained, by the leading one, according to his instructions, unless the case is so plain as not to require any statement. The counsel for the prosecution ought, however, to confine himself, so far as possible, to a simple statement of the facts which he expects to prove, and to abstain from any appeal to the passions of the jury, more particularly in cases where the prisoner has no counsel. After the opening, or where no counsel is engaged for the prosecution, immediately after the swearing of the jury, the examination of the witnesses on behalf of the Crown commences. Before being examined an oath or affirmation is administered to each witness 'that he will true answer make to such questions as the court shall demand of him, and will tell the truth, the whole truth, and nothing but the truth.' Where there is counsel, he examines the witnesses; where there is none, that duty devolves on the court. In criminal cases a single witness, swearing to the actual offence or to such facts as necessarily lead to the inference that it has been committed, if believed by the jury, is generally sufficient to substantiate the charge. In treason, perjury, and the offences of tumultuously petitioning, affirming that parliament has a legislative authority without the Crown, or that any person is entitled to the crown contrary to the Act of Settlement, and Blasphemy under the provisions of 9 & 10 Wm. III. c. 32, however, there must be two witnesses. In all cases, also, the prisoner's confession, if made in consequence of a charge against him, and in a direct and positive manner, voluntarily and without promise or threat operating on his mind at the time of making it, is sufficient, even if there be no other proof that the crime with which he is charged has been committed, for the jury to convict upon, if they believe it to be true. And the single unsupported testimony of an accomplice is sufficient (except where two witnesses are required), if the jury believe his story; but it is usual in such cases for the court to direct the acquittal of the prisoner. If, however, the accomplice be corroborated by unsuspicious evidence as to such parts of his testimony as show that his story has not been fabricated, the court will not interfere.

There are four kinds of proof by which criminal charges may be sustained: 1st, *positive*, as by the direct testimony of a witness who saw the fact; 2ndly, *circumstantial*, when a number of facts are presented which are inconsistent with any other hypothesis than that of the prisoner's guilt; 3rdly, *presumptive*, as when the possession of a stolen article casts on the prisoner the burden of showing how he obtained it;

4thly, *confessional*, where the prisoner makes a voluntary admission of his guilt as already mentioned. The general rules of evidence in criminal proceedings are the same as those which are applicable in civil cases. [EVIDENCE, P. C.] A husband or wife, however, may be a witness for and against each other upon a charge of criminal violence done by either to the person of the other, contrary to the rule in civil cases, which excludes the testimony of husband and wife for or against each other. The prosecutor, also, notwithstanding his connexion with the proceedings against the prisoner, is a competent witness in support of the charge, for such proceedings are carried on in the name of the crown, and the prosecutor has, according to legal construction, no direct interest in the result.

After the examination of each witness, he may be cross-examined on behalf of the prisoner, who is entitled at the time of the trial to inspect, without fee or reward, all depositions, or copies thereof, which have been taken against him and returned into court. (6 & 7 Wm. IV. c. 114, s. 4.) When the cross-examination is finished, the counsel by whom the witness was called is entitled to re-examine him for the purpose of explaining any matters touched upon or referred to in the cross-examination, into which confusion may have been introduced by the questions on the prisoner's behalf. The court may also put any questions it thinks proper to the witnesses, and for this purpose may recall a witness at any stage of the inquiry.

When the case for the prosecution is closed, the prisoner or his counsel (who has, since the passing of the 6 & 7 Wm. IV. c. 114, the same right to address the jury on the merits of the case in felony as he previously had in treason and misdemeanor) is entitled to address the jury, and in so doing to comment on the entire case for the prosecution; and if he intends to adduce evidence, may open that evidence with any particulars he may think proper. After the prisoner or his counsel has finished his address, the witnesses for the defence are to be sworn, and their evidence gone into. The accused is always allowed to call witnesses to speak to his *general* character, as being inconsistent with the imputed offence, and it is for the jury to estimate the value of such evidence.

When the prisoner's evidence is closed, witnesses may be called on behalf of the prosecution to give specific contradictions to the denials by the prisoner's witnesses on cross-examination, and generally to give any evidence in reply which is strictly applicable to the defence and which could form no part of the original case. Where such evidence is given, the prisoner or his counsel has a right to address the jury on it before the general reply for the prosecution.

When the defence is ended, the counsel for the prosecution, in all cases where witnesses have been called on behalf of the accused, is entitled to reply on the entire case and on all the observations made by the other side during its progress. After the case on both sides is closed, the court sums up the evidence, and in so doing directs the attention of the jury to the precise issue they have to try, and applies the evidence to that issue. Upon the trial of a person for a non-capital felony committed after a previous conviction for felony, the jury is not to be charged to inquire concerning such previous conviction, until they have inquired concerning such subsequent felony and have found such person guilty of the same; and where such previous conviction is stated in the indictment, the reading of such conviction to the jury is to be deferred until after such finding. Where, however, such person gives evidence of good character, the prosecutor may in answer thereto give evidence of such previous conviction, before such finding, and the jury may inquire concerning such previous conviction at the same time that they inquire concerning the subsequent felony. (6 and 7 Wm. IV. c. 111.) The summing up being concluded, the jury proceed to consider of their verdict. If, on consultation in the jury-box, they are not able to agree within a convenient time, they retire, and a bailiff is sworn to keep them together without meat, drink, fire, or candle till they are agreed. This rule, however, has been relaxed in modern times. In cases of misdemeanor, where the trial lasts more than one day, the court will generally allow the jurors to return to their homes, the jury engaging to allow no one to speak to them on the subject of the trial. But in cases of treason or felony, the course has been to permit them to retire in a body to some tavern, where accommodation is provided for them by the sheriff and his officers, who are sworn to keep them together, and neither to speak to them themselves nor to suffer any other person to speak to them touching any matter relating to the trial.

When the jury have agreed upon their verdict, they signify that they are ready to deliver it; and on returning into court for that purpose, their names must be called over, and all twelve must be within hearing when it is given. The foreman of the jury is the person who is to deliver the verdict; and in cases of treason or felony, it can only be received in open court and in the presence of the prisoner: in cases of misdemeanor it may be otherwise. The verdict may be either 'Guilty' or 'Not Guilty,' or may be a special one; and may be 'Guilty' upon one count of an indictment, and 'Not Guilty' upon others; or may be 'Guilty' as to part of a count, and 'Not Guilty' as to the remainder, where an offence is charged which includes a lesser crime of the same degree, and the latter only is proved; as where murder is charged, and the proof is of manslaughter: and since the passing of 7 Wm. IV. & 1 Vict. c. 85, s. 11, before referred to, the jury may find guilty of an assault, where one is included in the felony charged, and acquit of the felony, although an assault is a misdemeanor only. A special verdict is the finding of all the facts specially, where the jury doubt whether they constitute the offence in the indictment, and leaves the court to give judgment according to the legal effect of the facts so found.

Where upon the trial evidence is given of insanity at the time of committing the offence charged, and the jury acquit, they are required to find specially whether the accused was insane at the time of the commission of the offence, and whether he was acquitted on that account; and if they find in the affirmative, the court is to order him to be detained till the queen's pleasure be known; and she may give such order for his safe custody during her pleasure as she may think fit. (39 & 40 Geo. III. c. 94, s. 1; 3 & 4 Vict. c. 54, s. 3.) On a verdict of acquittal, or where he is discharged by proclamation for want of prosecution, the prisoner is to be immediately set at large in open court, without the payment of any fines in respect of such discharge. (14 Geo. III. c. 20; 55 Geo. III. c. 50; 8 & 9 Vict. c. 114.)

When a verdict of guilty has been returned against a prisoner, the court, except in the case of prosecutions pending in the Queen's Bench, may proceed at once to pass sentence upon him, unless he allege some matter or thing sufficient in law to arrest or bar judgment. In prosecutions pending in the Queen's Bench, however, the prisoner is allowed four days for moving in arrest of judgment; or, in cases of misdemeanor, for a new trial or writ of *venire facias de novo*. Also where the trial at any sittings or assizes is upon a record of the Queen's Bench, the judge before whom the verdict is taken may, under 11 Geo. IV. & 1 Wm. IV. c. 70, s. 9 (except where the prosecution is by information filed by leave of the Queen's Bench, or such cases of information filed by the attorney-general wherein he prays that judgment may be postponed), pass sentence at once; but such sentence is not to have the force and effect of a judgment of that court, until after the expiration of six days after the commencement of the ensuing term, during which period the prisoner may move for a new trial, or to have the judgment amended. Except in the last-mentioned case of a trial at the sittings or assizes upon a record of the Queen's Bench, or where the offence of which the prisoner is convicted is a misdemeanor punishable by a simple fine, or where the Queen's Bench, after conviction for misdemeanor, thinks proper to dispense with his attendance, sentence cannot be pronounced against a prisoner unless he be present in court at the time.

Judgment may be arrested where the offender has received a pardon since his arraignment or after conviction becomes insane, or, having been out of custody since his conviction, denies that he is the person convicted (in which last case a jury is to be impannelled to try the fact), or for some defect apparent in any part of the record, as regards either the jurisdiction of the court, the statement of the offence or any of the proceedings thereon, but not for any of the mere technical defects specified in 7 Geo. IV. c. 64, ss. 20 and 21. If the judgment be arrested, all the proceedings against him are to be set aside, and judgment of acquittal is to be pronounced in his favour; but he may be prosecuted again for the offence of which he is so acquitted.

A new trial may be had on the application of the defendant in all cases of misdemeanor pending in the Queen's Bench, where it appears to the court that the awarding one is essential to justice; as, for instance, where the verdict is contrary to evidence or the directions of the judge, or evidence has been improperly received or rejected at the trial. The court of Queen's Bench will also in its discretion, where a party is acquitted of a misdemeanor on a prosecution pending in that court, allow a new trial, on the application of the prosecutor, if such acquittal has been obtained by any fraudulent means or practice, as where the party acquitted has kept back any of the prosecutor's witnesses, or neglected to give due notice of trial.

A writ of *venire facias de novo*, the effect of which is the same as granting a new trial, may be awarded where, by reason of misconduct on the part of the jury, or of some uncertainty or ambiguity or other imperfection in their verdict, or of any other irregularity or defect in the proceedings or trial, appearing on the record, the proper effect of the first *venire* has been frustrated, or the verdict has become void in law.

Neither new trials nor writs of *venire facias de novo* are grantable in cases of treason or felony.

Where a new trial or writ of *venire facias de novo* is awarded, the parties stand in the state in which they were immediately before the first trial: the whole case is to be reheard, and the first verdict cannot be used upon the new trial, or as evidence of any matter found by such verdict, or in argument.

After sentence pronounced against an offender, the judgment of the court may be falsified or reversed, either by plea without writ of error or by writ of error: by the former, for some matter not apparent upon the face of the record, as want of authority in the court by whom the judgment was pronounced; by the latter, for the same matters as are sufficient to arrest a judgment, and also for any material defect in the judgment itself. Where the judgment has been pronounced by a court of oyer and terminer, gaol delivery, or quarter-sessions of the peace or of a county palatine, the writ of error is to be brought in the court of Queen's Bench, and for that purpose the indictment and other proceedings thereon must be removed into that court by writ of *certiorari* [CERTIORARI, P. C. and P. C. S.]: where it has been pronounced in the Queen's Bench, it is to be brought in the Exchequer Chamber, before the justices of the Common Pleas and barons of the Exchequer, from whose judgment a writ of error lies to the House of Lords. In cases of treason and felony it is in the discretion of the crown to grant or refuse a writ of error: in all other cases the fiat of the attorney-general must be first obtained, and this he ought to grant upon probable cause of error shown. When issued, the writ of error stays the execution of the judgment, where it has not been carried into effect during the time that such writ is pending, except that in cases of treason or felony the offender is not entitled to be liberated on bail. In cases of misdemeanor, however, where he is imprisoned under execution, or any fine has been levied, either in whole or in part in pursuance of the judgment, he is entitled to be discharged from imprisonment and to receive back any money levied on account of such fine, until the final determination of the Writ of Error. (8 & 9 Vict. c. 68, s. 1.) If the judgment be falsified or reversed, such judgment and the execution thereupon, and all former proceedings, become thereby absolutely null and void; and the person the judgment against whom is so falsified or reversed, if living, and, if dead, his heir or executor, is restored to all things which such person may have lost by such judgment and other proceedings, and stands in every respect as if such person had never been charged with the offence in respect of which such judgment was pronounced against him. If, however, the execution only be erroneous, that only will be reversed; and if the judgment be reversed for some technical error merely, in the indictment or subsequent process, the party may be prosecuted again. If the judgment be confirmed, the prisoner is to be remanded to undergo the remainder of his sentence.

Where there is nothing to arrest or bar a judgment, the execution of it may be prevented by a pardon received after sentence pronounced; but, without express words of restitution, no property which the offender forfeited on his conviction or attainder, is thereby revested in him; nor, unless where the pardon is by act of parliament, is the corruption of his blood removed, except as regards those of his blood born after the granting of such pardon, nor are any of the consequences of such previous corruption prevented.

In capital cases the execution of a judgment may also be suspended by a reprieve, either at the discretion of the Crown, or, where substantial justice requires it, of the court. There are two instances however in which the court is bound to grant a reprieve, viz.: 1, where the offender, if a female, is pregnant; 2, where the offender becomes insane after judgment. If the offender allege that she is pregnant or the court have reason to suppose that she is so, a jury of twelve matrons is to be impannelled with all possible dispatch to try whether or not she be quick with child. In case they find in the affirmative, the court respites the offender from time to time until she be delivered of a child or it is no longer possible in the course of nature that she should be so. After her delivery or where such delivery is no longer possible as before mentioned, or if the jury find that she is not quick with child, the court, at the expiration of the period for which it has respited her, proceeds to award execution against her.

Where insanity is alleged, the court will reprieve the prisoner, if found to be insane by means of an *ex officio* inquiry, or if his insanity otherwise sufficiently appear.

Should the execution of a judgment be neither prevented nor suspended, or, having been suspended, should have ceased to be so, such judgment is to be executed according to law by the sheriff or other authorized person or his deputy. In capital cases, if the offender, after hanging, be taken down before he be dead, he is to be hanged again until he be dead.

As regards the manner in which the various judgments which may be pronounced against offenders are to be executed, the subject is too extensive to be further treated of in an article like the present.

With respect to the expenses of prosecutions for indictable offences, the general provisions on the subject are contained in 7 Geo. IV. c. 64. According to these the court before which any person is prosecuted for felony or the following misdemeanors, viz., assaults with intent to commit felony; attempts to commit felony; riots; receiving stolen property; assaults upon peace-officers in the execution of their duty, or upon persons acting in their aid; neglect or breach of duty by peace-officers; assaults in pursuance of conspiracies to raise the rate of wages; obtaining property by false pretences; indecent exposure of the person; perjury and subornation of perjury, may, at the request of the prosecutor or any other person appearing on recognizance or subpœna to prosecute or give evidence, order payment of the costs and expenses incurred by the prosecutor in preferring the indictment, and also the reasonable expenses of the prosecutor and witnesses for the prosecution in attending before the grand jury and otherwise carrying on the prosecution; and also, whether a bill of indictment be preferred or not, may order the reasonable expenses incurred by any person by reason of attending on any such recognizance or subpœna (such attendance, where no indictment is preferred, appearing to be in *bonâ fide* obedience to the recognizance or subpœna), and, except in cases of misdemeanor, by reason of attending before the examining magistrate, and also, except in respect of attendance before such magistrate in cases of misdemeanor, compensation for trouble and loss of time. Such payments are in general to be made out of the county rate.

It is difficult to discover upon what principle the selection of the cases of misdemeanor in respect of which the court is empowered to award costs has been made. Other cases might with justice be included; and it may be a question whether, under certain limitations, the power ought not even to be extended to the expenses of the prisoner's witnesses.

Offences punishable on Summary Conviction.

It would be inconsistent with the limits of the present article to give a detailed account of the various offences punishable on summary conviction, in number far exceeding those which are indictable. They relate, however, principally to ale and beer houses, apprentices, petty assaults, the Customs and Excise, distresses, drunkenness, friendly societies, game, hawkers and pedlars, highways, turnpike roads, petty thefts not amounting to larceny, malicious injuries to property, pawnbrokers, railways, stage and hackney carriages, servants, vagrants, weights and measures, and the numerous offences punishable under the Metropolitan Police Acts.

Summary proceedings, except in the case of contempts of the superior courts of justice (which those Courts have been immemorially used to punish by attachment), were wholly unknown to the common law. Their institution appears to have originated partly in the necessity for relieving the ordinary tribunals from the immense increase of labour which would otherwise have been cast upon them, owing to the multiplicity of new offences of a trivial kind which were yearly created for the protection of society as it advanced in population and civilization, and partly in the desire to do more speedy justice in the case of such trifling offences than would have been possible had they been made indictable. In the case of indictable offences a party cannot in general, as before observed, be put upon his trial until a true bill has been found against him by a grand jury, and cannot be convicted except by the verdict of a petit jury: to have made all these minute offences indictable would therefore have entailed upon the class of persons qualified to serve as jurors a frequency of attendance which would have been found to be most troublesome and harassing. Accordingly numerous acts of parliament have from time to time vested in one or more justices of the peace or other persons the power to try parties accused of trifling offences without the intervention of a jury. The extension, however, of this mode of proceeding has been always regarded with extreme jealousy.

Where an offence punishable on summary conviction before a justice of the peace has been committed, or is suspected to have been committed, the general course of proceeding is as follows:—An information (but which need not be in writing unless directed to be so by the statute which creates the offence) is to be laid before the justice authorized to take such information, who thereupon issues a summons to the party complained of, containing the substance of the charge, and giving him notice that at a certain time and place the hearing of the complaint against him will be proceeded with. If the party attend at the appointed time and place, and confess that he has committed the offence, the justice proceeds at once to convict him, and to impose the penalty assigned by the Act which creates the particular offence. If he attend, but deny that he has committed the offence, or if he fail to attend, evidence is to be gone into for the purpose of showing that he has committed it. In the latter case, however, it must be first ascertained that he has been duly summoned. It appears that the examination of witnesses in summary proceedings must in all cases be upon oath, notwithstanding the Act creating the offence may authorize conviction *on the examination of witnesses*, without stating that the same is to be upon oath. So also such examination must be in the presence of the party complained of, where he appears; and generally, all rules applicable to the trial of indictable crimes may be considered as applying to the trial of offences punishable on summary conviction, so far as such rules are compatible with that mode of proceeding. If, after hearing the evidence, the justice is of opinion that the charge is not substantiated, the party accused is to be acquitted. If, on the other hand, he thinks that it is, he is to convict the offender and to impose upon him the assigned penalty. Upon conviction the justice usually issues his warrant to apprehend the offender, in cases where corporal punishment is to be inflicted upon him, or else to levy the penalty incurred, by distress and sale of his goods. This is the general mode of proceeding, as well where the conviction is required to be before two or more justices, as where it may be before a single justice of the peace; but for particulars recourse must be had to the several statutes creating the offences or inflicting the punishment. In some cases a power of appealing to the quarter-sessions is given to the party convicted. [JUSTICE OF THE PEACE, P. C.]

For the method of proceeding with respect to offences punishable on summary conviction before the Commissioners of Excise or persons other than justices of the peace, reference must be made to the statutes on the subject.

The principal authorities besides the statutes of the realm which have been consulted in the preparation of this article, are Hawkins's *Pleas of the Crown*; Blackstone's *Commentaries*; Russell, *On Crimes and Misdemeanors*; Chitty's *Criminal Law*; Starkie's Treatises *On the Law of Evidence and On Criminal Pleading*; Dickenson's *Guide to the Quarter-Sessions*, by Talfourd; the 4th, 5th, 6th, 7th, and 8th Reports of the Criminal Law Commissioners; the Report of the Commissioners for revising and consolidating the Criminal Law, on the subject of Penalties and Disabilities in regard to Religious Opinions; and Hulton *On the Law of Convictions*.)

LEASE. A lease, or letting, is sometimes called a Demise (demissio). It is sometimes said that Lease is from the Latin 'locatio;' but as the verb which corresponds to the noun Lease is Let, it seems that the word Lease is the noun which corresponds to the verb Let. The verb Let is akin to the French 'laisser' and the German 'lassen.'

He who lets land is called the Lessor, and he to whom land is let is called the Lessee.

There are various legal definitions of a lease. A lease has been defined to be a conveyance of lands or tenements from lessor to lessee for life, for years, or at will, generally in consideration of a rent or other annual recompense to be paid by the lessee to the lessor. The reservation of a rent is not essential in a lease; but payment of rent is now the chief condition on which lands are let.

To constitute a lease, it is necessary that the lands must be let for a less time than the period for which the lessor has an interest in the lands demised. If a man parts with all his interest in the lands or tenements, the conveyance is an assignment [ASSIGNMENT, P. C.], and not a lease. The relation that is created by a lease between the lessor and the lessee is usually expressed by the phrase landlord and tenant. The lessor has a reversion in the lands which are demised, that is, after the expiration of the lease the land reverts to him. The lessor, by virtue of this reversion, seignory, or lord's title, has the power of distraining on the land for the rent which is agreed on, and for the services which may be due by the terms of the lease; and fealty is always due to the lessor. [FEALTY, P. C.] The ordinary lease is that for a term of years, by which lease a rent, generally payable in money, at stated times, is reserved to the lessor. These stated times are usually quarterly periods.

The words used in a lease for the purpose of conveying that interest in the lands which constitutes a term of years are 'demise, grant, and to farm let.' These words are derived from the law-Latin expressions 'demisi, concessi, et ad firmam tradidi.' The word 'firma,' farm, is said to signify originally 'provisions,' and 'to farm let' does not properly signify to let to be farmed, in the modern sense of the term, but to let on the condition of a certain rent being paid in farm, that is, in provisions. If this explanation is correct, a 'farmer' is one who had the use of lands on condition of paying a 'farm' or rent in provisions, such as corn and beasts But the word 'farm' now signifies the lands which a man hires to cultivate upon the payment of a rent.

The interest which a man acquires in land by a lease for years is a term of years, or an estate for years. [ESTATE, P. C.] The word lease is used in common language also to signify the estate or interest which the lessee acquires by the lease; but the word lease signifies properly the contract or conveyance by which the lessee acquires the interest in the lands.

The words 'demise,' &c. above mentioned, are the proper words to constitute a lease for years: but any words are sufficient, which clearly show 'the intent of the parties that the one shall divest himself of the possession (of the land), and the other come into it for a determinate time.' When the written contract is not intended to be a lease, but an agreement for a future lease, it is often difficult to determine whether the contract is not so expressed as to make it a lease.

At common law, it was necessary for the lessor to enter on the lands in order to make the lease complete, and no writing was necessary. But the Statute of Frauds (29 Car. II. c. 3, § 1) enacted, that all leases, estates, interests, of freehold or terms of years, created by livery and seisin [FEOFFMENT, P. C.] only, or by parol, and not put in writing and signed by the parties so making the same or their agents thereunto lawfully authorized by writing, shall have the force and effect of leases or estates at will only, except leases not exceeding the term of three years from the making thereof, upon which the rent reserved to the landlord during such term shall amount to two-thirds at the least of the full and improved value of the thing demised. A deed is not necessary to constitute the writing a lease, unless the tenement is an incorporeal hereditament or a reversion or remainder. But leases are generally made by deed, because covenants can be made only by deed. [DEED, P. C.]

The word 'lands,' which refers to the subject matter of a lease, comprehends what is upon the lands, as houses and other buildings, though houses and buildings are generally mentioned specifically in the lease.

The law of leases comprehends a great number of rules, which may be conveniently reduced to the following general heads:—

1. The things which may be subjects of leases.
2. The persons who may grant leases, and their powers to grant.
3. The form of leases, and the legal construction of the agreements contained in them.

The examination of these subjects belongs to treatises on Law. The article 'Leases and Terms of Years' in Bacon's 'Abridgment' is generally referred to as a good compendium of the law. A lease may contain any agreements that are lawful. The object of the present article is to consider what agreements Farming-leases should contain or should not contain, in order that the lease may be most beneficial to the landlord and the tenant, and by consequence to the public generally.

The chief subjects of leases are houses and buildings of all kinds, cultivable lands, and mines. Many persons who have not the complete ownership of houses and lands are enabled to grant leases under particular powers; and there are many statutes under which particular classes of persons are enabled or restrained as to the granting of leases, such as Bishops, Deans and Chapters, and others. [BENEFICE, P. C.]

The kind of leases of which we shall treat here are farming leases, which are granted by persons who have full power to grant them on such terms as they please. The particular form of such leases, as already intimated, is a matter that belongs to the subject of public economy, and it is almost beyond the province of direct legislation.

At present a great part of the land in England and Wales is held by large propriotors, and the number of land-owners who cultivate their own estates is comparatively small. In many parts of the kingdom the number of small land-owners who cultivate their own farms has certainly been decreasing for some centuries, and they are probably fewer now than in some former periods of our history. In England the great subdivision of land has been prevented by the form of government and the habits and feelings of those who have had the chief political power: and the great increase of wealth that has arisen out of the manufacturing and commercial industry of the country has tended to prevent the subdivision of land and not to increase it. Those who acquire great wealth in England by manufactures and commerce generally lay out a large part of it in the purchase of land; for the ownership of land is that which enables a man to found a family and to perpetuate it, to obtain social respect and consideration, and also political weight in the administration of public affairs. It facilitates his election to the House of Commons, and if he plays his part well, it may introduce him in due time to the House of Lords, and place him among the nobility of England.

Those who cannot acquire land enough to give them political weight, are still anxious to acquire land as a means of social distinction, and as a permanent investment which must continually rise in value. Thus there is a constant competition among the rich for the acquisition of land, which raises its price above its simple commercial value; and a man of moderate means does not find it easy to purchase land in small quantities and on such terms as will enable him to obtain a proper remuneration for the cultivation of it.

The great mass of the cultivators in England are now tenant farmers, who hold their land either by leases for years or by such agreements as amount to a tenancy from year to year only; and there is the like kind of competition among them to obtain land upon lease, that there is among the wealthy to obtain land by purchase. The consequence is that more rent is often paid for land than it is worth: a consequence of the limited amount of land and of the number of competitors for it. This circumstance however, combined with others, enables the landlord to impose conditions which are unfavourable to the tenant and to agriculture, and finally to himself.

Several things are essential to the good cultivation of land, whether it is held by lease or is the property of the cultivator. These essentials are, a knowledge of the best modes of husbandry, adequate capital, and a market in which the farmer may freely buy and sell all that he wants. Now, in the present state of agriculture in this country, not one of these three conditions exists in the degree which is necessary to ensure good cultivation. The greater part of the land in England, as already observed, is cultivated under leases or a tenancy from year to year; and the covenants in the leases are often such as to be an insuperable obstacle to good agriculture. The condition then of the tenant farmer, as determined by his lease, is that which we have to consider.

Many landholders have several objects in view in letting their lands besides the getting of rent. One of these objects is to maintain their political weight by commanding the votes of their tenantry; and this is mainly effected by not granting them leases of their lands for determinate periods, such as seven, fourteen, or twenty-one years; but by making them very nearly tenants at will, or liable to quit at six months' notice. He who depends for his subsistence on having a piece of land to cultivate, out of which he may be turned on a short notice, will not be an independent voter. Nor can the landlord expect to have a good tenant who will improve his land and a political tool at the same time. The uncertainty of the tenure will prevent a man of skill and capital from investing his money upon so uncertain a return. There may be many cases in which the personal character of the landlord is a sufficient guarantee to the tenant that he will not be disturbed in the possession of the land, even where he has no proper lease, so long as he cultivates it fairly and pays his rent.

But the most intelligent landlords themselves admit that the only proper tenure of the tenant is that of a lease for a determinate period; and it is on this condition alone as a general rule, that a landlord can get men of capital and skill to cultivate his land. It has been maintained by arguments which are unanswerable, that if lands were let to farmer tenants on leases for a determinate number of years, and on conditions which should not interfere with the land being cultivated in the best mode, there would be a great amount of fresh capital applied to the cultivation of the land, with all the improvements of modern husbandry. It is contrary to experience and to all reason to suppose that a good farmer will apply his skill and capital to improvement of another man's property, unless he has the security that he will be remunerated.

The improvements which would follow from a good system of leasing would be the abolition of the evils which now exist in consequence of uncertain tenure and of bad leases. It is affirmed by the best authorities that the amount of capital which is now applied to the cultivation of the land in England is very inadequate, that a large part of the farmers have not sufficient capital to improve their lands, nor the necessary skill and enterprise; and it is maintained that these evils are mainly owing to the want of a sufficient security of tenure or the want of a lease, or, where there is a lease, to the absurd restrictions with which many of them abound.

It has been said, and truly enough, that there is no advantage to the landlord in granting a lease to bad cultivators, and that there are many such. Such a lease would not indeed be any advantage to the farmer himself or the community in general; but he who has land to let, and will let it on terms that are mutually profitable to the landlord and the tenant, will be much more likely to get a tenant of competent skill and capital than he who gives the farmer an uncertain tenure or binds him in the fetters of a bad lease.

The preservation of the game and the enjoyment of the pleasures of the chase, or of the profits derived from the wild animals, is another object which some landlords secure by their lease with as much minuteness and strictness as they do their rent. [GAME LAWS, P. C. S.] Thus, in addition to getting a rent from his land, the landlord often wishes to command the votes of his tenant and secure his game. With reference to these objects and certain other imaginary advantages which he purposes to secure by directing the mode of cultivation, he has a lease drawn up with conditions, restrictions, penalties, and feudal services, which no care on the part of the farmer can prevent him from breaking in some particular, and which no man of capital, skill, and independent feeling would consent to sign. Specimens of such leases have been printed and circulated. One of them appeared in the 'Leicester Chronicle' for June 28, 1845. This lease prescribes a mode of cultivation which is absolutely inconsistent with good farming. The landlord in such a lease directs the tenant how he must cultivate the land. If the directions which the landlord gives comprehended the best modes of cultivation, they would be unnecessary if he had a good tenant, and they would not be observed by a bad one. A good tenant with sufficient capital will farm the land according to the system best adapted for the land, and he will be ready to avail himself of all improvements. A bad tenant, whether he has capital or not, will not farm well simply because he is prevented from doing some things and bound to do others; for farming, like other matters, consists not only in doing a thing, but in doing it well. These conditions and restrictions, if enforced at all, can only be enforced by constant supervision, and must be an endless source of trouble and dispute.

But these farming leases are often copies of old leases, made in other days, and are unsuited to the present state of agriculture. The things which they require not to be done and those which they require to be done, are often inconsistent with good agriculture, or, in other words, they prevent the land from yielding that amount of produce which it would yield under the best system, not only without thereby being impoverished, but with the certainty of permanent improvement. Ignorance on the side of the landlord of his true interest is one of the reasons why many of these absurd leases still exist.

There can be no principle in the letting of land, if the object is simply to secure the best rent to the landlord and the permanent improvement of the land, which makes it different from the letting of any other piece of property. The good farmer hires land to cultivate, with the hope of deriving profit from the application of his skill and capital. He does not want the advice and direction of another man: he trusts to himself. The first object of the landlord is to get as much rent as his land is worth, and to secure it against deterioration during the tenant's occupation. The terms of the lease, then, should simply be, the payment of the rent agreed on, and the observance of such conditions as are found by experience and known to practical agriculturists to be necessary to secure the permanent value of the landlord's land. It is admitted by all reasonable people that the landlord should have ample security by the lease for his land being given up to him at the end of the lease in as good condition as he gave it to the tenant. The tenant wants no directions from the landlord, and no conditions in his favour, beyond the simple condition of being allowed to cultivate the land in the best way that he can for his own profit during a period sufficiently long to secure him a return for his outlay; and he acknowledges that he must submit to all conditions in favour of the landlord which are not inconsistent with his free cultivation, and which shall secure the permanent value of the landlord's property. Perhaps many landlords who now grant hard leases would admit this general principle: but when they came to details, they would insist on many conditions as necessary to secure their permanent interest, which a good farmer would object to as not necessary for that purpose, and also as inconsistent with his profitable cultivation.

The framing of such a lease as we have described in general terms, must be the joint work of intelligent and liberal landlords and of good tenant farmers. It may require some time, some more experience, and suggestions from many quarters before such a lease is got into the best form. But it is an object worth the consideration of all persons interested in the cultivation of the land, and the attempt has been made already. We have received a copy of such a lease from the Vale of Evesham Agricultural Association, which has been circulated for the purpose of obtaining the suggestions of competent persons.

It has been said that some farmers do not care for having long leases; they are willing to go on as they have done. But can it be shown that there is a number of intelligent farmers with capital who prefer a yearly tenure to a lease of reasonable length? Besides, some of these agreements for a tenancy from year to year contain restrictions almost as numerous and absurd as those in leases for a term of years. If there are farmers who prefer dependence to the independence which is the result of a fair contract between farmer and landlord, these are not the men to improve our agriculture; these are the men with little capital, and less skill, who have no hopes of improving their condition, who rely on the easy temper or good-nature of an indulgent landlord, and are taught that they and their labour must be protected from foreign competition. The intelligent farmer with capital seeks no protection against the foreigner, and wants no indulgence from his landlord. He is ready to give, and he would be compelled by competition to give, to the landlord the full value for the use of his land, and he would ask for no more than the liberty of cultivating it in the best way.

Before, however, a good farmer could enter on the land with full confidence, he would have one favour to ask of his landlord; and that would be, not to protect him. If he wanted beans or oats to feed his cattle with, to increase his manure and so increase his crop of corn, he would ask the favour of buying them where he could get them cheapest, in order that he might have a greater return for his outlay, and so better pay his rent, or even an increased rent. Under the protective system [CORN LAWS, P. C.] a man who is protected, as it is termed, in one thing, is taxed in another: he may be protected in what he has to sell, but he must pay for that protection by being taxed in what he has to buy. The farmer in one part of the kingdom wants something that he does not produce: but it is produced in another part of the kingdom. Both parts are protected in what they produce, that each may be compelled to buy of the other; and each is taxed in what he buys in order that the other may be protected. Thus the legislature interfere with the prices of things. They do not impose a tax on foreign produce that comes into the kingdom simply with the view of getting revenue from it; they profess to interfere in order to keep up the prices of certain commodities that are produced in the kingdom. They profess to regulate within certain limits the prices for which the farmer must buy and sell his agricultural produce: they profess to do it; but everybody who knows the history of the corn laws knows that they cannot do it, and never have succeeded in the attempt. But they have succeeded in breeding up a race of farmers, and of landlords too, who believe that their true interests are best consulted by the government attempting to raise the prices of all agricultural produce, both that which a farmer buys and that which he sells. As matters stand now, it is thus:—We have a landlord who by his lease directs his tenant how to cultivate, and at the same time reserves the power of walking over his ground when he pleases to kill the game which the farmer must not kill, but which he must feed; a tenant with deficient capital and insufficient skill, and the shackles of a restrictive lease, or an agreement for a lease which constitutes a tenancy from year to year; and a legislature which interferes with prices and shuts out the farmer as well as others from buying in the cheapest market whatever agricultural produce he does not raise himself. Then there is a cry of agricultural distress, and when the ablest man in the House of Commons asks for a committee of inquiry into the cause of this distress, those who complain of the distress will not have the inquiry.

It has been shown [AGRICULTURE, P. C. S.] that all duties levied on agricultural produce that is brought into these kingdoms, are protective duties, however small they may be. He who disputes this proposition is inaccessible to the cogent power of reason. He who admits it, and contends for the system, must contend that on the whole it does more good than harm. But the system continues, and we still hear of agricultural distress, so that the system at least does not prevent agricultural distress. Those who have handled the subject best attempt to prove, and we believe that they have proved, that the system causes agricultural distress, and that it is the chief obstacle to improved cultivation of land, the granting of good leases, the employment of fresh capital in the cultivation of land, and the employment of agricultural labour. All these subjects were urged by Mr. Cobden, in the House of Commons (1845), in a speech, when he moved for a select committee to inquire into the extent and cause of the alleged existing agricultural distress, and into the effects of legislative protection upon the interests of landowners, farmers, and farm-labourers—a speech unequalled for perspicuity of statement, practical knowledge of the subject, clearness of expression, and sound argumentation; a speech which would place Mr. Cobden, if he had not already earned that distinction, among the very few men who have views at once comprehensive and sound enough to entitle them to the honour of directing the affairs of an industrious people.

The covenants contained in a lease, however few they may be, often occasion difficulty and dispute upon the expiration of the tenancy. The landlord may often claim more than his due, and the tenant may be disposed to do less. These difficulties are not peculiar to farm tenancies; they occur continually in the case of dwelling-houses let for a term of years upon the condition of keeping them in good repair. If such disputes cannot be settled amicably, or by reference to arbitration, the only way is by legal proceedings. It has been suggested that in the case of dwelling-houses in large towns like London, some easy mode of finally settling such disputes might be established. In such cases, the evidence of surveyors is the evidence on which a jury must give their verdict in case of legal proceedings; and it would be quite as satisfactory to all parties, if the evidence that is submitted to a jury, for their judgment, were submitted to a few competent persons to be chosen in some uniform manner, and whose decision should be final.

In 1845 an act was passed (8 & 9 Vict. c. 124) entitled 'An Act to facilitate the granting of certain Leases.' Its object is to substitute abbreviated forms for those now in use, and it is provided that in taxing any bill for preparing and executing any deed under the act, the taxing officer, in estimating the proper sum to be charged, is to consider 'not the length of such deed, but only the skill and labour employed, and the responsibility incurred in the preparation thereof.' It is enacted in section 4, 'That any deed or part of a deed which shall fail to take effect by virtue of this act shall nevertheless be as valid and effectual, and shall bind the parties thereto, so far as the rules of law and equity will permit, as if this act had not been made.' There are schedules to the act, one of which gives, in column 1, short forms of expression which may be used in place of the ordinary expressions in leases, which are contained in column 2; and it is enacted by section 1, 'That whenever any party to any deed made according to the forms set forth in the first schedule of this act, or to any other deed which shall be expressed to be made in pursuance of this act, shall employ in such deed respectively any of the forms of words contained in column 1 of the second schedule hereto annexed, and distinguished by any number therein, such deed shall be taken to have the same effect and be construed as if such party had inserted in such deed the form of words contained in column 2 of the same schedule, and distinguished by the same number as is annexed to the form of words employed by such party; but it shall not be necessary in any such deed to insert any such number.' This act does not extend to Scotland. The amount of words saved by this act is not sufficient to compensate for the difficulties that may arise from persons using the abbreviated forms in cases where they may not intend them to have the full meaning which this act gives to them. He who wishes to guard himself either as landlord or tenant by suitable covenants will do better to express his meaning at full length, without availing himself of the abbreviated forms which this act invites him to use.

Leases in general require either an ad valorem stamp or the common deed stamp, without which the instrument cannot be given in evidence. Leases for a term determinable on a life or lives not exceeding three, and the leases of all ecclesiastical corporations, whether aggregate or sole, for any term not exceeding twenty-one years, are exempted from the duty. There is also a stamp duty on agreements for leases. This is one of the many modes of taxation.

LEASE. [GAME LAWS, P. C. S.]

LEASE, in Scotland. [TACK, P. C. S.]

LEASE AND RELEASE. [RELEASE, P. C. S.]

LEAST ACTION, PRINCIPLE OF. [ACTION, LEAST, P. C. S.]

LEATHER. An account of the chemical processes by which the skins of animals are converted into leather is given under TANNING, P. C., p. 37; and under LEATHER, P. C., p. 379, are some statistical statements respecting the leather manufacture. The present article treats of the subject of currying and leather-dressing.

In an interesting lecture 'On Tanning and Leather-dressing,' read by Mr. Arthur Aikin before the Society of Arts in 1830, and published in the fiftieth volume of the Society's 'Transactions,' pp. 192-214, is a notice of the principal kinds of skin which are converted into leather, and of the chief uses to which each kind is applied. From this we may condense a few particulars illustrative of the wide range of the leather manufacture, from which it will be seen that the processes followed in its different departments must be exceedingly various. Commencing with the larger and thicker skins, Mr. Aikin observes that among those of *oxen*, technically known as *hides*, those supplied by bulls are thicker, stronger, and coarser in the grain than those of cows; while the hides of bullocks, or castrated oxen, are intermediate between those of the bull and the cow. He states that the thickest and most substantial leather now in use is that made from the hides of the half-wild cattle of South America. Such leather is employed for the soles of boots and shoes; for most parts of harness and saddlery; for making leather trunks, buckets, hose for fire-engines, and pump-valves; for the thick belts used in military accoutrements; and for the gloves of cavalry. The thick *buff-leather* formerly used as armour, and which was pistol-proof, and would resist the edge of a sword, was made from the hide of the urus or wild bull of Poland, Hungary, and the middle and southern provinces of Russia; the animal itself being called *buffe*, whence the common name of the leather made from its hide. The skins of *calves*, though thinner than those of cows, are thicker than most other kinds of skin which are converted into leather. They are *tawed* [TANNING, P. C., p. 40] for the use of bookbinders, and are tanned and curried for the upper leathers of boots and shoes. Aikin states that it was formerly customary, in the south-west of Ireland, to slaughter cows when in calf, and that the celebrated Limerick gloves were made of the exceedingly fine and delicate skins of the unborn calves. The practice is however, he adds, now almost discontinued, so that the superiority of the manufacture referred to must now depend rather upon peculiarities in the mode of preparing the skins than upon their original quality. *Sheep skins*, which are most commonly of home growth, although Aikin refers to a considerable supply as coming from the Cape of Good Hope, vary much in quality. 'A long fleece, observes our authority, 'always indicates a thin skin; much of the jelly laid up in that organ being, perhaps, the material from which the fleece is elaborated;' to which he adds the important practical remark that 'as soon as a sheep has been sheared the air comes in contact with the cuticle, checks the perspiration and expenditure of the skin, and allows the jelly to accumulate; which it does so rapidly that, if a parcel of sheep encumbered with long fleeces are driven up to London from the distance of a few days' journey, and if part of them are slaughtered immediately on their arrival, and the remainder are sheared and slaughtered two days afterwards, the skin of the latter will be twice as thick as that of the former.' When simply tanned, sheepskins are employed for inferior bookbinding, for leathering bellows, and for various other purposes for which a cheap leather is required. All the *whit-leather*, as it is termed, which is used for whip-lashes, bags, aprons, &c., is of sheepskin; as are also the cheaper kinds of *wash-leather*, of which brushes, gloves, under-waistcoats, and other articles of dress are made. Mock or imitation morocco, and most of the other coloured and dyed leathers used for women's and children's shoes, carriage-linings, and the covering of stools, chairs, sofas, writing-tables, &c. are also made of sheepskin. *Lamb-skins* are mostly dressed white or coloured for gloves; and those of *goats* and *kids* supply the best qualities of light leather, the former being the material of the best morocco, of all colours, while kid leather, both white and coloured, affords the finest material for gloves and ladies' shoes. Leather from goat-skins, ornamented and sometimes gilt, was formerly used as a hanging or covering for walls. [TAPESTRY, P. C., p. 43.] *Deer* and *antelope* skins, shamoyed or dressed in oil [TANNING, P. C., p. 40], are used chiefly for riding-breeches. Shamoyed leather breeches were formerly very much used, especially in the army, and as English shamoyed leather was in high repute, it was used not only in the clothing of our own army, but also by the cavalry of Prussia, Austria, and most of the other German states. During the Peninsular war it was discovered that the health of the British cavalry was seriously affected in wet weather by their leather breeches, which, fitting close to the skin, and being long in drying, chilled the men, and rendered them liable to rheumatism and other diseases. Woollen cloth was accordingly substituted for shamoyed leather in this article of dress, first in the British, and subsequently in the Austrian and Prussian armies, and this change has effected a great decline in this branch of the leather manufacture. *Horse-hides*, which, considering their size, are thin, are tanned and curried, and are used by the harness-maker, especially for collars; and occasionally, when pared thin, for the upper leathers of ladies' walking shoes. *Dog-skins* are thick and tough, and make excellent leather; but Aikin observes that as the supply is entirely of home growth, and has fallen off so much of late years as to be nearly extinct, dog-skin leather has been in a great measure superseded, as a material for dress shoes, by horse leather and by tanned rat-skins. *Seal-skins* produce a leather similar but inferior to that supplied by dog-skins; and *hog-skins* afford a thin but dense leather, which is used exclusively for covering the seats of saddles. 'It comes,' Aikin states, 'from Scotland and Yorkshire; for, though hogs are abundant in every part of the country, the general custom of cooking pork with the skin on greatly restricts the supply.'

Referring to TANNING, P. C., for an account of the processes by which hides and skins are converted into leather by tanning, tawing, or shamoying, we may here notice some important observations on the subject quoted by Dr. Ure, in the 'Supplement' to his 'Dictionary of Arts' (art. 'Leather,' p. 147), from a communication made by Mr. Lee to the Franklin Institute, in February, 1843. Mr. Lee expresses his belief 'that much of the original gelatine of the hides is never combined with the tannin, but is wasted; for he thinks that 100 lbs. of perfectly dry hide, when cleansed from extraneous matter, should, on chemical principles, afford at least 180 lbs. of leather.' He believes the usual mode of preparing the hides for actual tanning, called the liming and bating, or unhairing and cleansing, to be a wasteful process. As stated under TANNING (p. 37), this is usually done either by steeping the hides in a solution of lime, or by placing them in a close heated chamber until the epidermis is loosened by incipient putrefaction. Sometimes however the object is effected by a process termed sweating, which is employed in Germany, and consists in laying the hides in a pack or pile, covered with tan, to produce fermentative heat. All of these plans, but especially the two latter, are said to be injurious to the hides. 'The *bate*,' observes Dr. Ure, apparently in reference to a process analogous to that described in TANNING under the term *raising*, 'consists in steeping the haired hides in a solution of pigeon's dung, containing, Mr. Lee says, muriate of ammonia, muriate of soda, &c.; but most probably phosphates of ammonia and lime, with urate of ammonia, and very fermentable animal matter.' Dry hides are often softened by the operation of the fulling-stocks, which has the effect of opening the pores, before liming and bating; but when this is done, care must be taken that the fulling or beating be not too violent, in which case it would make the hide too limber and thin. Mr. Lee conceives that the liming process is injurious, by carrying off a portion of the gelatine and albumen of the skin; and it appears that leather which has been highly limed is loose in texture, weighs light, and wears out quickly. The subsequent fermentation in the bating process aggravates the evil ascribed to the liming. This evil however appears to be avoided in a process which has been adopted in New York, Maine, New Hampshire, and some parts of Philadelphia, which is called, somewhat incorrectly, *cold sweating*, and which consists in suspending the hides, previously soaked, in a subterranean vault with a temperature of about 50° Fahr., in which they are kept constantly damp by the trickling of cold spring water from points in the roof. After hanging thus for from six to twelve days, the hair is found to be well loosened by the mere softening effect of moisture, without fermentation. In quoting Mr. Lee's observations Dr. Ure makes no remark on the enormous amount of the increased weight to be gained in tanning, according to Mr. Lee's computation; or upon the circumstance that a great increase of weight by the addition of vegetable matter has been shown by himself [TANNING, P. C., p. 38] to be a disadvantage. In order to judge of the efficiency of any process of tanning by comparing the weight of the tanned with that of the untanned hide, the relative proportions of animal and vegetable matter in the finished leather must be known. In illustration of this very important point we may throw into a tabular form the results of an analysis of specimens of calf-leather tanned in various ways, as given by Dr. Ure in the 'Dictionary of Arts' (not the 'Supplement'), art. 'Leather,' p. 763:—

Mode of Tanning.	Parts in 100 by weight. Animal Matter.	Vegetable Matter.
Quickly, by an infusion of galls	61	39
,, by solution of catechu	80	20
,, by infusion of Leicester willow	74·5	25·5
,, by infusion of oak-bark	73·2	26·8
Slowly, by infusion of Leicester willow	87	13
,, by infusion of oak-bark	85	15

The time occupied in the first four cases of *quick* tanning is not stated, but in the *slow* process it appears to have been about three months. Dr. Ure adds that sole leather generally contains no less than 40 per cent. of vegetable matter. The inner white part of every astringent bark, or that which lies next to the alburnum, contains, according to this authority, the largest quantity of tannin, and the middle coloured part the largest quantity of extractive matter, while the outer surface or epidermis seldom furnishes either tannin or astringent matter; and as young trees abound most in the white cortical layers, it follows that they are more productive of tannin, in proportion to the comparative weight of the barks, than old trees. 'The different qualities of leather made with the same kind of skin,' Dr. Ure observes, 'seem to depend very much upon the different quantities of extractive matter it may have absorbed.' 'The leather made with infusion of galls,' he adds, 'is generally harder and more liable to crack than the leather obtained from infusions of barks; and it always contains a much larger proportion of tannin, and a smaller proportion of extractive matter.'

Currying is the general name given to the various operations of dressing leather after the tanning is completed, by which the requisite smoothness, lustre, colour, and suppleness is imparted, to adapt it to the various purposes of the shoemaker, the coach and harness maker, the upholsterer and others. The processes of the currier vary much according to the kind of leather on which he is employed, but Dr. Ure, who gives a description, illustrated by engravings, of the principal tools employed (*Dict of Arts*, art. 'Currying'), after stating that every kind of tanned leather not intended for soles, or such coarse purposes, is generally curried before being delivered to the workman who fashions it, divides the chief operations of the currier into four. Of these the first is styled dipping the leather. It consists in moistening it with water, and beating it well upon a strong hurdle of basket-twigs, or a kind of trellis-work of wooden spars, with a mallet, or with an instrument called a *mace*, which may be described as a large mallet with a cubical head, in two faces of which are inserted four egg-shaped pegs of hard wood, turned smooth and polished, that they may not tear the softened leather. After this beating, by which the stiffness of the hide or skin is destroyed, it is laid over an inclined board, and scraped and cleaned, and wherever it is too thick, pared or shaved down on the flesh side, by the careful application of various two-handled knives; and then thrown again into water, and well scoured by rubbing the grain or hair side with pumice-stone, or with a piece of slaty grit, by which means the *bloom*, a whitish matter which is found upon the surface in tanning, is removed. The second process, according to Dr. Ure's division, is the rubbing of the leather with a wooden instrument called the *pommel* (French, *paumelle*), which, he states, is so called because it clothes the palm of the hand, and performs its functions. It is a rectangular piece of hard wood, about twelve inches long and five broad, flat on the upper surface, which is provided with a leather strap, fastened at both ends, to secure it to the hand of the workman, and somewhat rounded or convex on the lower surface, which is covered with triangular grooves. The currier uses several of these instruments, with grooves of various degrees of fineness, and also, for some purposes, pommels of cork which are not grooved at all. In using the pommel, the object of which is to give grain and pliancy to the skins, the leather is first folded with the grain side inwards and rubbed strongly with it; and subsequently it is rubbed with the pommel upon the grain side, without being doubled or folded. Third in order he places the scraping of the leather with tools applied nearly perpendicular to its surface and worked forcibly with both hands, to reduce such parts as may yet be left too thick to a uniform substance; and he notices as the fourth operation the dressing of the leather with the *round knife* (French, *lunette*), a singular instrument shaped somewhat like a saucer, with a cutting edge, and with a hole in the centre for introducing the hands of the workman. It is usually from ten to twelve inches in diameter, with the central hole about four or five inches. This tool is applied with its concave side downwards, and with it, while the leather is stretched over a cylindrical wooden beam, the currier dexterously pares off the coarser fleshy parts of the skin. In addition to these operations, which cannot be minutely explained without entering too much into detail, the currier uses occasionally polishers of smooth wood or glass for rubbing the surface of the leather; and, when the leather is intended for the use of the shoemaker, he applies to it some kind of greasy composition called *dubbing* (daubing) or *stuffing*. This is frequently done before using the pommel, and Dr. Ure states that the oil used for the purpose is prepared by boiling sheep-skins or doe-skins in cod-oil. As, however, his account is less distinct than that of Hebert (*Engineer's and Mechanic's Encyclopædia*, vol. ii. p. 71), we shall follow the latter, premising that the description relates to the preparation of calf-leather for the uppers of boots or shoes. On receiving the calf-skins from the tanner, the currier first, according to this authority, removes the offal parts, such as the head, tail, and shanks, which operation is termed *rounding the skin*. It is then soaked, shaved, and scoured as above described, in the course of the second of which operations the currier frequently examines every part of the skin, testing its thickness by passing it double between his fingers. After being thoroughly cleansed, and distended while thus in a wet state, the skin is *stuffed*, Hebert states, 'with a mixture of two parts cod-oil and one part tallow, called *dubbing*, which is applied to both sides of the skin, but chiefly on the flesh side.' 'It is then,' he adds, 'hung up to dry, by which the moisture evaporates, and the oil, which cannot be dissipated by mere exposure, gradually takes the place of the moisture, and sinks deeply into the pores of the skin.' The use of the pommel follows this operation, and is succeeded by *whitening*, or lightly shaving the flesh side over again, by which it is thoroughly cleaned, and brought to a proper state to receive the colour used in waxing. Before waxing, however, it is boarded and rubbed with the pommel a second time, which brings it to the state of *finished russet*, in which state it can best be preserved until wanted for sale. In the operation termed *waxing*, a colour or blacking, composed of oil, lampblack, and tallow, is well rubbed into the flesh side with a hard brush, the grain side being carefully kept clean. A coat of strong size and tallow is then laid on with a soft brush, after which the surface is rubbed with a smoothing-glass The finishing gloss is given by a little thin size laid on with a sponge, after applying which 'the skin is laid up to dry and incorporate,' according to our authority, 'and a lump of hard tallow is rubbed lightly over the surface.' 'The skin is thus,' he adds, 'completely finished for the consumer; and leather so dressed is found superior in appearance and durability to any other method.'

Leather is occasionally dressed 'black on the grain,' or having the hair or grain instead of the flesh side coloured. The currying operations in such a case are similar to those above described, but the first blacking is applied to the wet skin immediately after scouring, by rubbing it with a solution of copperas. A brush dipped in stale urine is then passed over the surface, and an iron slicker is used to make the grain come out as fine as possible. It is then stuffed with oil, and, when dry, *seasoned*, or rubbed over with a brush dipped in copperas-water, on the grain, until it is perfectly black; after which it is slicked with a gritstone, to remove any wrinkles and smooth down the coarse grain. The grain is finally raised by repeatedly rubbing over the surface, in different directions, with the pommel or graining-board.

One of the most singular operations in the working of leather, which may be noticed here as an illustration of the peculiar properties of the material, and of the power of the currier over it, is the mode of covering the roofs and upper pannels of coach-bodies, of which an interesting description is given in No. 625 of the 'Penny Magazine,' in 'A Day at a Coach-factory.' In this operation, which is only performed upon the higher class of carriages, the whole of the roof and upper part of the front, back, and sides, is covered with a single hide, not cut into pieces, one for the roof, one for each side, and so on, but made to fit closely in every part to the woodwork without any joints or divisions, and without showing any folds or wrinkles. To accomplish this apparently impossible feat, the hide, which is very large, and of sound quality, is, to quote from the paper referred to, 'first thoroughly moistened throughout and thrown over the top of the coach, the edges hanging down on all sides. The currier then rubs or presses it down all over the roof, until it lies close and even in every part. He next proceeds to one of the sides, and in like manner rubs and scrapes the leather till all irregularities disappear. The leather is in that soft and pliable state that it will yield to the movement of the tools, and enable the workman to fit it to every part of the coach with perfect closeness.' 'A little consideration,' observes the writer, 'must show that a superfluous fold of leather will occur at each corner; yet by working it towards a central point at the back or front, the currier succeeds in crasing or pressing out all irregularities, and in producing a surface sufficiently flat and smooth for the subsequent operations of the painter.' The edge of the leather is cut or trimmed to the beading which divides the upper from the lower pannels. In many cases modern carriages have the roof only covered with leather, which is strained on wet, nailed, and left to shriuk.

Japanned leather of various kinds is used in coach-making, harness-making, and for various other purposes. Mr. Adams, in his treatise on 'English Pleasure-Carriages' (p. 69), states that what is ordinarily termed 'patent leather' is covered with a coat of elastic japan, which gives a surface like polished glass, impermeable to water; and that hides prepared in a more perfectly elastic mode of japanning, which will permit folding without cracking the surface, are called 'enamelled leather.' Such leather is usually made black, but may be produced of any required colours. 'All this japanned leather,' he observes, 'has the japan annealed, something in the same mode as glass: the hides are laid between blankets, and subjected to the heat of an oven at a particular temperature during several hours.' Boots and shoes are sometimes made of thin enamelled leather, and they possess the advantage of never requiring blacking, water being sufficient to remove any dirt which impairs their gloss.

Of the preparation of Morocco and some other kinds of leather which present peculiar features in their manufacture, a notice is given under TANNING, P. C.; we may here add an account of the manufacture of *Russia leather*, called by the Russians themselves *jucten*, which is usually dyed red with the aromatic saunders-wood, and is celebrated for being free from mould in damp situations, and not only being proof against insects, but repelling them by its odour, so as to preserve books in the binding of which it is used. The skins are freed from the hair or fleece by steeping them in an ash-lye, then rinced, fulled, and fermented in a proper steep, after having been washed in hot water, for a week or more, to *raise or open* their pores. They are then cleaned, by working them upon the horse, on both sides. They are then soaked for forty-eight hours in a bath composed of water mixed with a paste of rye-flour, in the proportion of 38 lbs. of flour to 200 skins, fermented with leaven. The skins, when taken out of the bath, are left in tubs for fifteen days, and then washed. Being thus prepared for the action of the astringent or tanning juices, they are immersed in a boiler containing a hot decoction (just sufficiently cooled to avoid injuring the animal fibres) of willow bark (that of the *salix cinerea* and *salix caprea*), in which they are handled and pressed for half an hour. This manipulation is repeated twice a day for a week, after which the tanning infusion is renewed, and the process is repeated on the same skins for another week, after which they are exposed to the air to dry, dyed, and curried with the empyreumatic oil of the bark of the birch-tree, for the preparation of which Dr. Ure, whose account we have followed, gives full directions (*Dict. of Arts*, p. 770). This oil, to which the leather is indebted for its peculiarities, is applied only to the flesh side, and care must be taken to prevent its passing through and staining the grain side. Chevreul, having investigated the odoriferous matter of this oil, has given it the name of *betuline*.

Shagreen, a peculiar kind of leather, or rather of prepared skin, formerly much used for the covers of watch-cases, mathematical-instrument cases, &c., is briefly noticed under that head in P. C., p. 335, but the accouut there given does not altogether agree with those of Aikin and some other authorities. From Aikin's lecture, referred to at the commencement of this article, and Hebert's 'Engineer's and Mechanic's Encyclopædia,' vol. ii. p. 75, it appears that the skin, after being soaked in water and scraped to remove the hair, is further scraped until it does not exceed a wetted hog's bladder in thickness. It is then, while wet and soft, stretched upon a frame, and the grain side is strewed with the hard round seeds of the alabuta, or goose-foot (*chenopodium album*). A felt being laid over these, they are trodden deeply into the soft yielding skin, after which the frames are so situated in the shade as to allow the skins to dry slowly, when the seeds may be shaken out without violence, leaving the skin in a hard horny state, covered with deep indentations. The surface is then rasped or rubbed down with iron tools, nearly to the bottom of the holes or indentations, the skin being, during this operation, laid upon a block covered with wool. The skins are then softened, first with water, and then with a warm alkaline ley, and are heaped, while warm and wet, upon each other; and by this softening the depressed parts of the skin rise to their former elevation, forming prominent points wherever depressions had been made by the seeds. The skins are then salted and dyed, after which, according to Hebert, they are finished with oil or suet. That writer states that 'the beautiful green dye is given by soaking the inner or flesh side of the skin with a saturated solution of sal-ammoniac, strewing it over with copper-filings, rolling it up with the flesh side inwards, and pressing each skin with a considerable weight for about twenty-four hours; in which time the sal-ammoniac dissolves enough of the copper to penetrate the skin with an agreeable sea-green colour: this is repeated a second time, in order to give the colour more body.' 'Blue shagreen,' he adds, 'is dyed with indigo, dissolved in an impure soda by means of lime and honey. Black shagreen is dyed with galls and vitriol.' Aikin, evidently referring to a more ornamental variety of shagreen, instead of giving the above directions for dyeing, says that the skin is stained superficially only, of a green colour, with copper-filings and sal-ammoniac, and then dried; and that it is finally rubbed down to a perfect level, when the points that were prominent, being deprived of their superficial colouring, appear as white dots scattered over, and gradually melting into a green ground. The shagreen thus prepared is susceptible of a high polish, and is both beautiful and durable.

Great difficulties present themselves in the way of any application of machinery to the dressing of leather, in consequence of the varying hardness, thickness, and texture, not only of different skins, but of different parts of the same skin; yet the great amount of time and manual labour involved in the polishing and graining of morocco and other ornamental leathers has led to some ingenious contrivances for this purpose. Hebert contrived what he describes as the earliest machine for the finishing of leather, for which he obtained a patent, and which had been in use about twenty-five years when he published his 'Engineer's and Mechanic's Encyclopædia,' in 1839. This machine consists essentially of a stiff circular frame or wheel, eight feet in diameter, revolving horizontally upon a vertical axis, and carrying, on the under side of its periphery, a series of circular polishers or grainers, which are capable of being changed according to the nature of the work to be performed. These, as the apparatus revolves, pass over a series of eight tables, circularly arranged, and mounted upon elastic bearings. The skins to be operated upon are laid upon these tables, each of which is attended by a man who lays the skin smoothly upon it, and moves it about from time to time, so as to bring every part in succession under the revolving tool; but as no elasticity of mounting could counteract the difficulties arising from the varying substance of the skins, each table is further supported by a lever, to one end of which is attached a treadle, on which the workman can place one or both feet. The effect of this arrangement is that while both hands are left at liberty to manage the skin, a greater or less pressure can be given at pleasure by the operator, while, by entirely removing his foot from the treadle, the table may be caused to fall just clear of the rubbers or polishers, so that the skin will not be touched at all by them. That portion of the surface of the table upon which the rubbers operate is formed of brass, and adjusted to a very perfect level by screws, and its edges are slightly bevelled off to prevent the rubbers from *striking* the skin injuriously as they come in contact with it. To obviate the comparatively trifling defect arising from the circular instead of rectilinear action of the rubbers, Mr. Joseph Ellis contrived a similar machine, which is also described by Hebert, in which the rubbers were attached to the periphery of a vertical wheel about thirty inches in diameter, and the skin was laid upon a concave table accurately fitted to the path of the rubbers; but the serious practical objections to such a contrivance are evident. Hebert did not know whether it had been brought to work with advantage or not.

Leather-splitting machines, by which even very thin skins may be divided into two thicknesses, each of which is capable of being dressed as a perfect skin, have called forth much ingenuity of contrivance. Illustrated descriptions of several such machines are given by Hebert, and of one, different to any mentioned by him, in Dr. Ure's 'Supplement.' Before such machines were introduced the reduction of thickness necessary to bring many of the finer kinds of leather to the requisite tenuity was effected solely, as it still is partially, by paring or shaving the flesh side with a knife worked by hand, an operation occupying much time, and requiring great nicety to prevent cutting through the skin. The part shaved off, also, being necessarily in small pieces, was only available for the making of glue. By the use of a machine the best portion of the leather, that with the grain side, is cut of a much more uniform thickness, and with less risk of injury; the removed portion is taken off in a more useful form; and the whole operation is conducted more rapidly. Hebert states that, to show the capabilities of a splitting-machine long used by the Messrs. Bevington, of Bermondsey, it has been made to split sheep-skins into three equal parts, one of which, that on the grain-side, might be used as leather, the middle portion converted into parchment, and the slice on the flesh side, being unequal in thickness, and therefore unfit for any better use, being used for glue-making. In this machine, which is also represented and described in No. 652 of the 'Penny Magazine,' the skin is drawn between two revolving rollers, and presented, as it emerges from their grasp, to the edge of a long and very sharp knife, which is kept continually moving a little backwards and forwards with great velocity. As a skin of unequal thickness could not be grasped in the proper manner between two perfectly true and rigid rollers, the upper roller, instead of being solid, is composed of a number of circular discs or rings of metal, about half an inch thick, slipped on to an axis rather smaller than the holes in their centres, but compelled to revolve with it by means of what may be termed a planetary axis, which is a rod passing loosely through holes in the whole series of discs between their centre and their circumference, and so connected with the axis by its ends as to be carried round with it. By this contrivance the upper roller is enabled to adapt its surface to that of the skin, which is everywhere pressed with an equal force, due to the weight of the discs of which the upper roller is composed. It is stated in the 'Penny Magazine,' that this machine will split a sheep-skin of the ordinary size in about two minutes, during which time the knife makes from two to three thousand vibratory motions to and fro. This machine, according to Hebert, is the invention of Lieutenant Parr. In the machine described by Dr. Ure, and in some others, the knife is stationary, and the cutting is occasioned by the application of a steady force by which the skin is drawn against its cutting edge; and in Duxbury's patent skin-splitting machine the knife consists of a series of plates of steel so attached to the periphery of a wheel or disc seventeen feet in diameter as to form a gigantic cutting-instrument resembling a crown or trepan saw, the compound blade projecting horizontally from the rim of the wheel, parallel to its axis. The skin to be split passes round the circumference of a horizontal drum, the axis of which is at right angles with that of the great disc, and lies very nearly in the same plane with its face, and which, instead of being perfectly cylindrical, has its sides so hollowed as to present a concavity perfectly tallying with the curvature of the periphery of the disc. As therefore the drum revolves, it brings the skin, which is confined closely to its concave surface by a contrivance somewhat resembling the upper roller in the machine above described, in contact with the edge of the revolving knife, which cuts by a continuous onward movement, instead of a sawing action backwards and forwards. The extreme nicety required to fix the concavity of the feeding-roller to the edge of the circular knife, and to keep the knife or cutter itself perfectly true in shape, appear to be the chief objections to this ingenious contrivance.

We may close this article by referring to some practical remarks on the choice or purchase of leather in the second part of Mr. Devlin's work entitled 'The Shoemaker,' in Knight's series of 'Guides to Trade,' premising that the subject of his complaint in reference to English leather is likely to be, if it be not already, materially affected by the very great reductions of duty upon foreign leather and leather manufactures under the tariff of 1842, and the still further reductions proposed in the government measure now (February, 1846) under discussion. After some remarks tending to prove a great deficiency of knowledge not only among shoemakers, but even among tanners and curriers themselves, respecting the qualities of leather, Mr. Devlin quotes from a pamphlet printed by himself for circulation among the London trade, on the 'Boot and Shoe Trade of France, as it affects the interests of the British Manufacturer,' the following remarks:—'If we look,' he says, 'to the nature of our leather, to almost every description of our leather, excepting that used for the soles, we shall find the article not so good—so intrinsically good—as that which the French boot and shoemaker can purchase; and what is more pertinent to the matter is, that formerly it was not so; when a greater time and a more honest consideration were paid by both tanner and currier to the production of the highest degree of wholesomeness, superadding beauty of grain, a perfect blackness and polish, as mere graces, rather than being the only necessary perfections.' 'But what,' he adds, 'cares the manufacturer? He gets his work done rapidly, and, in consequence, *cheaply*; and being, as he is, protected from the full effects of French and other competition, by the 30 per cent. importation duty, and likewise, through this circumstance, feeling himself secure of the commands of the home boot and shoemaker, he goes on in his cupidity, hurrying and driving through as much business as he can, safe in his own interests, and never pestered, hurt, and insulted by those complaints which the less fortunate and apparently more responsible shoemaker is every day or hour under the compulsion of submitting to from the consumer, about the leather breaking, tearing, or cracking, or of its pressing on the foot with the severe hardness of an uncomplying piece of wrought-iron.' After some remarks indicative of his confidence in the ability of British manufacturers to excel in ordinary boot and shoe leathers, as they confessedly do in some other kinds, he further observes that 'were the same substance of leather to be wrought generally into boots and shoes by the British manufacturer as is wrought into boots and shoes by the French manufacturer, the imperfection would be still more glaring; and hence we are often compelled into clumsiness, to make the coarse and unsightly that we may produce the serviceable, and so save the pocket at the expense of the taste and the wish for more pliant and pleasurable wear.' 'Our roans too,' he proceeds, 'with which we line our boots and shoes, can bear no comparison with the roans of our neighbours; they are in many cases so hard and stiff with the remains of the unextracted gelatine matter of the skin, and are so scoured on the grain with various chalks and pigments to produce the requisite surface, that the awl or needle in working is continually being thrust into many loose fibres, thus rendering the work not anything like so agreeable or so perfect as it ought to be. Add to which the quick manner in which such lining dirties and roughens in the keeping of the shop, and in the use of the customer.'

In purchasing dressed leather, Mr. Devlin recommends the shoemaker to take care that it be not of too large growth for its substance, and that, if waxed calf, it have 'a free easy grain,' and 'a fine flesh, not ruffling into hairs, but, when bent inwardly a little, discovering a series of diminutive ridges or curls,—a pretty correct token that such leather has not been taken down too deeply.' 'It should always,' he says, 'be silky and soft to the feel, not rank with grease, but yielding and smooth from the manner it has been wrought.' Skins freshly curried should not be bought for immediate use, 'all calf or other oil-dressed leather being the better to be laid by, skin over skin, for a month or two before they are cut; leather in this condition, as the phrase is, *fattening*, and thereby attaining a more durable character.' 'The qualities of sole leather,' which is generally better in England than in any other country, are, according to the same writer, 'defined by its closeness, weight, and, when cut, by the uniform healthiness of hue it offers to the sight; badly tanned hides being generally streaky, black, brown, grey, and green.'

Hebert describes two compositions which have been patented as *substitutes for leather*. Of these, Gunby's, patented in 1824, consists of an elastic coating or varnish of glue-size, boiled linseed oil, lampblack, white lead, and pipeclay, varying in proportions according to the degree of elasticity required, spread upon cotton, linen, or woollen cloth, or upon felt; while Hancock's consists of a felted fabric of flax, cotton, or other material, covered with several coats of liquid caoutchouc. Gunby's patent substitute is chiefly intended for the manufacture of patten ties, but is suitable also for covering coach-tops, and for some other purposes.

LECANO'RA. [Liverworts, P. C. S.]

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LEDUM, a genus of plants belonging to the natural order Ericaceae. It has a minute 4-toothed calyx, 5 spreading petals, from 5 to 10 stamens, anthers opening by two pores at the apex. The capsules are subovate, 5-celled, 5-valved, stalked, and dehiscent at the base. The seeds are furnished with a membranous wing at each extremity.

L. latifolium is a small evergreen shrub, with an irregularly branched stem. The branches and under surface of the leaves are woolly; the calyx is very minute; the corolla white, with obovate obtuse petals. It has been commended as a stomachic; but an infusion of the leaves in beer renders it unusually heady, and produces headache, nausea, and even delirium. Pallas however says that they have been used with advantage in tertian agues, dysentery, and diarrhoea. They have an aromatic bitter flavour. This species is a native of the swamps around Hudson's Bay, Labrador, Greenland, and various parts of the United States.

L. palustre has linear leaves, with revolute margins, clothed with rusty tomentum beneath; it has 10 stamens, longer than the corolla. It is a native of North America, in the swamps of Canada and New York, also the North of Europe, Denmark, Silesia, &c. *L. palustre* has somewhat similar properties to those ascribed to the former species. In Germany a kind of beer is made from its leaves, and it has also been recommended as a febrifuge. This species was formerly admitted into the catalogue of British plants; but Mr. Babington considers that it has no claim to appear there, and has omitted it accordingly.

L. Canadense has ovate petiolate leaves, white beneath; the flowers disposed in terminal large umbellate corymbs of a white hue. It is native of the swamps of Canada. A peat soil or a very sandy loam answers best for the cultivation of the species of Ledum, and they are readily propagated by layers or by seeds. The seeds should be sown, and the seedlings afterwards managed in the same manner as the Rhododendron.

(Don, *Gardener's Dictionary*; Burnett, *Outlines*; Babington, *Manual of British Botany*.)

LEEK. [Allium, P. C.]

LEFEBVRE, FRANÇOIS JOSEPH, Duke of Danzig, and Marshal of France, was born of humble parents, at Ruffach, in Upper Alsace, on the 25th October, 1755. He was designed for the ecclesiastical profession, but having lost his father, he enlisted, when eighteen years of age, as a private soldier in the regiment of French guards. He had attained the rank of sergeant-major when, on the breaking out of the French revolution, that regiment was dissolved. The changes which then took place in the government of France removed those obstacles which prevented the promotion of meritorious soldiers who were deprived of the advantage of noble birth. Lefebvre obtained the promotion which his talent and services deserved, and in 1792 he became a captain of his regiment. In that capacity he was enabled to render some valuable assistance to the unfortunate family of the dethroned King Louis XVI., and on two occasions he gallantly interposed in their behalf, and, at the peril of his life, rescued them from an infuriated populace. His subsequent rise in the army was without precedent rapid, even at that period: on the 3rd of September, 1793, he became adjutant-general; on the 2nd of December, in the same year, he was a general of brigade; and on the 10th of January, 1794, he rose to the rank of a general of division. While serving with the army of the Moselle, he distinguished himself at the combat of Lambach, and in the battle of Giesberg. During the whole of the campaign in Germany and the Netherlands, under Pichegru, Moreau, Hoche, and Jourdan, he made himself conspicuous for his skill and courage. In 1796, when the French army under General Kléber had passed the Rhine [Kleber, P. C. S.], the Austrians, finding themselves compelled to retire from Uckerath, had entrenched themselves, twenty thousand strong, on the heights which surround the small town of Altenkirchen. Their formidable position was attacked on the 4th of June by Kléber, who formed his army into two divisions, the first of which, the advanced-guard, he placed under Lefebvre. The brunt therefore of the assault fell on that division, which boldly charged the enemy at the point of the bayonet, and, in spite of a most vigorous resistance, compelled them to retire in disorder, leaving behind them four standards, twelve pieces of cannon, and about three thousand prisoners. On the 25th of March, 1799, was fought the memorable battle of Stockach, in which Lefebvre acquired fresh renown; with only eight thousand men he resisted, for many hours, the attack of thirty thousand Austrians. For these eminent services however Lefebvre appears to have been but poorly rewarded, and there is extant a letter from him to the Directory at Paris, in which are contained the following passages, sufficiently characteristic of the poverty of France at that period:—'The definitive conclusion of peace,' he says in it, 'will enable the country to dispense with my services. I petition you therefore to assign me a pension which may maintain me in comfort. I ask not for carriage or horses, but only for bread. My services must be well known to you, and I shall not enumerate my victories; as for defeats, I have none to reckon.'

At the time when Bonaparte was placing himself at the head of affairs, the Directory, who supposed Lefebvre devoted to their cause, appointed him to the command of the guards of the Legislative Assembly; but, on the morning of the 18th Brumaire (October 14th), he attended the meeting of officers at Bonaparte's private residence, and cordially co-operated in their proceedings. He was also instrumental in extricating Lucien Bonaparte from his dangerous position in the stormy meeting of the Council of Five Hundred at St. Cloud. [Bonaparte, P. C.; Bonaparte, Lucien, P. C. S.] These important services were rewarded by the command of the seventeenth military division, whose head-quarters were at Paris.

In the year 1804 he was raised to the dignity of a Marshal of the Empire. He accompanied Napoleon the following year in the Austrian campaign, and in 1806 took an active part at the battle of Jena, where, though at that time upwards of fifty years of age, he fought on foot at the head of the guards.

In 1807 he was sent with an army of sixteen thousand men to invest Danzig, which was garrisoned by twenty thousand troops, besides a numerous militia, and the investment was completed on the 14th of March. A body of twelve thousand Russians were advancing to the relief of the besieged, and Lefebvre was compelled to divide his force, and to detach a portion of them to oppose the Russians. On the 15th of May a severe action took place between them and the French, when the latter, seconded by the troops of Marshal Lannes and General Oudinot, who had been sent by the Emperor to their assistance, successfully repelled nine Russian regiments, and a part of the Prussian garrison by whom they had been joined. On the 21st of May, preparations having been made for a general assault, the Prussian commander General Kalkreuth offered to accept terms of capitulation; the long resistance which this fortress, among the strongest in Europe, was still able to make, rendered these terms as favourable as could be expected. The garrison were allowed to retire with the honours of war, and to take with them their munition and baggage, on the condition of giving their parole not to serve during the space of one year against the French or their allies. On this occasion Marshal Lefebvre generously desired the two generals, who lent him so powerful an assistance, to join him in the honour of signing the capitulation, but with a similar generosity, they declined to share with him a triumph which belonged to him by so just a title. A few days after these events, Napoleon, who was desirous of reviving the high nobility in France, and to give additional lustre and more munificent rewards to the twenty-four grand dignitaries whom he had lately created, made Lefebvre duke of Danzig. This marshal being highly esteemed by the army, and his eminent services during the wars of the Revolution having acquired for him the gratitude and respect of every Frenchman, he wisely selected him as the first person on whom to confer the ducal dignity. The siege of Danzig indeed was one of the most brilliant triumphs of the Prussian campaign. Eight hundred pieces of cannon and immense magazines fell into the hands of the conquerors, and the capture of this important fortress not only secured the left flank and rear of Napoleon's army, but left to Prussia only the stronghold of Pillau along the whole coast of the Baltic. [Danzig, P. C.]

In the year 1808 Lefebvre joined the Peninsular expedition, and was appointed to the command of the fifth corps of the French army. On leaving, the Emperor had given him directions to keep the Spaniards in check till his arrival; but when employed in the province of Biscay, finding that the enemy were seriously harassing the flanks of his army, he gave them battle, and on the 1st of November triumphantly entered the town of Bilbao. His conduct however on that occasion appears to have given displeasure to Napoleon, as it interfered with his plan of operations. He was afterwards present at the battle of Tudela, where he had the command of the cavalry. [Lannes, P. C. S.]

In the German campaign of 1809 he rendered himself conspicuous as a brave soldier and an excellent tactician, at the battles of Eckmühl and Wagram, and in the dangerous warfare among the passes of the Tyrol. He was also with Napoleon in the disastrous expedition to Russia, and had the command of the old guard, which was however seldom called into action; but during the retreat he showed considerable military skill, and, for the most part, accompanied his corps on foot, sharing every suffering and exposing himself to every danger in common with the private soldiers.

During the campaigns of 1813 and 1814 he appears faithfully to have adhered to the declining fortunes of his master; and after the battle of Leipzig, when the remnants of the French army were called to fight for the defence of their native country, by none of his lieutenants was Napoleon more ably seconded than by Lefebvre. At the battles of Champ-Aubert (February 10, 1814), at Arcis-sur-Aube (March 20), and at Mont-Mirail (April 14), he displayed the same gallantry as in the more renowned but not more glorious fields of Jena, Tudela, and Wagram. It is however stated that Lefebvre greatly influenced the abdication of Napoleon, and at the first restoration of Louis XVIII. he was created Chevalier of St. Louis and peer of France. But on the return of his former chief from Elba, we find him again adhering to his fortunes, and accepting a seat in his Chamber of Peers, where however he held himself aloof from all discussions. (*Journal des Débats* of the 10th April, 1814.) At the second restoration of the Bourbons, he was excluded from the Chamber of Peers, to which he was recalled in 1819, having been a few years previously reinstated in his rank of marshal. He died at Paris on the 14th of September, 1820.

The private qualities of this distinguished general are perhaps more to be admired than his public character; it being difficult to reconcile his conduct, during the latter years of his life, with genuine patriotism. His manners evinced the modest simplicity of a soldier, who had risen by merit alone; his disinterestedness, which was proverbial, was rendered manifest by his leaving a widow so destitute, that she was obliged to sell her jewels in order to defray the expenses of a monument, which she generously caused to be raised to the memory of her husband in the cemetery of Père-la-Chaise. The character of this excellent woman, who was of most humble origin, may be best judged by a trait which Las Cases presents to us in his 'Memorial of St. Helena' (vol. iii. 393).

There was another well known general of Napoleon, the Count Charles Lefebvre Desnouettes, whose name has sometimes been confounded with that of Marshal Lefebvre. He was condemned to death on the second restoration of the Bourbons, but he was enabled to take refuge in the United States. He perished in a shipwreck on the coast of Ireland, as he was returning to Europe, on the 22nd of April, 1822.

(*Biographie Universelle, deuxième partie; Biographie Moderne; Dict. Hist. des Batailles;* Tissot, *Précis des Guerres de la Révolution*, Paris, 1821; *Mémoires de la Duchesse d'Abrantes*, Las Cases, *Mémorial de St. Hélène; Court and Camp of Napoleon.*)

LEFORT, FRANÇOIS, was the son of Jacques Lefort, member of the Grand Council of Geneva, in which city he was born in 1656. After having served as a cadet in the Swiss Guards in the service of France, and subsequently in a regiment belonging to the Duke of Courland, in the pay of the Dutch, he was induced to try his fortune as a military man in Russia, and obtained a captain's commission from the Czar Feodor or Theodore Alexiwich, and greatly distinguished himself in the wars with the Turks and the Tartars. Having in 1678 married Mademoiselle Souhai, whose father, a native of France, held the rank of lieutenant-colonel in the Russian service, he revisited his native country in 1682, but, staying only for a few weeks, got back to Russia in time to be in readiness for the crisis which occurred on the death of Theodore (P. C., xviii. 23). His abilities being well known, he was appointed by the Prince Galitzin, who governed the country under the Princess Sophia, in the name of her two brothers Iwan and Peter, one of the captains of a new body of troops raised to counteract the domination of the Strelitzes, or old national militia. In this capacity he first attracted the attention of the young czar Peter, in the early part of the year 1683; and on the 29th of June in that year he was raised by him to the rank of major. When, in 1689, Peter took refuge in the Troitski convent, Lefort was one of those who joined him there, and on the overthrow of the usurpation of Sophia, which followed, he became the chief minister of the emancipated emperor. Many of Peter's greatest plans are believed to have been suggested by Lefort; all the Czar's measures for civilizing and elevating his country found in him, at least, the most able and zealous of seconders and promoters. Holding at once the rank of general and that of admiral, Lefort was always equally ready for service by land or by sea; and his active and versatile faculties shone as much in civil affairs as in military. At last Peter lost this inestimable servant by his death at Moscow on the 12th of March, 1699: his health had been for some time declining, and a fever following upon the breaking out of an old wound carried him off. Peter lamented him as if he had been a brother. Lefort's moral nature appears to have been as admirable as was his capacity; considerations of self-interest were always postponed by him to the public good and the glory of his sovereign, and a noble contempt of everything mean or mercenary marked the whole of his career. He left a son, but he died at an early age. There is a Life of Lefort, in French, by Bassville; and there is a long article about him in the 'Biographie Universelle,' by Catteau Calleville, who refers to other authorities, and from whose account the above outline has been abstracted. See also Voltaire's 'Life of Peter.'

LEGACY DUTIES. [Probate Duties, P. C. S.]

LEGION OF HONOUR, an order of merit in France, instituted by Napoleon during the year 1802, as a recompense for military and civil services. This order consists of five divisions: *chevaliers*, of whom the number is unlimited, *officers*, *commanders*, *grand officers*, and *grand crosses*. The members swear fidelity to the king, to the charter, and to the laws. The ordinary regulations require twenty-five years' service during peace, and half that period during war, in a civil or military capacity, to be admitted to the first grade. But, in time of war, a brilliant exploit, or a severe wound, are deemed sufficient to qualify for admission into this order. This honour however is frequently granted to any distinguished person at the pleasure of the king. But to rise to a superior rank, it is considered indispensable for natives of the country to have passed through the inferior grades. To obtain the rank of officer it is necessary to have served four years as a chevalier; an officer must serve two years to become commander; a commander three years to become a grand officer; and, finally, to obtain the highest grade, which is that of grand cross, he must have served five years as a grand officer.

When a promotion takes place the king determines the number of decorations of each grade, and a distribution is made by the chancellor of the order in the following proportion, 40 to 40:—

2	to the minister of		Justice and Religion.
1	,,	,,	Foreign Affairs.
5	,,	,,	Home Affairs.
2	,,	,,	Public Works.
2	,,	,,	Finances.
20	,,	,,	War.
5	,,	,,	Marine.
1	,,	,,	Public Instruction.
2	,,	,,	Grande Chancellerie.
40			

On all public occasions certain military honours are due to persons decorated with this order, and, at all times, a soldier on duty is bound to present arms on seeing the decoration.

The following salaries are attached to the different grades: chevalier, 250 francs; officer, 1000; commander, 2000; grand officer and grand cross, 5000.

In the formation of this order, as at first designed by Napoleon, though of a strictly military nature, the honour was not restricted to military men alone, but was intended to be the reward of civil, scientific, and literary services. He wished, moreover, that the name which he gave it should imply its object, which was to form a body of the most distinguished citizens, specially bound together by the ties of honour and devotion to their country. The legion, which was to be composed of fifteen cohorts, was to be governed by a supreme council, composed of seven members, the three consuls, and four grand officers—the first of whom was to be chosen by the senate, the second by the legislative body, the third by the tribunate, and the fourth by the council of state. He likewise enacted that all military men, who had previously received honourable distinctions for their services by the republican government, should be, of right, members of the new order.

The proposition of the first consul, when presented to the legislative body and to the tribunate, met with a violent though not unexpected opposition. The representatives of the French nation could see in it nothing but a powerful weapon of military despotism, to be sooner or later wielded by one whose projects of absolute rule were beginning to be discovered. His brother Lucien, moreover, to whom the motion had been entrusted, by his imprudent zeal in urging its adoption, raised in the minds of many the idea that he was enforcing the interests of his family rather than those of the nation. Even in the council of state, which, by the nature of its constitution, was especially under the influence of Napoleon, it was deemed by some to be a most dangerous experiment, calculated to reanimate aristocratical feelings, and gradually to introduce the ancient régime; while others, among whom was the general Mathieu Dumas, were desirous that the institution should be restricted to military men. Among the representatives of the people, the general expediency of the institution itself was still more strongly combated than it had been in the council of state. 'Crosses and ribbons,' said they, 'are the pillars of an hereditary throne; they were unknown to the Romans when they conquered the world.' The first consul's reply to these different objections contains many observations strikingly put and correct. 'Such ideas,' he remarked, 'might be well adapted to the feudal ages, when the knights were accustomed to combat together, man to man, and the bulk of the nation was reduced to a state of slavery. But when the military system changed, it was then not prowess in war, but science and skill, which decided the fate of nations. In all civilized states military force must of necessity yield precedence to civil qualities. Bayonets must lower before the priest who speaks in the name of heaven, or the man of science who has obtained an influence by the ascendancy of his knowledge. Think not that it is as a general that I govern France; but because the entire nation believes me possessed of that ability in the direction of civil affairs so necessary to a ruler; without it I could not, for an instant, keep my ground.'—'France,' he continued, 'contains thirty millions of men, united together by the ties of intelligence, property, and commerce; what are three or four hundred thousand soldiers in comparison to such a mass? and, moreover, not only does a commander preserve his influence and ascendancy over the soldiers of his army chiefly in virtue of his qualities as a civilian, but, when his command ceases, he returns to the rank and position of a private individual. The natural tendency of military men is to carry every thing by force; the enlightened and educated civilian, on the other hand, elevates his views to the perception of the general good, and follows an opposite course of conduct. I have no hesitation in asserting that, if a preference is to be awarded to the one rather than to the other, it belongs to the civilian. If you divide society into two orders, soldiers and citizens, you create disunion into what should be but one body.'

Influenced by these arguments, a majority of the council agreed that the proposed honours should be extended indiscriminately to civil and military men of distinction. At length, after many an angry discussion, the project was passed into a law on the 29th Floreal (May 19th, 1802), in the national assemblies; in each of them, however, but by a small majority.

The Legion of Honour, though it undoubtedly seemed a forerunner to that new nobility which Napoleon, in after years, collected around his imperial throne, soon became an institution in the highest degree important to his interests, and popular among the nation. On the 24th of July, 1804, Napoleon distributed to the principal civil and military dignitaries of France the higher order of decorations. The splendid church of the Hotel des Invalides was the place appropriately selected for the distribution. He had not as yet given the decorations of this order to foreign courts; as a prelude to doing so, he bestowed it upon the venerable Cardinal Caprera, who, in his capacity of legate, represented Pope Pius VII. at Paris, and, to enhance the value of the honour, he, on that occasion, detached from his own neck the ribbon of the order, and placed it affectionately around that of the aged representative of a church with which France, through his instrumentality, had been happily reconciled. (Thiers, *Hist. du Consulat*, &c., b. xx.) [BONAPARTE, P. C.]

But a more imposing spectacle took place at the head quarters of the vast army which Napoleon had assembled at Boulogne, preparatory to his intended invasion of England. On the 14th of August, 1804, the festival of his tutelar saint, nearly eighty thousand men were drawn up on the slopes of a large natural amphitheatre, on the western side of the hill, on which is situated the so-called tower of Cæsar. An elevated throne was raised in the centre of this theatre, and the soldiers were drawn up as rays of a circle emanating from this throne as their centre; beyond them was congregated a countless number of spectators. At mid-day the emperor ascended the throne, amidst the din of military salutes and the acclamations of the crowd; near him was placed the famed buckler of Francis the First, while the decorations of the order about to be distributed were contained in the helmet of the illustrious Chevalier Bayard. He was surrounded by his brothers, by the chief functionaries of the empire, by the marshals and generals of his army. Amidst this proud array were to be seen the ancient standards of the republic, the witnesses of the victories of Rivoli, Arcola, and Marengo. In presence of all the assembly, Napoleon took the oath of adherence to the laws of this order and of his country first himself, and afterwards administered it to those around him; then, raising his voice, and addressing the veterans of his army, he exclaimed: "You also, soldiers, swear to defend, at the hazard of your lives, the honour of the French name, your country, and your emperor." This animating appeal was responded to by the deafening shouts of the mighty multitude. The distribution of the various decorations then took place, and this imposing ceremony was concluded by a general review of the whole army, whose ranks defiled before the imperial throne. Napoleon estimated at twenty-five thousand the decorations he had distributed during the ten years of his reign. This remarkable institution has outlived the fortune of its founder. Its benefits were appreciated by the Bourbons, who soon discovered that it was the most powerful means they could employ of increasing their popularity, and giving stability to their precarious position. It has been wisely adopted, and its utility has been increased, under the pacific reign of the house of Orleans. By its means the present king of the French has been enabled, at a comparatively small expense to the state, to conciliate the esteem and to reward the merit of the most deserving citizens. It has been placed on the breast of an Arago, a Guizot, and a Thiers, with equal honour, and as much applause, as it had been on those of a Ney, a Masséna, and a Lannes. It is to the credit of the French nation that, while no other people are perhaps so much under the influence of military renown, it would be difficult to mention the name of any other country where men of science and literature are more generally esteemed and rewarded.

But the benefits which have accrued to the French from this institution may be best described in the eloquent words of one of their living historians, in his history of the consulate and the empire. 'The institution of this order,' he says, 'dates scarcely more than forty years' existence, and it is now consecrated in the memory of the people, as if it had passed through the lapse of many ages; so much has it become in these forty years the reward of heroism, and of talent and merit of every kind; so much has it been sought after by the great and principal personages of Europe, those even who pride themselves the most on the honours of their ancestry. Time then, the best criterion of all institutions, has declared in favour of its worth and utility. Leaving aside the abuse which has occasionally occurred in the distribution of its distinctions, under the various governments which have succeeded one another, an abuse inherent in all rewards bestowed by man upon his fellow men, let us gratefully recognize what there was novel in plan, profound in design, and beautiful in execution in an institution whose object it was to place on the breast of the common soldier, or on that of the unassuming man of science, the same decoration which was destined to confer distinction on the commander-in-chief of armies, on princes, and on kings; let us recognise, in the creation of these honorific rewards, the most brilliant triumph of true equality, that equality which raises instead of abasing the minds of men; let us recognize, in short, that if to the great in civil or military life it might become a mere gratification of vanity, it was to the common soldier, returned to his domestic hearth, at once the pledge of honourable ease and a visible proof of his former prowess.' (Thiers, *Histoire du Consulat et de l'Empire*, vol. iii.)

The following statistical table will show the increase that has taken place in the members of this order, and also how liberally its honours have been distributed by the present king of the French. We are indebted for the latter part of these details to the prompt and kind investigation of two distinguished members of the Legion of Honour—the general Ocher de Beaupré, of the French artillery, and his nephew, Monsieur Théophile Ballaud, sub-prefect of St. Quentin.

In the year 1815, on the second restoration of the Bourbons, the entire number of members of all the different divisions of this order were 30,747. We have stated above the number which Napoleon estimated that he had distributed during his reign.

The following detail will show the increase during the reign of Louis Philippe.

	1831.	1833.	Nov. 9th, 1844.	Oct. 1st, 1845.
Grand Crosses	99	106	81	85
Grand Officers	183	195	201	215
Commanders .	726	825	833	911
Officers . .	4,056	4,475	4,482	4,759
Chevaliers . .	37,828	43,659	44,117	45,340
Total	42,892	49,260	49,714	51,310

Thus it appears that there has been an increase during fourteen years of 8418 members; the diminution in the highest decorations has probably arisen from the deaths of many of the old marshals and generals of the empire. Of the members in the year 1844, 29,843 received no pension, and 19,851 drew the salaries attached to the order. The revenue during that year was 7,000,000 francs, about £280,000, and the expenditure 6,897,728 francs, about £275,509. Our information respecting that year is derived from the French newspaper 'le Courrier de l'Europe' published in London.

A full account of this order and of its most distinguished members may be found in a work entitled 'Fastes de la Légion d'Honneur,' 4 vols. Paris, 1842 and 1844.

(Bulwer, *France, Social, Literary, and Political;* Bulwer, *Monarchy of the Middle Classes;* Thiers, *Histoire du Consulat et de l'Empire;* Alison, *History of Europe*, vols. iv. v.)

LEGITIMATION. [BASTARD, P. C.]

LEGUMINOSITES, a genus of fossil fruits, from the Isle of Sheppey. (Bowerbank.)

LEICESTER, OF HOLKHAM, THOMAS WILLIAM COKE, EARL OF. Thomas Coke, Esq., of Holkham, in Norfolk, great-great-grandson of Sir Edward Coke, the chief-justice, was in 1728 created Baron Lovel, of Minster Lovel, in Oxfordshire; and in 1744 Viscount Coke of Holkham, and Earl of Leicester. On his death without heirs male, in 1759, the titles became extinct, and the estates went to his nephew, Wenman Roberts, Esq. (the son of his sister Anne and her husband, Colonel Philip Roberts), who thereupon assumed the surname and arms of Coke. The subject of the present notice was his son, by his wife Elizabeth, daughter of George Chamberlayne, afterwards Denton, Esq., and was born on the 4th of May, 1752.

His father, who had been returned to parliament as member for the county of Norfolk at the general election in 1774, having previously sat for Harwich, for Oakhampton, and for the town of Derby, died in 1776; upon which his son succeeded him in the representation of the county. In a speech which he made at a dinner given to him in 1833, he stated that when he came forward on this occasion he did so with great reluctance, being no orator or politician, having just returned from abroad, and being attached to other pursuits. They told him however that if he would not stand, a Tory would be sure to come in; and upon this, he said his blood chilled all over him from head to foot, and he resisted no longer. This horror of Toryism, or of what he imagined that term to mean, constituted nearly the whole of Mr. Coke's political system to the end of his life. He was returned again for Norfolk at the next general election in 1780; but after the dissolution in March, 1784, he was one of the numerous supporters of the late unpopular Coalition Ministry, who were thrown out, and who received the name of Fox's Martyrs. He recovered his seat however in 1790; and he was also rechosen without a contest in 1796 and in 1802. At the next general election, in 1806, he was returned by a majority of 4118 to 3772 over Mr. Windham, but was unseated by a Committee of the House; upon which he was elected for the town of Derby, and his younger brother, Mr. Edward Coke, who had vacated his seat for that borough, took his place as member for Norfolk. At the next general election, in 1807, Mr. Coke became again member for that county, which he continued to represent down to his retirement from the House of Commons in 1832.

Mr. Coke, though a keen and steady partisan, was not a frequent speaker in parliament. The two occasions on which he appeared most conspicuously were, on the 24th of March, 1783, when in a short speech he moved an address requesting that his majesty would be pleased to form an administration entitled to the confidence of the people, which, being assented to, was followed by the resignation of Lord Shelburne and the formation of the Coalition Ministry of Mr. Fox and Lord North; and on the 2nd and 3rd of February, 1784, when he carried two motions against the existing ministry of Mr. Pitt, which however had no effect. He also on subsequent years came forward on some occasions when measures affecting agriculture occupied the attention of the House. In all matters of general policy he voted with Mr. Fox, and after his death with Lord Grey and what was commonly called the Whig party.

His influence in the country arose from his large estates and the lead he took in agricultural improvement, together with his popular qualities as a landlord and a country gentleman. He is said to have raised the rental of his estate of Holkham, in the period of between sixty and seventy years during which it was in his possession, from little more than 2000*l.* to above 20,000*l.* From the death of Francis, duke of Bedford, in 1802, he was regarded as the chief of English agriculturists. His plantations were so extensive that the average value of the annual fall of timber on his property is stated to have amounted at his death to 2700*l.*, or considerably more than the entire rental of the land when it came into his hands. The annual sheep-shearing at Holkham, at which some hundreds of guests were entertained for several days, was probably the greatest agricultural festival in the world.

According to Mr. Coke's own account in the after-dinner speech of 1833 already quoted, he was twice offered a peerage in the very first session that he sat in parliament. More than sixty years after, namely, on the 21st of July, 1837, he was at last raised to the Upper House as Earl of Leicester, of Holkham. It is understood that the difficulty which had prevented his being sooner made a peer was that he would accept of nothing except this earldom of Leicester, which had been held by his maternal great-uncle, whose estates he inherited, but which had in the mean time been bestowed, in 1784, upon Lord Ferrers, afterwards Marquis Townshend, to whose heirs it of course descends. It was thought a very strong measure, when, to gratify the old man, the same title, with the slight and not very intelligible variation, 'Leicester of Holkham,' was bestowed upon a second person. It made of course no difference that the other Earl of Leicester had subsequently acquired a higher title; he was still notwithstanding as much Earl of Leicester as Marquis Townshend. The proceeding was precisely of the same nature as if Mr. Coke had been made Duke of Wellington, of Holkham.

The Earl of Leicester died at Longford Hall, Derbyshire, on the 30th of June, 1832, at the venerable age of ninety. He was twice married: first, in 1775, to Jane, daughter of James Lennox Dutton, Esq., who died in 1800, and by whom he had three daughters, and many grandchildren and great-grandchildren; secondly, on the 26th of February, 1822, to the Lady Anne Amelia Keppel, third daughter of the Earl of Albemarle, who was then not quite nineteen, and who brought him five sons and a daughter. The eldest son, born on Christmas-day, 1822, is now Earl of Leicester.

(*Memoir in the Gentleman's Magazine for Sept.*, 1842. See also in the number for December, 1842, a short notice of his will, in which he is said to state in that document that he had 'lately expended the sum of 500,000*l.* in the improvement of his estate.')

LEI'ODON, a genus of fossil reptiles. (Owen.) One species found in the chalk of Norfolk.

LEIPA (generally called Böhmisch-Leipa), is a town in the circle of Leitmeritz, in the kingdom of Bohemia, and in the lordship of Neuschoss, belonging to Prince Kaunitz. It is situated on the river Polza, and has about 6000 inhabitants, who have flourishing manufactures of woollen-cloth, cottons, calicoes, chintzes, and very beautiful earthenware and glass-works. There are a gymnasium and a high school in the town.

(Hörschelmann, *Handbuch*; Stein, *Lexicon*; Cannahich, *Lehrbuch*.)

LEMNA, a genus of plants belonging to the natural order Aroideæ, and the suborder Lemneæ. It has a 2-flowered membraneous urceolate spathe; the male flowers consist of two stamens; the fruit is reticular and indehiscent. The fronds are without distinction of stems or leaves. The flowers appear just below the margin of the frond. Several species have been described. They are all inhabitants of stagnant waters, and are known familiarly by the name of 'Duck-weeds.'

(Babington, *Manual of British Botany*.)

LEMOINE, FRANÇOIS, a celebrated French painter of the eighteenth century, was born at Paris in 1688. He was the pupil of Louis Galloche, early distinguished himself, and in 1718 was elected a member of the Royal Academy of Painting: his presentation-piece was an excellent picture of Hercules killing Cacus. He obtained a great reputation by his painting, in oil, of the Transfiguration of Christ on the ceiling of the choir of the church des Jacobins, Rue du Bacq. In 1724 Lemoine visited Italy, where he remained for a year; the artists whose works chiefly attracted his attention were Pietro da Cortona, Lanfranco, and Bernini. After his return to France he was made professor of painting in the Academy, and in a very few years his reputation surpassed that of all his Parisian contemporaries: Louis XV. appointed him in 1736 his principal painter, with a salary of 4100 francs, in the place of Louis de Boullougne, deceased. The first of Lemoine's great works was the cupola of the chapel of the Virgin in St. Sulpice, in fresco, which he commenced in 1729, a work of three years' labour. His master-piece however is the Apotheosis of Hercules, painted in oil on canvas pasted on the ceiling of the Salon d'Hercule at Versailles, commenced in 1732 and finished in 1736. It is a grand composition, containing one hundred and forty-two figures, and it is the most extensive and most magnificent monument of painting in France, though in a florid and superficial style, and, like the works of his model, Pietro da Cortona, belongs to the class of works called *pitture di macchina* by the Italians. The composition is arranged in nine groups, is vigorous and effective in arrangement, colour, and light, and especially in aerial perspective; but it is a purely decorative work, and is effective only as a whole: the parts have little individual merit, and the drawing wants correctness, expression, and distinctive character. Lemoine used on the ground of this picture, the blue vault of heaven, ultramarine to the value of 10,000 francs: it is sixty-four feet by fifty-four.

After the completion of this great work he was without a rival in France, but he never enjoyed his success. He was naturally of a melancholy temperament, a weakness which the loss of his wife, and the constant and intense application arising from an insatiable ambition, combined with vexation on account of the detraction of his less successful contemporaries, aggravated to that degree that it amounted to a chronic aberration of intellect, and he destroyed himself in one of these nervous fits, June 4, 1737, ten months after the termination of his great work at Versailles, and in the fiftieth year of his age.

Lemoine painted also many easel-pictures, both of large and of very small dimensions, and the latter have realized high prices at auctions: a Flight into Egypt is considered his best easel-piece. There is not a single picture by him in the Louvre at Paris. Many of his works have been engraved by some of the best French engravers, as L. Cars, N. Cochin, H. S. Thomassin, Silvestre, Larmessin, Et. Fessard, &c. Boucher, Natoire, and Nonotte, distinguished painters, were the pupils of Lemoine.

(D'Argenville, *Abrégé de la Vie des plus fameux Peintres*; Watelet et Levesque, *Dictionnaire des Arts*, &c.; Gault de Saint-Germain, *Trois Siècles de la Peinture en France*.)

LENCISCUS. The reference from BLEAK, P. C., to LENCISCUS was a misprint. [LEUCISCUS, P. C. S.]

LENFANT, JACQUES, was born at Bazoche in Beauce, a district of the ancient province of Orléannois in France, on the 13th of April, 1661, and was the son of Paul Lenfant, the Protestant minister of Châtillon-sur-Seine. Being destined to the same profession as his father, he was sent to prosecute his studies at Saumur; during his residence at that university he lived with the learned Jacques Cassel, the professor of Hebrew, with whom he formed a friendship which continued during their lives. He afterwards completed his theological education at Geneva and Heidelberg, in which latter town he was admitted into the ministry of the Protestant church during the month of August, 1684. Soon after his ordination he obtained the appointment of minister of the French church at Heidelberg, and chaplain to the Dowager Electress Palatine. The invasion of the Palatinate by the French troops, under Marshal Turenne [TURENNE, P. C.], compelled Lenfant to leave Heidelberg in 1688, and he settled at Berlin. The fear of meeting his countrymen arose from having rendered himself obnoxious to the Jesuits by two letters which he had written against that society, and which are appended to his work entitled 'A Preservative against a re-union with the Church of Rome.' Though the Protestant French church of that city had already a sufficient number of pastors attached to it, the reigning Elector of Brandenburg, Frederick, afterwards King of Prussia, who knew Lenfant by reputation, appointed him to that church, where for upwards of thirty-nine years he performed duty. In tho year 1705 he married Mademoiselle Gourgaud de Verones, a French lady from Poitou. In 1707 he visited England, and it is recorded that he was admitted to preach before Queen Anne, though we do not understand how he could have been permitted to do so without having received episcopal ordination; it is further stated that the Queen wished him to enter the Church of England, and offered him, in case he resolved to do so, to appoint him her chaplain. In 1710 he obtained the situation of chaplain to the King of Prussia, and councillor of the high consistory. He was also a corresponding member of the Society for the Propagation of the Gospel in Foreign Parts, which had a few years before been established in London. Lenfant was suddenly attacked with paralysis, while in the apparent enjoyment of perfect health, on the 29th of July, 1728, and he died on the 7th of August following.

His disposition is represented to have been amiable, and his manner simple and modest. Of a reflective turn of mind, he spoke but little, and that little well. Though a most voluminous writer, he was fond of society, and opened himself without reserve to the confidence of his friends. He is said to have had few personal enemies, which may be readily believed, for his character is universally described as remarkable for its disinterested charity, and for the exercise of the peaceable virtues of a Christian. As a preacher, his manner was pleasing and persuasive; the matter of his discourse was chiefly of a practical nature, and his eloquence was rather chaste than energetic. His varied talents and the depth of his learning may best be judged of by tho study of the numerous and valuable works which he has left, many of which are of indispensable utility to the theological student. The style of his writing is elegant, though never florid; it has less force than that of Jurieu [JURIEU, P. C. S.], and less eloquence than that of Saurin [SAURIN, P. C.], but the French is more pure, and the diction more chaste. In one respect especially he is far superior to any of the French Protestant writers of that period; his writings, particularly those of the latter years of his life, contain little asperity and few severe expressions of condemnation against those who differed with him in opinion. It is not certain whether he was the first to form the design of the 'Bibliothèque Germanique,' which was commenced in 1720, but it is well known he took a prominent part in its execution, and he is the acknowledged author of the preface.

Lenfant's first work, which appeared in 1683, was a review of one of Brueys, who, though a celebrated French dramatist, has written several theological works in defence of tho Roman Catholic faith. In 1688 be published a translation of a selection from the letters of St. Cyprian, in 1690, a defence of the Heidelberg catechism, which is generally annexed to his 'Preservative,' &c., a work wo have before alluded to; and in 1691, a Latin translation of the celebrated work of the Père Mallehranche on 'Research after Truth.' His history of the female Pope Joan, appeared in 1694; the arguments in it are drawn from the Latin dissertation on that suhjeet of Spanheim. It is said, however, that, in after life, Lenfant discovered and acknowledged the absurdity of this fiction. [JOAN, POPE, P. C.] In 1708 appeared his remarks on the Greek edition of the 'New Testament,' by Mill, which are in the 'Bibliothèque Choisio' of Le Clerc, vol. xvi. The following works afterwards appeared in succession: 1,'Réflexions et Remarques sur la Dispute du Père Martiany avec un Juif;' 2, 'Mémoire Historique touchant la Communion sur les deux Espèces;' 3, 'Critique des Remarques du Père Vavaseur; sur les Réflexions de Rapin touchant la Poëtique;' 4, 'Réponse de Mons. Lenfant à Mons. Dartis au sujet dn Socinianisme.' The above short works are to be found in the 'Nouvelle de la République des Lettres,' a review to which Lenfant was a frequent contributor.

In 1714 was published bis learned and interesting 'History of the Couneil of Constance,' 2 vols., Amsterdam. Two years after he wrote an apology for tbis work, whieh had been severely attacked in tbe 'Journal de Trévoux.' In 1718, in conjunction with Beausobre, he puhlished a translation of tbe New Testament, with explanatory notes, and a long and most learned introduction. It is hy this work, perhaps, that he is most known in England. [BEAUSOBRE, P. C.] We shall now hriefly mention the most important of his other productions: 1, 'Poggiana; or the Life, Cbaracter, and Maxims of the celebrated Florentine writer Poggio,' Amsterdam, 1720 [BRACCIOLINI, P. C.]; 2,'A Preventive against Reunion with the See of Rome, and Reasons for Separation from that See,' Amsterdam, 1723—a work whieh continues to enjoy great popularity among Protestants; 3, 'History of the Couneil of Nice, and of the most remarkahle Events during tho Interval hetwoen it and the Council of Constanee,' a learned and most accurate work, written with sufficient impartiality, 1724; 4, 'A Volume containing sixteen Sermons, on different Texts of Scripture,' 1728; 5, 'A General Preface to the Old and New Testaments,' whieh is appended to the French Bible in octavo, published at Hanover and Leipzig in 1728; 6, 'A small volumo of Remarks on Gishert's Treatise on Pulpit Eloquence.' The last work of Lenfant is one which has greatly added to his already high reputation, 'Tbe History of the Wars of tho Hussites, and of the Council of Basle,' 1728; hut the labour wbich the composition of it occasioned is said to have hastened his death; he had been many years collecting materials for this valuahle history, and had access, tbrough the influence of the King of Prussia, to the archives of tho corporation of Basle. The principal details of the life of Lenfant have been taken from a memoir annexed to the above work.

LENTIBULARIÆ. [LENTIBULACEÆ, P. C.]

LEONU'RUS (from λέων, 'a lion,' and οὐρά, 'a tail'), a genus of plants helonging to the natural order Lahiatæ. The anthers approximate in pairs, with parallel cells and naked valves. The upper lip of the corolla is nearly flat, the lower one trifid, with the middle lobe obcordate. Tbe calyx is tubular and 5-toothed; the nuts flatly truncate.

L. cardiaca, Mother-wort, is a bitter herh, with a pungent unpleasant smell. The stems rise from 2 to 3 feet in height; they are wand-like, downy, purplish, and quadrangular. The leaves are long-stalked, somewhat downy, and of a dark green colour. The lower leaves are the broadest, and deeply jagged, the upper ones 3-lohed, and tbose about the summit lanceolate and undivided. The corolla is of a purple colour, and externally hairy; the calyx rigid and pungent. It is found in hedges and waste places in Great Britain, all over Europe, and the middle of Asia. The reputed tonic powers of this herb as a remedy in palpitations of the heart and cardialgia, or heartburn, are now disregarded: from being used however in the last complaint it derives its name. It has been extolled by the Russians as an antidote to canine madness, and bees are fond of the honey contained in its flowers.

L. marrubiastrum has elongated pubescent branches, oblong ovate deeply-toothed leaves, the calyx nearly glahrous, and the corolla small, white or pale-red, and shorter than the calyeine teetn, wnich are suhulate, spiny, and diverging. It is found in waste plaees throughout Europe and Asiatic Russia. There are eight species of *Leonurus* described by botanists as growing chiefly in Europe and the North of Asia. None of them are very ornamental, and being biennial plants, the seeds only require to be sown in the open ground.

(Don, *Gardener's Dictionary*; Lindley, *Flora Medica*, Babington, *Manual of British Botany*.)

LEPADOGASTER. [DISCOBOLI, P. C. S.]

LEPI'DIUM (from λεπίς, a scale, in allusion to the form of the pods, which resemble little scales), a genus of plants belonging to the natural order Cruciferæ, and the tribe Lepidineæ. It has a roundish or ohlong pouch, either notched or entire, compressed valves, keeled or winged at the back. There is hut one seed in eaeb cell; the filaments are simple. The species consist of herbs or small shruhby herbs with small white flowers. This genus is divided into seven sections, the first of which, *Cardaria*, is so called from the heart-shaped form of the silicles. To this section belong:

L. Draba. It has ohlong leaves, entire or toothed, the lower ones narrowed into a foot-stalk, the stem-leaves sagittate and amplexicaule, the style as long as the dissepiment. It is native in the south of Europe from Spain to Tauria, and from Greece to Paris. It was introdueed into Great Britain probahly hy foreign seed, and is now found in the hedges of Kent.

L. sativum, common Garden Cress, belongs to the section *Cardamom* of this genus. It has orbicular pods, variously eut winged leaves, and smooth hranehes. It is native of Persia and the island of Cyprus in corn-fields. There are three varieties of the species: the broad-leaved eress, which is cultivated chiefly for rearing young turkeys; the eurled variety, which is sometimes used as a salad, hut is considered preferahle as a garnish; and the common plain-leaved cress, which forms one of our earliest spring salads, and has a peculiarly warm and grateful relish. All the varieties are raised from seed, of which one ounce will serve for a hed four feet square. Cress should be raised four or five times a month so as to have the crops delicately young in succession. When raised in the open garden it should be sown early in March, and if the weather be cold it should be covered either with matting or a frame during the night. Cress is often raised on porous earthenware vessels of a conical form, having small gutters on the sides for retaining the seeds. These are called pyramids: they are somewhat ornamental in winter, and afford repeated gatherings. This species is the λεπίδιον of Dioscorides, 2. 203.

L. campestris has downy leaves, the upper ones toothed, the lower ones oblong and narrowed into a foot-stalk, the stem leaves lanceolate, sagittate, and amplexicaule. It is distinguished from the other species by the pouch being ovate, rough, and covered with minute scales, notched and rounded at the end, the style scarcely longer than the notch. It grows on dry gravelly soil in Great Britain.

L. latifolium has ovate lanceolate leaves, serrated or entire; the pouch is oval and downy. It has numerous small flowers in compound leafy panicled clusters. It is a native of Europe, also of Algiers, and of several parts of England generally near the sea. It has a very hot biting taste, and has been used instead of horse-radish, occasionally as a salad; the poor people are in the habit of eating it as a condiment to their food, hence it has acquired the name of *Poor Man's Pepper*. An infusion of it acts as an emetic. Fraas believes this to be the κράμβη ἀγρία of Dioscorides, 2. 147, although it is usually referred to the Brassica eretica. It is also the Lepidium of Pliny, 20. 17. 19. δ.

The green-house species will thrive well in any kind of light soil, and are readily propagated hy cuttings planted under a hand-glass, or by seeds. The hardy perennial species, by dividing at the roots or hy seeds, will grow in any kind of soil. The hardy annual kinds only require to be sown in the open ground. None of the species are worth cultivating for ornament.

(Don, *Gardener's Dictionary*; Babington, *Manual of British Botany*; Fraas, *Synopsis Floræ Classicæ*; Burnett, *Outlines of Botany*.)

LEPIDOPUS. [TÆNIOIDES, P. C. S.]

LEPIDO'TUS, a genus of fossil ganoid fishes, abundant in the oolitic strata. (Agassiz.)

LEPISMA. [THYSANURA, P. C. S.]

LEPRA. [SKIN, DISEASES OF, P. C. S.]

LEPTACANTHUS, a genus of fossil placoid fishes, occurring in the carboniferous and oolitic strata. (Agassiz.)

LEPTÆNA, a subdivision of the great family of fossil

Brachiopoda, proposed by Dalman to include species which Mr. Sowerby named Producta. Its use is at present more restricted, and has become rather indefinite. Leptæna lata of the Silurian system may be regarded as a frequent type. The species are extinct, and are confined to palæozoic strata.

LEP'TIDES, Two-winged Flies (*Diptera*), of the division *Tanystoma* in Latreille's arrangement. They are remarkable for the habits of their larvæ, which excavate funnel-shaped cavities in the sand, and secreting themselves at the bottom, lie in wait for their prey. When an insect falls into the pit the larva of the *Leptis* suddenly rising seizes it, and clasping the body sucks out the juices, after which it flings away the carcass.

LEPTOCE'PHALUS, a remarkable fish of the Eel tribe, discovered on the British coast in Pennant's time, and since observed in the Mediterranean. The *Leptocephalus Morrisii* is a small, slender, and compressed animal, as thin as a piece of tape, and at first sight resembling a marine worm. The head is extremely small and short, the eyes large, the jaws furnished with numerous minute teeth; the pectoral fins and gill openings very small, and the anal and dorsal fins connected with the tail. The outline of the body resembles that of the Lancelet (*Branchiostoma*); but the organization of the *Leptocephalus* is that of a perfect fish. Mr. Yarrell describes the vertebræ as having no spinous processes. It lives among seaweed.

(Montagu in 2nd vol. of the *Wernerian Memoirs*; and Yarrell, *British Fishes*, vol. ii.)

LEPTO'LEPIS, a genus of fossil ganoid fishes, occurring in the liassic strata.

LESCOT, PIERRE, a French architect of the sixteenth century, of whom, however, nothing is distinctly known, but he is generally supposed to have designed and commenced, together with Jean Goujon, the present palace of the Louvre for Francis I. and Henry II.; the exact time is a matter of uncertainty. Lescot was born, according to some accounts, about 1510, and he lived to the age of sixty; other accounts give the dates 1518 and 1578 as the years of his birth and death. He erected the southern and western sides of the quadrangle, but all that now remains by Lescot is the western side, facing the Tuileries, known as the *Vieux Louvre*; it contains the antient Salle des Gardes, or Salle des Cent-Suisses, with the caryatides of Goujon, whence its modern name of Salle des Caryatides.

Lescot's style and services to architecture have been the subjects of various speculations; but they are all extremely vague, and amount to very little. By some he is supposed to have been the first to abandon the old irregular Gothic, and to have introduced the Italian style into France; but this was done by Italian artists themselves, several of whom were employed by Francis I. long before Lescot could have attained anything like mastery in his art, or even maturity of years. Fontainebleau is an instance, in which Serlio, Primaticcio, and others were employed by Francis I.

Lescot is said also to have designed the 'Fontaine des Innocents,' attributed by some to Goujon, the sculptor of the nymphs upon it. Lescot was Abbé of Cluny or Clugny, and a canon of the Cathedral of Notre Dame.

(Sauval, *Antiquités de Paris*; *Voyage Pittoresque de Paris*; Clarac, *Musée Royale des Antiques du Louvre*; Quatremère de Quincy, *Dictionnaire Historique d'Architecture*, &c. &c.)

L'ESPINASSE, MADEMOISELLE, the name of a lady much celebrated in the Parisian literary circles soon after the middle of last century, was born in 1732. She is supposed to have been the illegitimate daughter of people of rank. She was employed to read to and converse with Madame du Deffand in her blindness; but being ambitious, well-informed, and eloquent—endowed with much of what the French call l'esprit—she attracted the interest of the circle surrounding Madame du Deffand to an extent which greatly displeased that lady. She dismissed Mademoiselle, who had the boldness to plan, and the ability to execute, the collection of a brilliant literary circle round herself. In 1764, when D'Alembert fell ill she nursed him with zeal, and thenceforth he resided in her house. Marmontel, who in his Mémoires has given a very full account of this lady, states that she made divers attempts to accomplish a high matrimonial alliance, and in one instance induced the relations of a noble Spaniard on whom she had made an impression to allow him to return to France, by procuring a false medical certificate that it was necessary to his health. Morellet, the uncle-in-law of Marmontel, however, in his Mémoires throws doubt on this story. She died in 1776, to the great grief of D'Alembert, whom she had long mortified by not returning his affection. Three volumes of her love-letters, conspicuous for very ardent eloquence, were published in 1809.

LETTER OF CREDIT. [CREDIT, LETTER OF, P. C. S.]

LETTERS, THREATENING. [THREATS, P. C.]

LEUCISCUS, a genus of fishes of the family *Cyprinidæ*, distinguished by having short and soft anal dorsal fins, and a mouth unfurnished with barbules. There are many species, well-known inhabitants of the rivers of Europe. Those best known in Britain are the Roach (*Leuciscus rutilus*), the Dace (*Leuciscus vulgaris*), the Chub (*Leuciscus cephalus*), the Rudd (*Leuciscus erythropthalmus*), the Bleak (*Leuciscus alburnus*), and the Minnow (*Leuciscus phoxinus*). More rare are the Graining (*Leuciscus lancastriensis*) and Azurine (*Leuciscus coeruleus*), formerly supposed to be peculiar to the north of England, but stated by Agassiz to inhabit certain Swiss lakes. The Dobule (*Leuciscus dobula*), a native of the rivers of Western Germany, has been taken by Mr. Yarrell in the Thames, and the Ide (*Leuciscus idus*) is doubtfully recorded as a native of Scotland. Most of these fishes are sought after by anglers, either for the sport they afford or to be used as bait for pike. None of them are very excellent as food. The roach and chub have been known to attain a weight of five pounds.

The scales of several of these fishes have been used in the manufacture of artificial pearls. 'On the inner surface of roach, dace, bleak, whitebait, and other fishes,' writes Mr. Yarrell, 'is found a silvery pigment which gives the lustre those scales possess. Advantage has been taken of the colouring matter thus afforded to imitate, artificially, the oriental pearl. When this practice was most in fashion, the manufactured ornaments bore the name of patent pearl, and the use was universal in the bead-trade for necklaces, ear-drops, &c. At present it seems confined to ornaments attached to combs, or small beads arranged with flowers for head-dresses. So great was the demand formerly at particular times, that the price of a quart-measure of fish-scales has varied from one guinea to five. The Thames fishermen gave themselves no trouble beyond taking off the side scales, and throwing the fish into the river again; and it was the custom for hawkers, regularly, before selling any white-fish, as they were called, to supply the bead-makers with the scales. The method of obtaining and using the colouring matter was, first carrying off the slime and dirt from the scales by a run of water; then soaking them for a time, the pigment was found at the bottom of the vessel. When thus produced, small glass tubes were dipped in, and the pigment injected into thin hollow glass beads of various forms and sizes. These were then spread on sieves and dried in a current of air. If greater weight and firmness were required, a further injection of wax was necessary. Of this pigment, that obtained from the scales of roach and dace was the least valuable; that from the bleak was in much greater request; but the whitebait afforded the most delicate and beautiful silver, and obtained the highest price, partly from the prohibitory regulations affecting the capture of this little fish, the difficulty of transmission, and rapid decomposition.' (*History of British Fishes*, vol. i.)

LEVANT COMPANY. In 1581 Queen Elizabeth granted to a company the exclusive right of trading to Turkey. This was the origin of the Turkey or Levant Company. Its exclusive privileges of trade extended to the dominions of the Grand Seignor, whether in Europe, Asia, or Africa. Factories were established, and the company was at the cost of supporting an English ambassador at Constantinople, and consuls at Aleppo, Smyrna, and other places. Adam Smith speaks of the Turkey Company in his time, seventy or eighty years ago, as 'a strict and oppressive monopoly.' The Turkey Company surrendered its charter in 1825.

LEWIS, MATTHEW GREGORY, a writer of novels, poems, and dramatic pieces, was born at London on the 9th of July, 1775. His father was deputy secretary-at-war, and was connected with many families of rank and wealth. Lewis studied at Christ Church, Oxford, and afterwards lived for some time in Germany. There he became acquainted with Göthe and his followers, and imbibed the mysterious and tragic spirit of which his writings are full. Previously to his residence in Germany, when only sixteen years old, he wrote a successful comedy, called 'The East Indian.' The novel by which he is chiefly known, 'The Monk,' was published in 1794, when he was in his twentieth year. In the skilful employment of supernatural and mysterious agencies, and the display of horrors, it is, perhaps, unrivalled in the English language. A considerable portion of its details are devoted to the operations of the lustful passions on the character of a man violent and unscrupulous in his nature, but under the restraint of monastic vows. The young novellist drew the character broadly and offensively; and the singular lubricity of a performance, calculated by its genius and adaptation to the taste of novel readers to be extensively circulated, excited much indignation. It is understood that the Society for the Suppression of Vice applied to the Attorney-General to take legal steps against Lewis. These attacks only swelled the author's fame. At that time it was rather favourable to the success of a work of genius that its morality was not perfectly pure, and Lewis had the satisfaction of being a much courted and slightly abhorred man. His character, as represented in his published letters, is singularly at variance with that which might be derived from the study of his works. He appears to have been good-hearted, simple, affectionate, and not addicted to any vice. He had a very difficult part to maintain in his intercourse with his parents, his mother having, on account of her levities, long been separated from her husband. Although he could not vindicate her conduct, he gave her his kindest sympathies. It is a singular circumstance in his life, that, after having lived for some time on bad terms with his father, the latter dying in a temper which precluded the son from any hope of succession, yet left him, with slight exceptions, his whole fortune. This event made Lewis a rich West India proprietor. He was very kind to his slaves, and his occasional visits to his estates in Jamaica were welcomed as occasions of public rejoicing both among his own slaves and those in the neighbourhood of his estates. His poetical pieces, including 'Alonzo the Brave,' 'Bill Jones,' &c., are well known: they are distinguished by the fluency of their versification, and the distinctness and power with which they narrate horrible and tragical incidents. There is, however, in all his writings, a tone of barbarous and exaggerated taste. In 1812, he introduced to the stage the drama of 'Timour the Tartar,' which is said to have had much influence in creating the taste for gorgeous pageants, from which the British stage has for some years been struggling to relieve itself. Lewis died at sea, on the 14th May, 1818, when on the way home from a visit to his Jamaica estates.

(*Life and Correspondence of Matthew Gregory Lewis*, 8vo., London, 1839.)

LEYDEN, LUCAS VAN, a very celebrated old Dutch painter and engraver, was born at Leyden in 1494. He was first instructed in the arts by Hugh Jacobzc, his father; afterwards by Cornelis Engelbrechtsz; and he distinguished himself even as a boy by his engravings, and was a famous painter as early as his twelfth year. He painted in distemper a picture of St. Hubert, in 1506, for a citizen of Leyden of the name of Lokhorst, who was so astonished and gratified at the excellence of the work, that he paid him twelve gold pieces for it, one for each year of his age; at that time doubtless a very large sum for a picture. Some of Lucas's early engravings are highly prized by print-collectors, and accounted among the greatest rarities of their class: they owe their value, however, much more to their time and the peculiar circumstances of their origin, than to any intrinsic merit they may have. They are better as engravings than as works of art. Vasari speaks highly of the prints of Luca d'Ollanda, as he is called by the Italians. He excelled in aërial perspective, but he was far surpassed by his two contemporaries, Albert Dürer and Marcantonio—in correctness of drawing by the latter, and in execution and in drawing by the former. Albert Dürer visited Lucas at Antwerp in 1521, and he makes the following note in his journal: 'I was invited to dinner by master Lucas, who engraves in copper: he is a little man, and is a native of Leyden.' This visit was paid during a journey which Lucas made through Zealand, Flanders, and Brabant, for the sake of becoming acquainted with and seeing the works of their various painters. The entry above quoted from the pocket-book of Albert Dürer, fixes the date of this journey six years earlier than the account of Van Mander, who says that Lucas made it when he was about thirty-three years of age, which, according to his own date of Lucas's birth, 1494, would be in 1527.

Lucas, who was well to do in worldly matters, fitted up a small vessel or sloop expressly for this journey; and at Middelburg, where he entertained the painters of the place with a feast which cost him sixty florins, he persuaded Jan de Mabuse to join him, and they made the excursion together, both clad more like princes than artists. It was a succession of feasts, and Lucas repeated the entertainment of Middelburg at Ghent, at Antwerp, and at Mechlin. He, however, was not less energetic in his pleasures than at his work, and he indulged during this excursion in a round of dissipation which appears to have lastingly injured his constitution: he was never well afterwards. His own vanity led him to account for his illness by the supposition that some of his rivals whom he had entertained had endeavoured to poison him, and he added to his malady by indulgence and despondency. He allowed his mind to fall into such a morbid state that his physical strength left him, and he passed nearly the whole of the last few years of his life in bed, or at least in the sick-room, still, however, working at occasional intervals. He died in 1533, aged only thirty-nine.

Lucas's pictures are very scarce; they are in the old Flemish style, but are among the best works of that school. They are earnest, expressive, deeply coloured, and executed with great care; and are beautiful and highly interesting, notwithstanding their Gothic forms and arrangement: in the perspective of colour they are in advance of their time. The galleries of Vienna, Berlin, Dresden, and Munich possess a few good pictures by Lucas; his own portrait is in the Berlin Gallery. There is a very small curious picture by him in the collection of the Duke of Devonshire, at Devonshire House; it represents a man having a tooth drawn, while a woman is picking his pocket: there is a print of it, of the same size, by Lucas himself, dated 1523. There is a picture also by Lucas at Wilton House, and another at the Liverpool Institution. Mr. Rogers, the poet, possesses a pen-and-ink drawing of the portrait of the Emperor Maximilian I., of which the print by himself, is considered by some his best engraving. A picture of the 'Last Judgment,' one of his most remarkable works, is still in the town-house at Leyden. The print of Eulenspiegel, a notorious clown or jester of the fourteenth century, is the rarest engraving in existence: there are said to be not more than five or six of the original extant, but it has often been copied, and the first copy was made in 1644 by Hondius, when the price of the original, even at that early time, was fifty ducats; it is about six and a half inches high and rather better than five wide, and represents a man playing the bag-pipes, with two children on his back, followed by a woman who is also carrying a child, and is leading an ass burdened with two panniers in which are three other children; the whole family is preceded by a small figure dressed in a cowl, with a stick in one hand and a jug in the other, an owl on his shoulder, and a dog walking before him—this is Eulenspiegel; it was engraved in 1520. Bartsch, who published a distinct catalogue of the prints of Lucas van Leyden, describes 174 engravings by him; in all, including wood-cuts, his prints amount probably to about 200.

(Van Mander, *Het Leven der Schilders;* Bartsch, *Catalogue Raisonné de toutes les Etampes qui forment l'Œuvre de Lucas de Leyde*, and *Peintre Graveur*, vol. vii.; Huber, *Manuel des Amateurs*, &c.; Von Quandt, *Entwürfe zu einer Geschichte der Kupferstecher-kunst;* Van Eynden and Van der Willigen, *Geschiedenis der Vaterlantsche Schilder-kunst*, &c.)

LIBEL. [LIBEL, P. C.] The Act of 6 & 7 Vict. c. 96, entitled 'An Act to amend the law respecting defamatory words and libel,' has made some alterations in the law of defamation and libel. The Act commences with the preamble, 'For the better protection of private character, and for more effectually securing the liberty of the press, and for better preventing abuses in exercising the said liberty, be it enacted,' &c. The Act enacts—§ 1, That in any action for defamation it shall be lawful for the defendant, subject to a certain notice in writing therein described, to give in evidence in mitigation of damages, that he made or offered an apology to the plaintiff for such defamation at such time as in the said section is more particularly described.

§ 2 enacts, That in any action for a libel contained in any public newspaper or other periodical publication, it shall be competent to the defendant to plead that such libel was inserted without actual malice and without gross negligence, and that at such time as the section mentions he inserted in such newspaper or other periodical publication a full apology for the said libel, or made such other apology as in the said section is more particularly described.

§ 3 enacts, That if any person shall publish any libel upon any other person, or shall directly or indirectly threaten to print or publish, or shall directly or indirectly propose to abstain from printing or publishing, or shall directly or indirectly offer to prevent the printing or publishing of any matter or thing touching any other person, with intent to extort any money or security for money or any valuable thing from such or any other person, or with intent to induce any person to confer or procure for any person any appointment or office of profit or trust, such offender on conviction may be imprisoned for any term not exceeding three years. This enactment does not in any way affect any law as to the sending or delivery of threatening letters or writings. [THREATS AND THREATENING LETTERS, P. C.]

§ 4 enacts, That if any person shall maliciously publish any defamatory libel, knowing the same to be false, on conviction he shall be liable to two years' imprisonment, and to pay such fine as the court shall award.

§ 5 enacts, That if any person shall maliciously publish any defamatory libel, on conviction he shall be liable to fine or imprisonment, as the court may award, but the imprisonment is not to exceed one year.

§ 6 makes an important change. It enacts, That on the trial of any indictment or information for a defamatory libel, the defendant having pleaded such plea as in this section is afterwards mentioned, the truth of the matters charged may be inquired into, but shall not amount to a defence, unless it was for the public benefit that the said matters charged should be published. The defendant must in his plea to such indictment or information allege the truth of the matters charged in the manner that is required in pleading a justification to an action for defamation.

§ 7 enacts, That when on the trial of any indictment or information for the publication of a libel, under the plea of Not Guilty, evidence shall have been given which shall establish a presumptive case of publication against the defendant by the act of any other person by his authority, it shall be competent to the defendant to prove that such publication was made without his authority, consent, or knowledge, and that the said publication did not arise from want of due care or caution on his part.

§ 8 enacts, That in the case of any indictment or information by a private prosecutor for the publication of any defamatory libel, if judgment be given for the defendant, he shall be entitled to recover from the prosecutor the costs that he has sustained by reason of such indictment or information; and that upon a special plea of justification to such indictment or information, if the issue be found for the prosecutor, he shall be entitled to recover from the defendant the costs sustained by him by reason of such plea.

This act does not extend to Scotland, § 10. As it was doubted whether or not it did extend to Ireland, this act was extended to Ireland by 8 & 9 Vict. c. 75.

Defamation and libel were punished among the Romans. The oldest extant rule about defamation and libel is contained in the fragments of the 'Twelve Tables,' which punished both slanderous words and libellous writings. (Cicero, *De Repub.*, iv. 10.) The penalty was capital (in the Roman sense of that term), and it appears to have been death. Libellous writings were generally denominated 'famosa carmina' and 'mala carmina.' In course of time the Praetorian Edict modified the old law, or probably it fell into disuse. The praetor allowed an action for slander which was against 'boni mores' (*Dig.* 47, tit. 10, s. 15); and against 'boni mores' means, that which was disapproved of by the morality of the community, and tended to bring infamy or odium on the person against whom it was directed. The technical word for this kind of 'slander' was Convicium, which properly meant something said to a man's face that was injurious; but the commentators on the Edict laid it down that there might be Convicium even if the person against whom it was directed was not present. Convicium in fact was personal abuse which tended to damage a man, and was said with circumstances of great publicity. But the Praetor's Edict extended to other cases, and allowed an action wherever a man had done or said anything which injured a person's character. This general clause included libellous writings, and many other things, such as certain modes of soliciting women's chastity, and addressing them in obscene language. The penalty in all these cases was a sum of money assessed by Recuperatores as damages.

Under the imperial government the term 'liber famosus' often occurs: it signifies any writing in prose or verse which tended to injure a man's character (ad infamiam alicujus). The offence consisted in writing the libel, spreading it about or selling it, or in causing these things to be done maliciously (dolo malo); it made no difference whether the libel was anonymous or had a false name to it. The penalty was (according to some law, the name of which is not known), that the libeller, if convicted, became 'intestabilis,' that is, he could not make a will or be a witness to a will. (*Dig.* 28, tit. 1, s. 18.) A senatûs consultum extended the penalties of this lex to cases where there was no writing, but only marks which were of a like tendency; this must mean drawings and caricatures, such as are now published in London. Everything therefore which tended to the 'infamia' of a person, writings in prose or verse, and drawings, whether a man was mentioned or not mentioned, provided the person intended was clearly pointed at by such writings or drawings, were punishable offences; and writer, draftsman, and all concerned were liable to the legal penalty.

This legislation seems to belong to the Imperial period, though it was not intended to protect the emperor only. Augustus commenced this legislation (Sueton. *Octavian.*, 55), and probably his chief object was to protect himself. The Roman Cæsars, like other high personages in modern times, were the objects of pasquinades and various kinds of compositions which were intended to satirize them and make them ridiculous. The penalty of the law of Augustus is not certain; but in later times various Senatus consulta increased the penalty to Deportation or perhaps only relegation. If the author of a liber famosus had been punished in a criminal prosecution (judicium publicum), the injured person might still have his action, if he was mentioned by name in the libel. (*Dig.* 47, tit. 10, s. 6.) But if a man libelled a guilty person (nocens), it was considered equitable that he should not be subject to any legal penalty, 'because the bad deeds of evil-doers ought to be known, and it was expedient that they should be known.' Compare the 6 & 7 Vict. c. 96, § 6.

The 'libri famosi,' or 'libelli famosi,' of the Imperial period, signified anonymous writings, which contained a charge against some person, and were either sent to the Cæsar or to some magistrate, or put in some place where they might be found, for the purpose of causing injury to the person accused This is the only signification of the expression 'libelli famosi,' in the Theodosian and Justinian codes Constantine the Great declared that such charges should not prejudice any person who was mentioned in them, and that such writing should be burnt when the author was unknown. If the author was discovered, he was punishable even if he could prove the truth of the matter contained in the writing. Other constitutions on the same subject were made after the time of Constantine.

(Rein, *Das Criminalrecht der Römer*.)

LIBEL (Ecclesiastical Law). [ECCLESIASTICAL COURTS, P. C. S.]

LIBELLULA, the genus of insects which includes the well-known Dragon-Flies. It belongs to the order *Neuroptera* and to the section *Subulicornes* in the arrangement of Latreille. The dragon-flies have horny strong mandibles and maxillæ, covered by the labrum and labium; their tarsi are three-pointed; their wings are equal; the posterior extremity of the abdomen is furnished with hooks or peculiar appendages. The size, beauty, and habits of these insects have rendered them favourite objects of study with the entomologist. In the larva state they live entirely in the water, engaged in unceasing war with other insects, which by singular devices they entrap and devour. Their pupa state is also passed in water, and, contrary to the usual habit of insects, is a period of activity and locomotion. They are then furnished with an extraordinary mask formed out of that part of the head which replaces the lower lip, and by which they cover the jaws and the whole under part of the head. They use it to alarm and seize their prey, projecting it at will. When perfect insects, they become inhabitants of air, and are endowed with extraordinary power of flight and precision of movement, performing astonishing evolutions. Their habits continue as ferocious as they were before. When taken and imprisoned, they have been known to devour their own bodies! Several valuable monographs have been published on these interesting insects by De Geer, Roesel, Vander Linden, and Charpentier; but the most important and most recent is that of the distinguished Belgian zoologist M. de Sells Longchamps, entitled 'Monographie des Libellulidées d'Europe.' In this work 61 species are described, arranged under the genera *Libellula, Cordulia, Lindenia, Gomphus, Cordulegaster, Æshna, Anax, Calepteryx, Lestes, Sympecma*, and *Agrion*.

In the arrangement of Westwood ('Introduction to the modern Classification of Insects') the genera of *Libellulidæ* inhabiting Britain are grouped under two sub-families, *Libellulides* and *Agrionides*. The following table exhibits the chief characters of the British genera:—

Sub-fam. 1.—LIBELLULIDES.

A. Ocelli in a row . . .	*Anax* (1 species): anal angle of posterior pair of wings rounded. *Æshna* (7 species): anal angle of posterior pair of wings more or less angulated in the male. *Cordulegaster* (1 species): anal angle of posterior wings strongly angulated.
B. Ocelli in a line; eyes remote	*Gomphus* (2 species).
C. Ocelli in a triangle .	*Cordulia* (3 species): anal angle of posterior wings angulated in the male. *Libellula* (15 species): anal angle of posterior wings rounded in both sexes.

Sub-fam. 2.—AGRIONIDES.

A. Wings membranous	*Agrion* (13 species): stigma rhomboidal; areolets mostly quadrangular. *Lestes* (3 species): stigma oblongo-quadrate; areolets mostly pentagonal.
B. Wings coriaceo-membranous; stygma obsolete	*Calepteryx* (4 species).

LI'BERI, PIE'TRO, Cavaliere, was a celebrated painter of Padua, where he was born in 1605. He was the pupil of Padovanino, and is considered by some the best draftsman of the Venetian school of painters. He studied in Rome, at Parma, and in Venice, and his works are not distinguished by the peculiar characteristics of any particular school, but are equally conspicuous to a certain degree for the qualities of all. There are several great works by him, as the Slaughter of the Innocents, at Venice; Noah leaving the Ark, at Vicenza; and the Deluge, at Bergamo: he executed also many works in Germany. He was very fond of painting the nude, and particularly naked Venuses, which from their character acquired him the name of Libertino. Liberi had two manners; at one time he was bold and careless, and at another minute and laborious: this variety he explained to be intentional; he said that for the expert and intelligent he painted freely, but for the ignorant he finished highly. He died in 1687.

(Zanetti, *Della Pittura Veneziana;* Lanzi, *Storia Pittorica*, &c.)

LIBERTY. This word is the Latin *libertas*. The corresponding Teutonic word is *freiheit*, or, as it appears in English, *freedom*.

Liberty and freedom are familiar words with indefinite meanings. 'Liber,' the adjective which corresponds to the noun 'libertas,' is properly opposed to 'servus,' or slave; and libertas is the status of a freeman, as opposed to servitus, or the status of a slave. This division of freemen (liberi) and slaves (servi) was the fundamental division of persons in the Roman law (Gaius, i. 9). This word Liberty, then, in its origin indicates merely the personal status of a man as contrasted with the condition of servitude. In Greek the like opposition is expressed by two other words (δεσπότης, δοῦλος). But the word Libertas had also a political meaning among the Romans. When the Romans had ejected their last king, they considered that they had obtained their Liberty. (Livy, ii. 1.) The political meaning of libertas (liberty) was derived from the contrast of liberty and servitude in the person of individuals; and if the mass of a nation were subjected to the arbitrary rule of one man, that was considered a kind of servitude, and the deliverance from it was called libertas, a term which in this sense is clearly derived from the notion of liberty as obtained by him who was once a slave.

In the Greek writers the words (δεσπότης and δοῦλος), which respectively signify master and slave, were also applied in a political sense to signify monarch and subject. The Persian king was master (δεσπότης), and his subjects were slaves (δοῦλοι).

The political sense then of liberty and freedom, if traced to its source, is founded on the notions of personal liberty as contrasted with personal servitude. He who became free from being a slave in a republic became a member of the state, in which he formerly had no political existence. It is implied by the circumstance of his becoming free that he became a citizen, though positive law, as among the Romans, might limit the degree in which he thereby obtained citizenship. [CITIZEN, P.C. S.] Slavery may and did exist in many states of antiquity which were under monarchical or tyrannical rule; but he who was the slave of an individual in any such state, and obtained his freedom, did not thereby become a citizen, but was merely released from the duty that he owed to his master: he still owed together with others the duty of perfect obedience to an individual monarch or tyrant.

The words liberty and freedom, as political terms, have always been used to express a condition of a people in which they are to some degree at least secured against the arbitrary rule of an individual or of a small number of persons; and the word slavery, in its political sense, is applied to nations in which the mass of the people have not reasonable security for their lives and property against the capricious rule of one man or of a number of persons who form a small minority of the whole.

That which is really meant by political freedom and liberty is nothing more than a form of government which shall in some degree at least secure to the people the enjoyment of life and of their property against the tyranny of one man or of a few. Freedom and liberty then are terms which can only be applied to constitutional governments [CONSTITUTION, P. C.], and to republics, in the proper sense of that term. There is no political liberty or freedom under any other form of government, though under a monarchy, when the administration is good, there may be in many respects more personal freedom than there is in a pure democracy. But the essential quality by which political liberty or freedom is distinguished is simply this: the sovereign power is not in the hands of one or of a small minority, but it is either distributed among the whole community or a considerable part of it.

Political liberty does not exist in some civilized nations in Europe, in Prussia for instance. Political liberty does not exist in Russia. In some countries where it does not exist, it is the general opinion that its existence would be a benefit to the whole nation. In other countries the mass of the people are still in such a condition that political liberty could not exist, for political liberty, as already stated, means that the sovereign power must be in the hands of a large number, and they must possess intelligence enough to enable them to exercise and keep the power; but there are nations where the mass of the people are too ignorant to exercise or keep any political power.

The highest degree of political liberty is in a Democracy [DEMOCRACY, P. C.]; for it is that form of government which is furthest removed from a monarchy. The relationship of monarch and subject is the like relationship to master and slave.

A nation which strives for its liberty strives for a popular form of government, whether it be a constitutional kingly form or a democracy. But Liberty is a specious word, often ill understood; and many who have cried out for liberty have either not considered exactly what it is they want, or they have supposed that liberty would free them from many evils which they consider to be peculiar to a state of political slavery. It is now generally admitted, that in those states where a large part of the population have equal political knowledge with the few, who direct administration, the general interests are best served by this large number participating in the government. Political liberty then, to some extent or degree, is, in many countries, necessary for securing the advantages of good administration. But there are many evils incident to states, which are not due to the want of political liberty; and it is therefore a matter of importance for those who would make changes in government to consider whether the evils of which they complain are owing to the want of political liberty or to other causes.

The notion of political liberty has been based upon the analogy already pointed out between Political Liberty and Personal Liberty; which is a false analogy, though an historical one. Man, it has been assumed, is naturally free. No man is naturally or by nature another man's slave. As no man, it is said, is naturally a slave, so all mankind have naturally a right to political liberty, and just government, it is said, arises from the consent of the governed.

On these assumptions rests the American Declaration of Independence: 'We hold these truths to be self-evident: that all men are created equal; that they are endowed by their Creator with certain inalienable rights; that among these are life, liberty, and the pursuit of happiness; that to secure these rights governments are instituted among men, deriving their joint powers from the consent of the governed,' &c.

In this passage Liberty seems to mean the personal status, which is opposed to slavery; and it is on the assumption of the equality by birth and the endowment of all men with certain inalienable rights, that this instrument would found the American title to Political Liberty. It involves the doctrine of the social contract, and assumes, as an historical fact, an origin of governments by consent of the governed. It was also promulgated in a country in which a very large number of persons were then slaves and still are slaves.

If theories of government are to be tested by historical facts, it would be consistent with such facts to say, that men are not created equal; that they have not been endowed with liberty, for a large part of them have always been slaves; and that governments have been constituted without the consent of the governed. These are real facts: those assumptions are untruths.

Political liberty rests on no such sorry basis as the Declaration of Independence places it on. That nation which can obtain it and maintain it is in a better condition than if it were politically a slave, even to the wisest of masters; and when it is able to obtain and maintain that liberty, it is right, or in other words it is for the general interest, that a nation should, by force if necessary, alter that form of government which is political slavery.

That liberty promises to be most stable which is the growth of long time and the result of a perpetual struggle between a master and his slaves, in which the master has not ceased to be master all at once, but has always lost something in the contest.

That which is of sudden growth or is the offspring of Revolution, is often premature, and always insecure; for liberty so acquired may only be a step from a state of political slavery to a more wretched state; it may be a step from a state of slavery, mild and tolerable, to an anarchy, which of all things is most intolerable.

The words Liberty and Equality often go together, and each of them in so doubtful a sense that one hardly knows what to make of them. Liberty is often used, apparently without people considering what they really mean, in the sense of freedom from restraint. But this kind of Liberty is inconsistent with Political Liberty properly understood; and all men's liberty of action is and must be restrained by positive laws in every well-ordered community. Every law that forbids any act directly or by implication abridges Liberty, and such abridgment is always a universal benefit when the law which so abridges liberty only abridges it in cases where it is useful to all that it should be abridged, and where the law is so framed as to accomplish that object. Equality, in its unlimited sense, can no more exist in any state than perfect individual liberty; for if each man is left to exercise his industry in the best way that he can, without interfering directly with the industry of others, some will be richer, and happier, and wiser than others. The only Equality that can be approached to in a well-ordered state is that Equality which is the result of a good polity, which polity, so far as it is consistent with the universal good, secures alike to every individual in the State the free enjoyment of his industry, wealth, and talents, imposes restraint on all alike, and makes all alike bear the burden of taxation and of the services due to the State. Further, it gives to as large a number as it can, consistently with the universal interest, an equal share in the sovereign power; but no polity that has ever yet been framed has ever given an equal share in the sovereign power to all the members of a community: such an Equality is impossible.

The Declaration of Rights published by the French National Assembly in 1791 contains the words 'free,' 'equal,' 'rights,' 'liberty,' and many others, all of which are used in a manner as remote from precision as the most confused understanding could suggest. This strange sample of nonsense has been examined and dissected by Bentham in his 'Anarchical Fallacies' (Bentham's *Works*, part viii., Edinburgh, 1839).

The word Liberties is often used to express those particular constitutional principles or fundamental laws by which the political liberty of a nation is secured. If the British parliament should attempt to abolish the trial by Jury in all cases, or the Habeas Corpus, such an attempt would be called an attack on the liberties of Englishmen.

LICI'NIO. [PORDENONE, P. C.]

LIGAMENTS, in Anatomy, the organs by which the various articulations of the animal body are held together. [ARTICULATION, P. C.] They are generally very strong membranes, and in their structure and composition resemble tendons. [TENDON, P. C.] They are in most instances attached to two bones, and assist in the formation and strengthening of the joints. Ligaments are of various forms: some completely enclose the joint as in a case or capsule, and are then called capsular ligaments, as is seen in the knee, hip, and shoulder joint; others form straight bands passing from one bone to another; whilst others, again, are inserted into the heads and cavities of bones within the joints. For the composition and chemical characters of the tissue forming the ligaments see TISSUES, ANIMAL, P. C. S.

LIGHT, ABSORPTION OF. [ABSORPTION OF LIGHT, P. C. S.]

LIGHT-BALLS, for military purposes, are hollow cases, either spherical or in the form of cylinders, terminated at each extremity by a hemisphere: they are filled with a combustible composition, and being thrown, by night, in a burning state from mortars, or in some cases from the hand, they serve to discover the working-parties or troops of the enemy.

The spherical cases are made of canvas or cartridge-paper, cut into eight equal gores of a proper form and the edges sewn together, a hole being left for the introduction of the composition and the application of a fuze. The oblong cases consist, frequently, of two hollow hemispheres of iron, which are connected with each other by four slender bars of iron attached to their bases, in positions parallel to the axis of the case, and the whole is then covered with canvas: the entire length is about 1½ calibre of the piece of ordnance from which the ball is to be projected,—a mortar of one of the four different kinds, the calibre varying from 4⅖ inches to 10 inches.

The composition consists of pulverized saltpetre (6½ lbs.), pulverized rosin (1¾ lbs.), ground sulphur (2½ lbs.), and linseed oil (½ lb.). The dry materials, after having been passed through a sieve, are mixed with the oil while the latter is in a boiling state; and sometimes a small quantity of mealed gunpowder is added. The oblong balls are filled by passing the composition through a fuze-hole in one of the hemispheres, and are afterwards strengthened by cord wound about them. The fire is communicated to either kind of ball, at the time of being projected, by means of a piece of quick-match in the fuze.

Previously to besieging a fortified place, the works and the ground about them are reconnoitred, usually by night; the first trenches are also traced and formed during the hours of darkness, and therefore the defenders, at the commencement of the siege, prepare some mortars charged with light-balls: these balls being thrown beyond the glacis, enable them to discover the operations of the enemy, and direct a fire of shot against them. The assault of a breach is also frequently made by night; and in this case light-balls should be thrown by the defenders into the ditches of the place for like purposes. These may be made by merely filling granades with the composition above mentioned, and they may be thrown by hand.

Major-General Sir J. T. Jones states (*Journal of Sieges*), that the defenders of the towns which were besieged by the British army in Spain threw light-balls in order to discover the operations of the attack; and that two or three men of the engineers' brigade were kept in readiness to run up and extinguish them as they fell. That officer adds that the men generally succeeded, in a few seconds, in smothering them with filled sand-bags, or by shovelling earth over them. Some casualties are stated to have occurred among the men so employed, but the fire of the enemy being directed against them was thereby diverted from the working-party often employed at only a few yards' distance from the ball. On account of the great utility of such balls for illuminating the ground occupied by the enemy, Sir J. T. Jones recommended that grenades or other missiles should be connected with them by pieces of chain, in order that, through the risk of the explosion, men might be deterred from attempting to extinguish the light.

It may be added here that spherical cases of pasteboard or canvas filled with a composition which while burning emits a great quantity of smoke, are frequently discharged from mortars in order to conceal a movement of troops from the view of the enemy: they are also occasionally thrown from the hand either to suffocate the men employed in the galleries of military mines or to compel them to quit their work: these are called smoke-balls. The composition consists of mealed powder (5 lb.), pulverized saltpetre (1 lb.), pulverized seacoal (1½ lb.), pitch (2 lb.), and tallow (½ lb.): the pitch and tallow are melted together, and the dry materials, after being sifted, are mixed with the liquid.

LIGHTHOUSE. [SEA-LIGHTS, P. C. S.]

LIGHTS, ANTIENT. A Light is a right to the enjoyment of free access of light to a man's premises or buildings, which right must not be impaired by the building or erection of any object in such way as to obstruct the light. By the 2 & 3 Wm. IV. c. 71, § 3, an absolute right to light may now be acquired by twenty years' uninterrupted enjoyment, unless the use has been enjoyed by some consent or agreement made or given by deed or writing.

When a right to light has been established, he who occupies or owns the adjoining land cannot build in such manner as to obstruct the light. If such obstruction is built or erected, the person who is injured has an action on the case: and the Court of Chancery will in certain cases grant an injunction to restrain a person from making any erection or improvement which darkens or obstructs the usual lights or windows of an adjoining house. It will depend on the circumstances of the particular case, whether the new building or erection causes such a privation of light as to be an illegal act.

The right to the free enjoyment of Light belongs in the Roman law to the class of Servitutes (easements), among which were the Servitus altius non tollendi, ne luminibus officiatur, ne prospectui officiatur (Dig. 8, tit 2, s. 11, 12, 15-17). The general rule is thus expressed by Ulpian: 'He who shall attempt to obstruct his neighbour's lights, or to do anything else to damage them, must know that he ought to maintain the form and condition of the antient edifices. If you and your neighbour cannot agree about the height to which buildings may be raised which you have begun to erect, you will have the privilege of having an arbiter.'

It is said that according to the English law the stopping of a prospect is not a nuisance. The Roman law, as already observed, allowed a Servitus ne prospectui officiatur. The Roman rules of law as to easements in general are more precise than those of the English law.

LIGHTS, ARTIFICIAL. Within the last few years many new contrivances have been introduced for the illumination of apartments—by candles, by lamps, and by a sort of combination of both. The modes of illuminating large buildings have been explained in GAS, P. C.; BUDE LIGHT, P. C. S.; and DRUMMOND LIGHT, P. C. S.; while the articles ARGAND, P. C., and CANDLE, P. C., illustrated the common modes of domestic lighting. The recent inventions may be classed thus:—1, *Candles*; 2, *Candle-Lamps*; 3, *Oil-Lamps*; 4, *Spirit-Lamps*.

1. *Candles*.—Dr. Ure, in the Supplement to his 'Dictionary of Arts,' describes the mode adopted by Messrs. Hempel and Blundell, for making candles of palm-oil, margaric acid, and stearic acid or stearine. The palm-oil is melted in an iron pan, and then cooled gradually, by which it is separated into a liquid *oleine* or oil, and two solids, *stearine* and *margarine*. The oil being expelled by pressure, the solid fats are melted and mixed with quicklime; and the mixture is afterwards brought to a granulated state by the action of cold water. Muriate of lime and sulphuric acid are then employed to separate the quicklime from the solid fats; and the latter, after being washed, cooled, and crystallized, are pressed, whereby the stearine is separated from the margarine. The two are separately bleacbed; and the stearine goes through further refining processes, until it assumes the form of a pure and solid kind of palm-wax or hardened tallow, fit to make into candles in the usual way. The margarine, or margaric acid, obtained in this way, is mixed with common tallow to make another sort of candles.

Palmer's candles differ in many points from those in common use. In a patent obtained for them in 1842, one of the arrangements was intended to make the wick bend out of the flame, so as to come into contact with the atmosphere, and thereby render the troublesome process of 'snuffing' unnecessary; this consisted in impregnating one side of the wick with common paste or starch, which gave a greater stiffness and less combustibility to that side of the wick than to the other: this inequality of action gave a bending tendency to the wick. The same object is, however, now attained by having the wick in two halves, twisting spirally round each other; each half is bound round in a tolerably compact form; and the process of untwisting the spiral, by the gradual burning of the candle, causes the tops of the two wicks to spread out laterally beyond the boundary of the flame. The carbon or charred portion of the wick becomes then carried off or consumed, and the candle needs no snuffing. A particular mode of introducing the wick into candles, and a small apparatus for preventing the 'guttering' of candles, formed part of the patent of 1842.

The circumstance of palm-oil being in a solid state in our climate, coupled with an ascertained mode of separating it into three different substances, oleine, stearine, and margarine, has led to many suggested variations in the mode of making candles, by the mixture of one or more of these component elements with tallow or some kind of animal fat. There have also been patents taken out for new varieties of wick, and new forms given to the candle; but these do not involve any features which call for much notice.

2. *Candle-Lamps* or *Tallow-Lamps* is a designation under which may be grouped many recent contrivances, having for object the burning of solid tallow or fat instead of oil, but without having the tallow formed into a candle.

The *Soho* lamp, patented in 1840, is intended for burning solid tallow or some other kind of fat; although the lamp itself is very similar in shape to many of those used with oil. The tallow is brought to the form of a long cylinder like a candle without a wick, and is placed in the vertical stem of the lamp; there is a spiral spring beneath it, which presses it up close to a conical cap or cover at the top. A fixed tube passes up through the centre of the cylinder of tallow, from top to bottom; and in this tube is placed a cotton wick dipped in wax, the height of which above the top of the tallow can be regulated by a rack, pinion, and nut. The tallow or fat is made into a hollow cylinder in order to leave room for the central tube containing the wick. When the lamp is to be extinguished, the wick is drawn down below the top of the tube, and again raised before the tallow becomes cold.

The lamps or candlesticks now made for burning Palmer's candles, and which are indeed fitted for most kinds of candles, bear a good deal of resemblance to the above, in respect of having a conical cap to keep the candle within the tube, and a spiral spring in the lower part of the tube to press the candle upwards as it burns; but there is no necessity for the central wick tube, since the candles employed have wicks of their own. These candlesticks, and the candles belonging to them, offer the two conveniences of maintaining the light always at an equal height, and of dispensing with the aid of the snuffers. Some sort of shade or globe is necessary for realizing the latter of these two benefits fully; since the flame becomes very unsteady if the burning be effected as in a common candle.

One of the projects of this class consists in placing any kind of wax or tallow or fat into a receptacle, and having either hot water or hot metal beneath it, so as to keep it in a melted state, fitted to be used in the same manner as oil; but any method of keeping the water or the metal hot would seem likely to be a far greater inconvenience than any supposed good arising from the use of a solid food for the lamp. In another contrivance however, where the substance employed is either lard or tallow, there is a piece of metal which descends from the flame into the vessel containing the lard; and this metal, becoming heated by the flame, communicates this heat to the lard, and thus keeps it in a melted state. The inconvenience of such arrangements arises from the circumstance that the hot water or a heated piece of metal must be put into the lamp before lighting it, in order to melt the tallow. When this preliminary step is taken, the tallow is kept in a melted state by various means. One ingenious mode consists in having an air-tube within the wick, to carry air up to the flame, and two projections from this tube at the top, into the flame itself; so that the metal of which the tube is made, becoming heated at the upper end, speedily communicates heat to the contents of the lamp below.

There are many curious little pieces of mechanism, patented within the last few years, the object of which relates principally to the burning of common candles, or the mode of adjusting them into the candlesticks. One consists of a candle-shade constructed in a circular ring, which ring is suspended from a conical cap which rests on the top of the candle; as the candle burns, this cap sinks with it, and by that means the shade is kept at a constant height relatively to the level of the blaze, though not relatively to the level of the table on which the candlestick is placed. Another contrivance is intended to afford the means of adjusting any candle, large or small, to a large candlestick, by having a semicircular piece of brass, which is made to press against one side of the candle in the socket. A simpler contrivance for the same object consists of a pair of wedges, placed one on either side of the lower end of the candle. Another little piece of apparatus consists of a wire-frame for supporting a shade, and which is itself supported by having a sort of circular spring hoop, which clasps the candle.

3. *Oil-Lamps*.—One of the difficulties which have lessened

the usefulness of common oil-lamps is the tendency of the oil to thicken in cold weather; while another lies in the imperfection of the means for keeping the wick well moistened with oil up to the verge of the flame. Both of these matters have engaged attention within the last few years. Dr. Ure remarks (p. 134), 'The great cost of light from wax, spermaceti, and even stearic candles, as also the nuisance of the light from tallow ones, have led to the invention of an endless variety of lamps, of which the best hitherto known is undoubtedly the mechanical or Carcel lamp, so generally used by the opulent families in Paris. In this lamp the oil is raised through tubes by clockwork, so as continually to overflow at the bottom of the burning wick; thus keeping it thoroughly soaked, while the excess of the oil drops back into the cistern below.'

There is a lamp called the *Meteor* lamp, having some of the properties of the Carcel, but intended to burn rape-oil. The internal arrangements of this lamp are curious and complicated. The lower part of the pedestal consists of a reservoir for containing the oil; and in this reservoir is a kind of piston or plunger, worked up and down by a nut and screw from the outside; the rising of this piston occasions the pressure or tightening of a coiled spring, and this pressure causes the oil to be forced up a central tube towards the flame. The admission and regulation of the oil to the lamp, the adjustment of the wick, the arrangement of the air-holes for admitting draught, and of the gallery which supports the glass chimney, are all of an intricate kind, and, whatever may be their efficiency while in good order, would render the repair, in case of damage, a serious matter.

One of the modes adopted for maintaining the oil in a liquid state, is by the use of a lamp constructed by Mr. Parker, in which the oil is used in a hot state. At a small distance around the tube which contains the wick is another tube, and the space between the two tubes, of capacity sufficient to hold a pint, constitutes the reservoir for the oil. The oil is thus so near the flame, that it speedily becomes warm, by which its facility of burning is much increased. A slide-valve is opened to allow the oil to descend from the reservoir to the wick. The intensity of the flame is modified by raising or lowering a bell-mouthed glass chimney by means of rackwork mechanism. In a series of experiments on the illuminating powers of different kinds of lamps and candles, Dr. Ure found that the hot-oil lamp, with a given quantity of oil, gave a brighter light than any other form of lamp; or, the light being equal in intensity, the hot-oil lamp was the most economical. This corroborates, so far as it goes, the remarkable results obtained by the hot-blast in the iron manufacture.

Argand's principle of the mode of admitting air to act on the wick has been the one most generally followed since his time; and many of the subsequent inventions have had relation merely to some modification of this arrangement. The *Solar* lamp, one of the modern kinds, has a provision for sending up air through the interior of the wick, as in the Argand; but the action of the air on the exterior of the wick is made more decided. The wick passes through a hole in the centre of a cap or cone; and the air is admitted so as to act on the flame close to this hole, and in a horizontal direction, while the flame is yet small; so that the exposure of the gaseous products to the air is much more intimate than in the ordinary lamps, and the combustion more complete. Many improvements have been introduced from time to time; but the solar lamp remains in principle an Argand, with the addition of a cap or cone to deflect the external air more directly toward the flame. Many of the modern variations in lamps and in gas-burners have had relation to this circumstance of admitting the external air to act at the points and in the quantity found best for the maintenance of a clear flame.

4. *Spirit-Lamps.*—In chemical experiments the spirit-lamp has long been a valuable piece of apparatus; but the use of spirit instead of oil, as a food for lamps intended for domestic purposes, is a modern innovation, and has led to much mechanical ingenuity in the construction of the apparatus.

The term 'spirit' is rather a vague one, since there are many kinds of spirit which are inflammable enough to be used for this purpose; but the kind here alluded to is the *spirit of turpentine*, or that liquid which is distilled from common turpentine by being separated from the resin which is a component ingredient in the last-named substance. When brought to its purest state, this spirit is called by the French chemists '*camphine*;' and hence the name for some of the modern spirit-lamps. Turpentine being a very abundant produce of the American forests, camphine has been long in use in the United States for lighting shops and public buildings, and it seems to have been from that country that the practice was borrowed and introduced into England. When the import duty on turpentine was lowered two or three years ago, the price became reduced sufficiently to direct the attention of lampmakers to the practicability of using camphine as a substitute for oil. Many different forms of lamp have resulted from these inquiries; and different processes have also been adopted for freeing the turpentine from a small quantity of oxygen which it contains.

Young's 'Vesta' lamp is one of those varieties. In the specification of the patent it was stated that the lamp is constructed for burning rectified spirits of turpentine, or camphine; that, on account of the inflammability of this liquid, provision is made for keeping cool the reservoir where it is deposited; that no tube or metal conductor of any description is allowed to pass into or through the liquid from the burning part of the lamp; that a non-conductor of heat is placed between the burner and the liquid; that the cotton wick hangs down from the burner into the spirit, so as to supply spirit to the flame by capillary attraction, without the intervention of any metallic or conducting substance; that the admission of air to the interior of the wick is managed without the necessity of passing an air-tube through the liquid. All these features and a few others are rendered necessary in the camphine or spirit lamps, on account of the extreme inflammability of the liquid; an inflammability such that the arrangements for an oil-lamp would not be available for a camphine-lamp without much danger.

Whether these camphine-lamps receive the name of 'Vesta,' or 'Gem,' or 'Victoria,' or 'Paragon,' or 'Imperial,' or any other of the many which have been applied to them, they all present in common a reservoir, generally of glass, placed between the supporting pillar and the burner; the spirit is contained in this reservoir, and a cotton wick is seen to dip down into it. The chief points in which the several varieties of the lamp differ are in the arrangements for admitting air to the flame.

Of one of these lamps, the 'Vesta,' Dr. Ure states, that if 'burning with its utmost brilliancy, without smoke, it emits a light equal to very nearly twelve wax or sperm candles of three or four to the pound; and in so doing it consumes exactly one imperial pint of spirits of turpentine (value sixpence) in ten hours: hence the cost per hour for a light equal to ten such candles is one halfpenny.' Since that statement was written, the demand for camphine has raised its price, and the relative advantages in its favour are therefore smaller; but it still remains much cheaper than any form of candle or of oil-lamp, in relation to the quantity of light yielded. All lamp-oils contain some oxygen, which neutralizes a part of the hydrogen and carbon, and also some oxide or other substance which damps the brilliancy of the flame; whereas rectified camphine, being composed almost wholly of hydrogen and carbon, contains nothing but what is susceptible of combustion. Whether the lamp be so constructed as to admit of this perfect combustion, and also so as to avoid danger, are questions for the manufacturer; but in a scientific point of view, camphine seems better fitted for combustion than oil. It is not alone from turpentine that the spirit may be procured; for tar and naphtha also, if subjected to careful distillation and rectification, will yield a spirit or camphine differing but little from that yielded by turpentine.

A few words may here be added concerning two important features connected with lamps, viz. the comparative illuminating powers of different kinds, and the means of carrying off the products of combustion.

Pectet, Dr. Ure, and Dr. Fyfe have all instituted experiments bearing on the former of these two questions. Pectet experimented on candles only. He determined what would be the value of different kinds of candle, sufficient to produce a given intensity of light, as determined by Carcel's lamp as a standard. They rank in the following order, the first being the cheapest:—tallow candles, six to the pound; ditto, of eight to the pound; pressed tallow; stearine; spermaceti; wax. This relation was as to price only; the relative weights of material consumed followed a different order of arrangement, the spermaceti being the least, and the pressed tallow the greatest. In Dr. Ure's list ('Supplement to Dictionary of Arts') the relative quantities of light for a given price, or the relative cheapness of a given quantity of light, among several kinds of lamps and candles, are placed in the following order:

Hot-oil lamp, with southern whale-oil,
Carcel lamp, with sperm-oil,
Hot-oil lamp, with sperm-oil,
„ „ with common olive-oil,
„ „ with cocoanut-oil,

French lamp, with sperm-oil,
Mould tallow candles,
Palmer's spread-wick candles,
Stearic acid candles,
Cocoa-nut stearine,
Spermaceti candles,
Wax candles:

the first being, in point of economy, the cheapest, and the last the dearest.

Dr. Fyfe's experiments ('Transactions of the Royal Scottish Society of Arts') seem to have been of a more extensive character, embracing a larger number of sources of illumination. Assuming a given intensity of gas-light as a standard, he experimented on ten varieties of candles, and found their relative cheapness, in producing the given degree of light, to rank as follows:—tallow with single wick, cocoa, composite, palm, tallow with double wicks, wax, diaphane, margarine, spermaceti, and composition. In another table, comparing gas, oil, and candles together, he assumed an Argand gas-flame as a standard of intensity and price, and gives the following arrangement in respect to the ratios of relative cheapness, the intensity of light being uniform:—

Argand gas-flame	1·00
Solar lamp	2·00
Naphtha	2·00
Solar oil in Argand lamp	3·98
Whale-oil	5·00
Sperm-oil	8·00
Tallow candle (two wicks)	12·70
Cocoa candle	13·10
Tallow candle (one wick)	13·50
Composite	14·50
Palm	18·90
Wax	25·90
Diaphane	27·10
Margarine	28·40
Spermaceti	29·20
Composition	29·20

According to this table, composition candles are nearly thirty times as costly as gas for an equal intensity of light.

Dr. Faraday has introduced an important arrangement for carrying off the products of combustion in gas and oil lamps. This arose out of a complaint, on the part of the members of the Athenæum Club, that the air of their library was vitiated and the binding of the books injured by the lamps then used. Dr. Faraday investigated the subject, and shortly afterwards communicated to the Institute of Civil Engineers the mode which he proposed to adopt for remedying the evil. In a paper communicated to this body (Session 1843) he adduced striking proof of the magnitude of the product resulting from combustion. Oil and gas each contains carbon and hydrogen, and each requires the addition of oxygen to bring about combustion. The light is one of the indications of the intensity of this union; and the substances which result from it are mainly two—*water*, by a combination of some of the oxygen with the hydrogen; and *carbonic acid*, by the combination of more of the oxygen with the carbon. The quantity of these two substances produced, owing to the enormous absorption of oxygen during the combustion, would by many persons be deemed quite extraordinary. 'A pint of oil, when burned, produces a pint and a quarter of water, and a pound of gas more than two and a half pounds of water; the increase of weight being due to the absorption of oxygen from the atmosphere, one part of hydrogen taking eight parts (by weight) of oxygen to form water. A London Argand gas-lamp, in a closed shop-window, will produce in four hours two pints and a half of water; a pound of oil also produces nearly three pounds of carbonic acid, and a pound of gas two and a half pounds of carbonic acid. For every cubic foot of gas burned, rather more than a cubic foot of carbonic acid is produced.'

As the water produced deadens the effect of the flame, and as the carbonic acid is very deleterious to the lungs, Dr. Faraday contrived a mode of carrying both off without allowing them to mix with the air of the room. Air is admitted to feed the flame, nearly in the usual way; but when the products of combustion have arrived at the top of the glass chimney, their progress is arrested by a covering of talc, and they are compelled to pass down between the chimney and another larger glass chimney concentric with it. The open space between the two chimneys communicates with a pipe which is conducted in any convenient way into the open air; the carbonic acid, aqueous vapour, smoke, and other emanations from the flame have no means of escape except through this tube, and they are thus wholly cut off from contact with the air of the room. The mode of carrying out the arrangement may be varied in its details; but the general result is said to be that the light is brighter, the space around the lamp cooler, and the air of the room less vitiated than when common open burners are used.

LIGOZZI, JA'COPO, a distinguished Italian painter in fresco and in oil, was born at Verona, in 1543, and studied under Paolo Veronese. He established himself at Florence, where he had much influence upon the painters of his time, especially in colouring, for though not equal to Paolo Veronese, Ligozzi was an effective and powerful colourist, and at the same time that he added vigour to the colouring of the Florentines, he improved his own drawing. The Grand Duke Ferdinand II. appointed Ligozzi his principal painter, and superintendent of the Imperial Gallery. He died in 1627.

Ligozzi is the painter of several great works in oil, though they are what the Italians call *quadri di macchina* or machines, that is ornamental or decorative works, distinguished chiefly for their size and effect on the eye. The following works, however, are of a superior order of this class—San Raimondo resuscitating an infant, in Santa Maria Novella; the four crowned Saints,—SS. quattro Coronati—at Gli Scalzi, or the barefooted friars, at Imola; and the Martyrdom of Santa Dorotea, at the Conventual Friars, at Pescia. Ligozzi executed also many small highly finished easel pictures. Agostino Carracci engraved some of his works.

(Lanzi, *Storia Pittorica*, &c.)

LIGUSTRUM, a genus of plants belonging to the natural order Jasminaceæ. It has a fleshy fruit, the berry containing two membranous one-seeded nuts. The calyx is short, tubular, and four-toothed; the limb of the corolla 4-parted and spreading; stamens 2, with short filaments. The species are shrubs or low trees, natives of Europe and Asia.

L. vulgare, Common Privet, has elliptic lanceolate glabrous leaves; compound racemes; sweet-scented flowers, white at first, but soon changing to a reddish brown. The berries are dark purple, almost black. It is a bushy sub-evergreen shrub, growing in hedges and thickets in Great Britain, and native of the South-west of England. This plant was formerly called Prim, or Primwort, from its being used for verdant sculptures, or topiary-work, and for primly cut hedges. The common English name Privet seems to have been given to it from its being frequently planted to conceal private places. In German, Dutch, Danish, and Swedish it is called Ligster; in French, Troëne; in Italian, Ligustro; in Spanish, Alhena; and in Portuguese, Affena. It is probably the Σφίραια of Theophrastus, 'Hist. Plant.' 1, 14. In point of utility and ornament few shrubs exceed the privet. Its chief use is to form hedges either for shelter or ornament. It bears cutting well, and is not liable to be disfigured by insects; having fibrous roots, it robs the ground less than almost any other shrub. It is one of the few plants that will grow in the smoke of London; it also thrives under the dripping of other trees. The wood is hard and fit for timber. From the pulp of the berries a rose-coloured pigment may be prepared; with the addition of alum they dye wool and silk of a good durable green. The following varieties are those found chiefly in our gardens:—

L. v. leucocarpum, the white-berried privet.
L. v. xanthocarpum, the yellow-berried privet.
L. v. chlorocarpum, the green-berried privet.
L. v. sempervirens, the Italian or evergreen privet.
L. v. variegatum, the variegated-leaved privet.
L. v. angustifolium, the narrow-leaved privet.

L. Sinense has lanceolate tomentose leaves, white flowers, and very small brown berries. It is a native of China, near Canton.

L. Japonicum is a native of Japan, with oblong ovate grooved leaves, and white flowers growing to the height of six or eight feet.

L. spicatum has elliptic acute leaves, hairy beneath, as well as the branchlets. Flowers crowded, almost sessile, spicate, disposed in a thyrse, having the axis very hairy, and minute bracteas. It is an evergreen shrub, native of Nepaul, on mountains, growing from six to eight feet in height. All the species of Privet are of easy culture, and will grow in any kind of soil. Cuttings root without difficulty. *L. lucidum* requires some protection in the winter.

(Don, *Gardener's Dictionary*; Babington, *Manual of British Botany*; Frass, *Synopsis Floræ Classicæ*; Loudon, *Encyclopedia of Trees and Shrubs*.)

LILAC. [Syringa, P. C.]

LI'LIUM (the Latin *Lilium*, and Greek λείριον), a genus of plants the type of the natural order Liliaceæ. It has a perianth of six leaves spreading or reflexed, with a longitudinal nectariferous furrow at the base of each; an undivided style, capitate stigma, and flat seeds. The colour of the flowers is either white, yellow, or red.

L. candidum, common White Lily, has lanceolate scattered leaves attenuated at the base, a bell-shaped smooth corolla, the petals of a beautiful shining white on their inside, ridged and not quite so transparent or luminous on their outside. The flowers are large, white, and in a cluster at the top of the stem. It blossoms early in the summer, and has been cultivated in our gardens from time immemorial. Great doubts had existed respecting the native habitat of this species, till Mr. Hawkins, the friend and companion of Dr. Sibthorp, found it growing wild in that classical and celebrated spot the Vale of Tempe. It is the κρίνον of Theocritus (*Id.* 23) and of Dioscorides (3. 106). Both Pliny and Ovid have added their testimony to the general admiration in which this plant has been universally held. The flowers have a pleasant sweet smell, and were formerly used for medicinal purposes, particularly as an antiepileptic and anodyne. A water distilled from them had reputation as a cosmetic, but the odorous matter they contain is so exceedingly volatile that it is impossible to preserve it, as it is wholly carried off by evaporation. The roots only are found available in medicine, and they are frequently employed as emollient poultices, owing to the mucilaginous matter which they contain. It is however doubtful whether they are more efficacious than poultices formed of bread or farina. Gerard prescribes the lily root internally in dropsies, and for this purpose bread was made of barley-meal with the juice of the roots instead of water, and eaten for a considerable length of time. This species, as well as others, is cultivated in Siberia and eaten as the potato. The scent of the lily is exceedingly powerful, and peculiarly distressing in some cases. Murray mentions an instance of death ensuing from exposure to the odour of this plant.

L. bulbiferum, Bulb-bearing or Orange Lily, has linear-lanceolate scattered leaves, a bell-shaped erect corolla, glandular and rough on the inside, downy without. The flowers are large and handsome, of a beautiful red or orange colour, pale on the outside, and without any scent. The bulb is composed of numerous thick white loosely imbricated scales. This species and *L. chalcedonicum* is probably the κρίνον of Theophrastus, 'Hist. Plant.' 6, 6, and undoubtedly the ἡμεροκαλλίς of Dioscorides, 3. 127. It is a native of Italy, Austria, and North America.

L. superbum, Superb Martagon Lily, has a revolute corolla, the lower leaves whorled, the rest scattered. The flowers form a branched reflexed pyramid, and are large and handsome, one at the end of each branch, red or yellow with dark spots; their smell is disagreeable. The bulb is as white as ivory. It is a native of North America, whence it was imported by Mr. Peter Collinson in the year 1738.

L. Martagon, Turk's-cap Lily, has whorled elliptic lanceolate leaves, pubescent scabrous stem, nodding flowers, and a reflexed perianth. Though not a native of Great Britain, it is naturalised in copses in many places.

The species enumerated are those most commonly cultivated in our gardens, each of which has many varieties and sub-varieties. They are capable of being propagated by planting the offsets of the roots and by sowing seeds to obtain new varieties. Every year the roots produce many offsets, which, however, unless greatly wanted, are better left on for two or three years. The proper time for separating them is in summer and autumn, when the winter is past and the stalks decayed, either by taking them from the mother bulbs in the ground or removing the whole and dividing the offsets from the main bulb when uncovered; they should then be planted in beds a foot asunder and three inches deep, to remain a year or two; the large roots set again in the borders singly. The sowing of seed is chiefly practised to obtain new varieties of Martagons; it should be done in the autumn, soon after the seed is ripe, in pots or boxes of rich light sandy earth, with holes in the bottoms half an inch deep; the pots or boxes should be placed in a sheltered position during the winter and refreshed often at first with water; the plants will appear in the spring; in August they should be transplanted into nursery beds in flat drills an inch deep and three or four asunder. After having grown in this situation till the August or September following they should be again transplanted into another bed, and at greater distances; after which they may be finally removed into the pleasure-ground. The bulbs should be planted singly, as they soon increase by offsets into large bunches. All the species and varieties of *Lilium* are valuable as plants of ornament for the beauty of their flowers, which have a noble appearance. They are proper for the pleasure-ground, and if planted with judgment, succeed each other in blooming upwards of three months. The common white lily, the orange lily, and martagon will thrive under trees. The orange-lily also answers well for small gardens and confined situations in towns and cities.

(Babington, *Manual of Brit. Botany;* Fraas, *Synopsis Plantarum Floræ Classicæ;* Rees, *Encyclopædia.*)

LIMBURG, a town in the province of Liege, in the kingdom of Belgium, situated in 50° 40′ N. lat. and 6° E. long., on the Weze (Wesdre). It is a fortified town with two gates, on a mountain, at the foot of which is the suburb of Dalhem or Dolham. This suburb is larger than the town; both together have 3000 inhabitants, who manufacture a considerable quantity of fine linen. There are marble-quarries in the neighbourhood. The railroad from Brussels to Aix-la-Chapelle passes near Limburg.

(Hassel, *Handbuch;* Stein, *Lexicon.*)

LIMBURG ON THE LAHN, situated in 50° 20′ N. lat. and 8° 3′ E. long., is a town in the duchy of Nassau. It is the see of a Roman Catholic bishop. It lies on the river Lahn, over which there is a stone bridge. It has a mint and four churches, of which St. George's Church is deserving of notice. The inhabitants, 3000 in number, have a manufacture of earthenware, and carry on a considerable trade in the productions of the country.

(Cannabich, *Geography;* Stein, *Handbuch*, by Hörschelmann.)

LINA'RIA (from λίνον, flax, owing to a similarity in the leaves), a genus of plants belonging to the natural order Scrophulariaceæ. It has a 5-parted calyx, a personate spurred corolla, the lower lip 3-fid with a prominent palate closing the mouth. The capsules open by valves or teeth at the top. The species are annual or perennial plants, very rarely small shrubs, and the flowers of a beautiful appearance, racemose or spicately racemose at the tops of the branches.

L. Cymbalaria, ivy-leaved toad-flax, has roundish heart-shaped leaves, 5-lobed and glabrous; the stem is procumbent, slender, and rooting. The flowers are solitary, axillary upon long stalks, and of a pale blue colour. It is native of Europe, chiefly on old walls. It grows abundantly in Italy and Sicily, and is found in Great Britain. There are several varieties of this species.

L. Elatine, halbert-leaved toad-flax, has ovate hastate leaves, the lower ones ovate, the peduncles glabrous, stem procumbent, and the spur straight. The flowers are solitary, on long slender stalks, small, and of a yellow colour, with the upper lip purple. It is a native of Europe and Africa, and is found in chalky corn-fields in Great Britain.

L. spuria, spurious toad-flax, has roundish ovate entire leaves, the spur curved upwards, the peduncles hairy, and the stem procumbent. The appearance of this plant is similar to the last, but the flowers are larger, and the whole plant not so slender. It is native throughout Europe in corn-fields, and is found in Great Britain.

L. minor, smaller toad-flax, is distinguished by its linear lanceolate leaves, which are obtuse, glandular, pubescent, and mostly attenuate. The flowers are solitary and axillary, the peduncles three times as long as the calyx, and the seeds oblong sulcate. It is found in sandy corn-fields throughout Europe and Great Britain.

L. pelisseriana, is known by its racemose flowers, which are of a dark purple colour with darker veins. It is native of the south and middle of France and of Great Britain.

L. repens, is distinguished by its lanceolate sepals and angular seeds with transverse elevated lines. The flowers are of a bluish colour, the stem erect, branched, and leafy. The seeds are much smaller than either of the following species. It is found on calcareous soils, particularly near the sea, in Great Britain.

L. Italica has scattered linear lanceolate leaves, lanceolate oblong sepals, and orbicular scabrous seeds, with a membranous margin. The corollas are of a deep yellow colour. This species is found plentifully in the West of England and near Cork, in Ireland; it is also native of Switzerland, Italy, and Hungary.

L. vulgaris has ovate acute glabrous sepals, shorter than the capsules, and the spur. The flowers greatly resemble those of *L. Italica*, but are twice the size. In Worcestershire this plant is called 'Butter and Eggs.' Gerard names it wild-flax, toad-flax, and flax-weed. It abounds in an acrid oil which is almost empyreumatic. Taken inwardly, it induces nausea. It has been advised in dropsy, but Haller and others disapprove of it. When united with milk the juice is a poison to flies.

The whole of the species of Linaria have an elegant appearance, and are therefore suited for flower gardens. They grow well in common garden earth, but prefer a dry sandy soil. The seeds of the annual species require to be sown early in the open border where they are intended to remain. The perennial kinds may be propagated by division at the roots or by seeds.

(Don, *Gardener's Dictionary*; Babington, *Manual of British Botany*.)

LINCOLN, PORT. [SOUTH AUSTRALIA, P. C. S.]

LINDSAY, SIR DAVID, a Scottish poet, was born at Garmylton, in Haddingtonshire, about the end of the fifteenth century. He inherited from his father the estate of 'The Mount,' in Fifeshire, whence, to distinguish him from many others of the same name, he is usually called Sir David Lindsay of the Mount. In the year 1512, he was appointed servitor, or gentleman usher, to the young prince of Scotland, afterwards James V. His duties seem to have been of the most servile kind,—he had not only to attend the person of the infant prince, and see that he was properly attended to, but he seems to have himself exercised the craft of nursing. He says,

When thou was young, I bore thee in my arm
Full tenderly, till thou begouth to gang;
And in thy bed oft happit thee full warm,
With lute in hand syne softly to thee sang;
Some time in dancing fiercely I flang,
And sometimes playing farces on the floor,
And sometime on my office taking cure.

There is little doubt that his genius and good-humour must have made him a very animated and delightful companion to his charge. He seems never to have been entrusted with the education of the prince, which was placed in the hands of a much graver personage—Bishop Gavin Dunbar.

Lindsay's name is connected with a curious and poetical incident. He is the authority on which his kinsman, Lindsay of Pitscottie, in his 'Chronicles of Scotland,' describes a spectral apparition which, in 1513, appeared to James IV. in the church of Linlithgow, and warned him against that campaign which terminated so fatally in the battle of Flodden. Sir David professed to have seen the apparition approach and vanish, and described him as 'ane man clad in a blue gown, beltit about him with a roll of linen cloth, a pair of bootikins on his feet to the great of his legs, with all other clothes conform thereto.'

The 'Dreme,' supposed to be the earliest of his writings, appeared in 1528; it is a satire on the times, representing a vision of the punishment of the prevailing iniquities in the other world. His principal pieces are 'Complaint of the Papingo;' 'Complaint of John the Commonweil;' 'History of Squyer Meldrum;' 'The Monarchie;' and 'The Play, or Satire, on the Three Estates.' There is little sentiment or pathos in Lindsay's poetry—a fierce and unscrupulous tone of sarcasm is his principal quality. All that was powerful in the country came under his lash, and it is one of the most inexplicable circumstances in literary history that he should not have been the victim of his audacity. He particularly excelled in his attacks on the priesthood and the corruptions of the court; and after the Reformation his name was long popular as that of a Protestant champion. 'The Satire on the Three Estates' stands half way between the early 'Mysteries' and the dramas of the latter part of the sixteenth century. It was sometimes acted in the open air, and could not have failed strongly to excite popular feeling against the corruptions, civil and ecclesiastical, which it unsparingly exposed. 'It is a singular proof,' says Sir Walter Scott, 'of the liberty allowed to such representations at the period, that James V. and his queen repeatedly witnessed a piece in which the corruptions of the existing government and religion were treated with such satirical severity.' Another feature that makes the circumstance of Lindsay's performances having such an audience, seem strange at the present day, is their broad indecency. It is certainly beyond that of the other writers of the age, for 'Davie Lindsay,' as he was long called in Scotland, seems to have had an innate liking for what was impure. His 'Squyer Meldrum' is a sort of chivalric history of adventures, some of which exhibit a very loose and dangerous morality. Lindsay held the office of Lord Lyon King at Arms. In 1537 he had the task of preparing some masques or pageants to celebrate the arrival of Mary of Guise, queen of James V. The time of his death is not known, but he is said to have been alive in 1567.

(Lord Lindsay, *Lives of the Lindsays*; Irving, *Lives of Scottish Poets*.)

LINDSEY, REV. THEOPHILUS, was the youngest son, by a second marriage, of a respectable mercer and proprietor of salt-works, residing at Middlewich, in Cheshire, where he was born June 20, 1723, Old Style. His mother having some connection with the family, by whom she was much respected, Theophilus, Earl of Huntingdon, husband of Selina, Countess of Huntingdon, stood god-father for him, and gave him his baptismal name. Lindsey entered St. John's College, Cambridge, in 1741; and, after taking his degrees, he was elected fellow in 1747, about which time, in his twenty-third year, he commenced his clerical duties at an episcopal chapel in Spital Square, London. He then became domestic chaplain to Algernon, Duke of Somerset, and after his death, travelled for two years on the continent with his son, subsequently Duke of Northumberland. On his return, about 1753, he was presented to the living of Kirkby Wiske, in the North Riding of Yorkshire; and in 1756 he removed to that of Piddletown, in Dorsetshire. In 1760 he married a step-daughter of his intimate friend Archdeacon Blackburne, and in 1763, chiefly for the sake of enjoying his society, and that of other friends in Yorkshire, he exchanged the living of Piddletown for that of Catterick, which was of inferior value. Before this removal Lindsey, who had felt some scruples respecting subscription to the thirty-nine articles even while at Cambridge, began to entertain serious doubts concerning the Trinitarian doctrines of the offices of the Church of England, though, for reasons explained at some length by his principal biographer, on his own authority, he did not deem these a sufficient obstacle to the renewal of his assent to them on entering a new living. In 1769 his anti-Trinitarian opinions received additional strength from the commencement of an intimacy with the Rev. William Turner, a presbyterian minister at Wakefield, and Dr. Priestley, then a dissenting minister at Leeds, both of whom entertained similar views with himself. While contemplating the duty of resigning his living, Lindsey was induced to defer that step by an attempt which was made in 1771, by several clergymen and gentlemen of the learned professions, to obtain relief from parliament in the matter of subscription to the thirty-nine articles, and in which he joined heartily, travelling upwards of two thousand miles in the winter of that year to obtain signatures to the petition which was prepared. The petition was presented on the 6th of February, 1772, with nearly two hundred and fifty signatures, among which were those of many eminently pious and learned men; but, after a spirited debate, its reception was negatived by 217 to 71. It being intended to renew the application to parliament in the next session, Lindsey still deferred his resignation; but when the intention was abandoned he began to prepare for that important step, which involved not only severe pecuniary sacrifices, but also the breaking-off from many esteemed friends. Strengthening his mind for the trial by the example of the two thousand ejected ministers known as the Bartholomew divines, he drew up, in July, 1773, a copious and learned 'Apology' for the step he was about to take, which was subsequently published. In the following December, notwithstanding the attempts of his diocesan and others to dissuade him from the step, he formally resigned his connection with the Established Church, and, selling the greatest part of his library to meet his pecuniary exigencies, he proceeded to London. He and his wife reached London on the 10th of January, 1774, and they were soon reduced to such straits as to be compelled to sell their remaining plate for subsistence. On the 17th of April, after experiencing much difficulty in reference to its registration as a place of dissenting worship, he began to officiate in a room in Essex Street, Strand, which, by the help of friends, he had been enabled to convert into a temporary chapel. His desire being to deviate as little as possible from the mode of worship adopted in the Church of England, he used a liturgy very slightly altered from that modification of the national church-service which had been previously published by Dr. Samuel Clarke; which modified liturgy, as well as his opening sermon, Lindsey published. Being very successful in his efforts to raise a Unitarian congregation, he was able shortly afterwards to commence the erection of a more permanent chapel in Essex Street, which was opened in 1778, and which, together with an adjoining residence for the minister, was put in trust for the maintenance of Unitarian worship. His published 'Apology' having been attacked in print by Mr. Burgh, an Irish M.P., by Mr. Bingham, and by Dr. Randolph, Lindsey published a 'Sequel' to it in 1776, in which he answered those writers. In 1781 he published 'The Catechist, or an Inquiry into the Doctrine of the Scriptures concerning the only True God, and object of Religious Worship;' in 1783, 'An Historical View of the State of the Unitarian Doctrine and Worship from the Reformation to our own times; with some account of the obstructions it has met with at different periods;' an elaborate work, which had been several years in preparation; and in 1785, anonymously, 'An Examination of Mr. Robinson of Cambridge's Plea for the Divinity of our Lord Jesus Christ, by a late member of the University.' The work to which this was a reply had appeared several years before, but Lindsey, who disliked personal controversy, had not intended to answer it, though his friends at length prevailed on him to do so. In 1788 he published 'Vindiciæ Priestleianæ,' a defence of his friend Dr. Priestley, in the form of an address to the students of Oxford and Cambridge; and this was followed in 1790 by a 'Second Address to the Students of Oxford and Cambridge, relating to Jesus Christ, and the origin of the great errors concerning him.' In 1782 he invited Dr. Disney, who then left the Established Church on the same grounds as he had done himself, to become his colleague in the ministry at Essex Street, and in 1793, on account of age and growing infirmities, he resigned the pastorate entirely into his hands, publishing on the occasion a farewell discourse (which he felt himself unable to preach), and a revised edition, being the fourth, of his liturgy. He nevertheless continued to reside at the chapel-house, as did his wife after his death. In 1795 he reprinted, with an original preface, the 'Letters to a Philosophical Unbeliever,' which Dr. Priestley had recently published in America in reply to Paine's 'Age of Reason;' and in 1800 he republished in like way another of Priestley's works, on the knowledge which the Hebrews had of a future state. Lindsey's last work was published in 1802, entitled 'Conversations on the Divine Government; showing that everything is from God, and for good to all.' He died on the 3rd of November, 1808, in his eighty-sixth year, and was buried at Bunhill-fields. Copious biographical notices of Lindsey were published in the 'Monthly Repository' and 'Monthly Magazine' of December, 1808, the former being by Mrs. Catherine Cappe, with whom he had lived on intimate terms when in Yorkshire, and the latter by Mr. Joyce; and in 1812 the Rev. Thomas Belsham published a thick octavo volume of 'Memoirs,' in which he gives a full analysis of his works, and extracts from his correspondence, together with a list of his publications, which embrace, besides those above mentioned, several single sermons and tracts. Two volumes of his sermons were printed shortly after his death. The amusing autobiographical 'Memoirs' of Mrs. Cappe, printed in 1822, also contain many notices of Lindsey. A portrait of him accompanies Belsham's 'Memoirs.'

LINEAL DESCENT. [DESCENT, P. C.]

L'INGEGNO. [LUIGI, ANDREA DI, P. C. S.]

LI'PARIS. [DISCOBOLI, P. C. S.]

LIPPI, FRA FILIPPO, a celebrated Italian painter and one of the most distinguished of the *Quattrocentisti*, was born at Florence in the year 1412. He was the son of Tommaso Lippi, who died when Filippo was only two years of age; his grandfather's name was Guido Lippi. His mother died soon after he was born, and he was brought up by his father's sister Mona Lappaccia, until he was eight years old, when she placed him in the Carmelite convent Del Carmine, to commence his novitiate. Here he showed such a strong disinclination for study and so great a propensity for scribbling figures and other objects in his books, that the prior came to the wise conclusion of having him educated for a painter, then an occupation not in the least inconsistent with the assumption of a monastic life. Filippo was accordingly permitted daily to visit Masaccio, who was then employed in painting the chapel of the convent, and he took extreme delight in contemplating the works of Masaccio there. Filippo himself gave early evidence of his extraordinary ability, by a fresco of the papal confirmation of the rules of the order of the Carmelites, painted near a work by Masaccio, in the cloister of the convent, but both are now destroyed; he executed also several other works in various parts of the convent and in the church Del Carmine, each work superior to its preceding, and so like those of Masaccio that his spirit was said to have passed into Filippo. All these works however, or at least what remained of them, were destroyed in the conflagration of the church in 1771.

In 1430, or when only seventeen years of age, Filippo gave up the monastic life, left the convent Del Carmine, and went to Ancona. Here, while on an excursion of pleasure at sea with some other young men, he was captured by a pirate and carried in chains to Africa, and there sold as a slave. Eighteen months after the commencement of his captivity he amused himself one day with drawing, from memory, his master's portrait in chalk upon a white wall. The performance appeared to his master a sort of prodigy; he immediately released Filippo from his captivity, and after he had employed him to execute various pictures for him, sent him back safe to Italy. Filippo was landed in Naples, where he was, probably shortly after his arrival, employed by Alfonso Duke of Calabria, afterwards Alfonso I. of Naples, to paint a picture for the chapel of the Castell' Nuovo, then in his possession, which would fix the date at about 1435, or five years from the time that Filippo left his convent. He remained only a few months in Naples, and then returned to Florence; and one of the first works which he executed at this time was a small picture of the Adoration of the Madonna, for the wife of Cosmo de' Medici, which is now in the Imperial Gallery at Florence.

Fra Filippo executed many excellent works at Florence, Fiesole, Arezzo, and at Prato. While engaged in 1459 in the convent of Santa Margherita, in the last named place, he seduced and carried off Lucrezia, daughter of Francesco Buti, a young Florentine lady who was being educated at the convent; and he had a son by her called Filippino Lippi, who became likewise a celebrated painter, and died in 1505, aged only forty-five. The Death of San Bernardo, painted for the cathedral of Prato, is one of Lippi's finest works; it is in oil and on panel, and is still in the cathedral. The passages also from the lives of John the Baptist and St. Stephen, painted in fresco, in the choir of the same church, from 1456 to 1464, the figures of which are colossal, are among the best works of the fifteenth century: Vasari terms the martyrdom of St. Stephen his master-piece. Filippo has introduced his own portrait into this piece, and he has painted that of Lucrezia Buti as Herodias in one of the series from the life of the Baptist. These frescos were recently restored by a painter of Prato of the name of Marini.

Fra Filippo died at Spoleto in 1469, aged 57; this is no doubt the correct age of Filippo, though Vasari by his carelessness has done much to obscure the matter. In his first edition he states that Filippo died in 1438 aged 67, and in the second, in the same year aged 57; but 1438 is evidently a misprint for 1468; and, from Filippo's connection as a boy with Masaccio, he cannot have been 67 when he died, but may very well have been 57, which age accords with other facts mentioned in his Life: the year of his death, however, was 1469, as discovered by Baldinucci in the Necrology of the Carmelites. But Baldinucci and all other writers have overlooked the value of the evidence connected with Masaccio, and have assumed 1400 to be about the time of Filippo's birth, whereas Masaccio himself was born only in 1402. The pupilage of Filippo to Masaccio, or his works, which is the same, decides another fact, hitherto in doubt, namely, the time in which Masaccio executed the frescoes of the Carmine, supposing they were all painted at one period. Vasari says they were painted after Masaccio's return from Rome, and after the recall from exile of Cosmo de' Medici, which took place in 1434. But the 'Consecration of the Church of the Carmine,' in the cloister, was painted before Filippo left the convent, because Filippo painted his picture of the Confirmation of the rules of the Carmelites by the side of it, and, as said above, he left the convent when only seventeen years old; at the latest, therefore, in 1430, when Masaccio may have been twenty-eight years of age. The frescoes of the Brancacci chapel were executed after the 'Consecration,' and though some of those also may have been completed before 1430, as Masaccio died before they were all completed, it is probable that he was engaged in this convent at two distinct periods, with a considerable interval between them. The picture which Masaccio left incomplete is the resuscitation of a boy by St. Peter, which was completed by Filippo's son Filippino, many years afterwards. The works of Masaccio himself were a continuation of the history of St. Peter, commenced and left unfinished by his master Masolino da Panicale, who died aged only thirty-seven, but in what year is uncertain, yet probably not later than 1420, notwithstanding what Vasari says about Masaccio introducing the portrait of his former master Masolino into the picture of the 'Consecration,' which may have been done from memory or from some existing portrait, for Masolino was certainly dead before Masaccio commenced any work for the Carmine.

Fra Filippo is said to have been poisoned by the relations of Lucrezia Buti; Lanzi speaks of the fact as certain, but Vasari merely alludes to it as a vague report, which is the more probable version. The relations of Lucrezia could do her little service by poisoning Filippo, whom she evidently loved, for she would not return to her relations; and fifty-seven years is no a very short life for a man notoriously given to pleasure; his death also did not take place until eleven years after the abduction of Lucrezia, for Filippino was ten years old when his father died. Fra Filippo was buried at Spoleto, in the cathedral, which he was engaged in painting at the time of his death. His son was instructed in painting by Filippo's pupil and assistant Fra Diamante. He afterwards erected a marble monument, with a Latin inscription by Politian, to his father in the cathedral of Spoleto, by the order and at the expense of Lorenzo de' Medici.

Fra Filippo excelled in invention, in drawing, in colouring, and in chiaroscuro, and for his time was certainly a painter of extraordinary merit; he must, even without reference to time, be accounted among the greatest of the Italian painters from Masaccio to Raphael, both inclusive. Some of his easel pictures in oil are finished with extreme care and great taste; there are a few in the gallery of the Florentine Academy, of which the Coronation of the Virgin, formerly in the church of Sant' Ambrogio, is an admirable work. There are some chalk studies of hands by Filippo in the British Museum. Several of his works have been engraved by Lasinio.

Filippino, though not equal to his father in the higher qualities, surpassed him in others, especially in general accessaries, which he was perhaps the first to bestow great attention upon, and he had much more taste than most of his contemporaries; he understood better the rendering of mere appearances, one of the most essential, though not one of the highest qualities in pictorial art. He excelled in painting Madonnas; but his chief works are the frescoes of the Strozzi Chapel, in Santa Maria Novella, and of the Brancacci Chapel of the Carmine, where, besides others, he painted Peter and Paul before the Proconsul, which was long attributed to Masaccio, as in the 'Etruria Pittrice,' where it is engraved, and in many other works.

(Vasari, *Vite de' Pittori*, &c.; and the notes to the German Translation by Schorn; Baldanzi, *Delle Pitture di Fra Filippo Lippi nel Coro della Cattedrale di Prato*, &c.; Baldinucci, *Notizie dei Professori del Disegno*, &c.; Rumohr, *Italienische Forschungen*; Speth, *Kunst in Italien*; Gaye, *Carteggio inedito d'Artisti*, and *Kunstblatt*, 1836.)

LIQUIDITY is that condition of a material substance in which the particles have a perfect freedom of motion, without any sensible tendency to approach to or recede from one another, except by the action of some external power. Liquidity is therefore comprehended in the condition of fluidity, the latter term being applied as well to gases, and even to the principle of electricity, magnetism, &c., as to water, oil, &c., which are properly called liquids. [FLUID, FLUIDITY, P. C.]

The phænomena of capillary or molecular action show that the attractions which constitute what are called the affinities of substances extend to very small distances only from the particles; and hence, when the particles of a substance are situated beyond the limits of such attractive forces, the repulsive power, arising probably from the action of caloric, causes the particles to recede continually from one another, and induces the state of aeriform fluidity. Now the phænomena of crystallization seem to indicate that the attraction of affinity is exerted with greater or less intensity according as the like or unlike sides of the particles of a substance present themselves to one another in their mutual approaches; but it is probable that this modification of the attraction of affinity extends to less distances from the centres of gravity of the particles than the general attraction extends: hence, when the particles of a substance are, from any cause, brought so near one another that the attraction of affinity is in equilibrio with the repulsive force of the caloric, and at the same time the modification of that attraction caused by the various positions which the particles assume in approaching one another, entirely or nearly vanishes, it should follow that the particles become freely moveable in any direction about one another, whatever be their form; and thus may arise the condition of liquidity.

It may be added that, if the particles of a substance be, by the abstraction of caloric, made to approach still nearer to one another, the attraction of affinity will exceed the force of repulsion; and there will be constituted a solid body, which may be crystallized or not according as the particles approach one another gradually or otherwise: in the former case they may arrange themselves in such positions as to become connected together in one direction by the sides at which the attraction is the greatest; while, if the approach is rapid and is accompanied by agitation, the union of the particles may take place irregularly.

The particles of a liquid are held together with considerable force notwithstanding their freedom of motion, since a small quantity of a liquid has a tendency to take a spherical form when at a distance from any substance for which its particles have greater affinity than for one another: this is very evident in mercury, oil, and water, the first of which on being suffered to fall on a table immediately divides itself into globules, and the others take a like form when a small quantity of either is suspended from a pointed extremity of any object.

The dilatations of water and mercury by the application of heat, as well as the remarkable fact that the expansions of water are equal at temperatures which are at equal distances above and below about 39° (Fahrenheit's scale), have been noticed under THERMOMETER, P. C. But the expansions of any liquid, at different temperatures, for equal increments of caloric, are not equal to one another; and the following table of expansions, in volume, for an increment expressed by 1° (Fahr.), is abridged from that which is given by Dr. Young in his *Lectures on Natural Philosophy* (vol. ii. pp. 392, 393):—

Temperature.	Expansion.
Water (Sp. gr. = 1 at the maximum density).	
44 and 34°	·00002
48 and 30°	·00004
54	·00008
64	·00010
74	·00014
90	·00020
142	·00031
212	·00038
Highly rectified spirit of wine (Sp. gr. = 0·825).	
0°	·00047
12	·00050
32	·00054
52	·00057
72	·00061
92	·00065
132	·00074
172	·00083
Sulphuric acid (Sp. gr. = 1·84).	
55°	·00021
60	·00029
65	·00037
Muriatic acid (Sp. gr. = 1·185).	
50°	·00035
60	·00055
65	·00070

From the experiments of MM. Dulong and Petit, the mean expansion of mercury, in volume, for 1° (Fahr.) between the temperatures of freezing and boiling water, is expressed by ·000101; between the freezing-point of water and 392° (Fahr.), by ·000102; and between the freezing-point of water and the temperature at which mercury boils, by ·000105.

The expansions are expressed in parts of the original volumes of the liquids; and the corresponding linear expansions, in parts of the length of a column of the liquid, may be obtained with a sufficient approximation to the truth on dividing each of the above numbers by 3.

The phænomena of molecular action in liquids are mentioned under CAPILLARY ATTRACTION, P. C., and the state of our knowledge on that subject is noticed under THEORIES OF MOLECULARITY, P. C. For the specific heat of liquids, or their capacity for caloric, see SPECIFIC HEAT, P. C. S.

LIS PENDENS. [NOTICE, P. C.]

LITHOGRAPHIC PRESS. In the article LITHOGRAPHY, P. C., a reference was made to PRESS for an account of the press used in lithographic printing; but this account was accidentally omitted.

The mode of printing from a lithographic stone does not differ very materially from that adopted with copper and steel plates. A direct downward pressure, such as is used in type-printing, would not produce all the required effects: the action necessary being rather a kind of rolling than a direct pressure. In printing from a copper plate, the plate and the paper are passed between two rollers, the uppermost of which has an elasticity or softness given to it by layers of padding or felt; and the degree of closeness between the rollers is regulated according to the strength or blackness of the impression required.

In the lithographic process, the pressure is accompanied by a sort of scraping movement. Soon after the adoption of this branch of engraving, the press used in Paris consisted of a hollow table for holding the stone, covered with a tympanum or stretched parchment; the engraved stone was inked by rollers, the paper was laid down on it, the tympanum was brought down over the paper, and a bar of wood was pressed firmly on the tympanum; the stone, by the action of the levers, was made to traverse from side to side beneath this bar, so that every part of it in turn experienced the pressure of the bar.

All the parts of the apparatus have since undergone improvement and modification. Messrs. Taylor and Martineau's lithographic press has two cast-iron uprights rising from the bed or table; and there is a carriage for containing the stone, which carriage is supported on rollers moving along a miniature railway. The scraper or bar, instead of being pressed down by leverage, is governed by a spring, which keeps it closely in contact with the tympanum. A cylinder, worked by a handle, sets the carriage in motion, and the stone is thus brought in all its parts under the action of the scraper or pressing-bar. The different parts of the apparatus are adjusted to different requirements of the art by regulating screws.

Other machinists have improved the press in various ways; but the general principle of the apparatus may be inferred from these few details.

LITHORNIS. A fossil bird from the Isle of Sheppey is thus named by Owen.

LITHOSPERMUM (from λίθος, a stone, and σπέρμα, a seed; in reference to the hard seeds or nuts), a genus of plants belonging to the natural order Boragineæ. It has a deeply cut calyx in five segments, a funnel-shaped corolla, with a naked or minutely five-scaled throat. The filaments are very short; the stamens included in the tube. The nuts are smooth or tubercular, stony, and attached by their truncate flat base to the bottom of the calyx.

L. officinale, Gromwell, has an erect much-branched stem, lanceolate acute veined leaves with tubercles and adpressed bristles above, hairy beneath; the throat of the corolla has minute scales within, and is of a pale yellow or greenish colour. The nuts are white, shining, and very hard, two or three ripening in each calyx. They were esteemed in antient times as an infallible lithonthriptic; their virtues in this respect are, however, entirely imaginary. This species is native of Europe, Asia, and North America. It is found in dry and stony places in Great Britain, but sparingly.

L. purpureo-cæruleum has herbaceous stems, the barren ones prostrate and creeping, the others erect. The leaves are lanceolate, acute, and scabrous, of a dark green, with revolute margins. The flowers are showy and large, at first red, and afterwards of a bright blue. The nuts are white, highly polished, and hispid. This species has no scales in the throat of the corolla, but merely five longitudinal downy folds. It is native of middle and south Europe, of the Caucasus in woody mountain places, and of England and Wales in chalky soil.

L. arvense, Bastard Alkanet, has an erect branched stem, lanceolate leaves rather acute, hairy, and subciliated; the calyx a little shorter than the corolla; the nuts tubercular, wrinkled, polished, and of a pale brown. The throat of the corolla is destitute of scales, as in the former species. The flowers are white and small; the root of a bright red, communicating its colour to paper. It is native of Europe, Asia, Africa, and some parts of North America, and is found plentifully in the corn fields of Great Britain.

L. tinctorium has herbaceous procumbent stems, lanceolate obtuse leaves, hairy calyxes a little shorter than the tube of the corolla. The upper leaves are half-clasping, the lower ones on petioles. The flowers sessile in simple or conjugate leafy spikes; they are of a fine blue colour with a white throat. It is native of Spain, South of France, Italy, and Hungary, in sandy sterile places.

L. tenuiflorum has an herbaceous erect branched stem, lanceolate obtuse hairy scabrous leaves, the lower ones opposite; the calyx is shorter than the tube of the corolla, conniving when bearing fruit. It is native of Egypt and the island of Cyprus, and has the habit of *L. arvense*, but is much smaller. It is the Λιθόσπερμον of Dioscorides, 3. 148, and the Lithospermum of Pliny, 27. c. 74. *L. apulum* is the Σκορπιοειδὴς of Dioscorides, 4. 192.

All the species of Lithospermum are noted for the stony hardness of their pericarps, which have the brittleness and lustre of porcelain. This membrane when analyzed is found to contain nearly 60 per cent. of earthy matter, which is more than is known in any other organized substance. According to Spenner *L. officinale* is the only true Lithospermum, none of the other species having a crown of scales in the throat of the corolla. The perennial and herbaceous species are plants of very easy culture, requiring hardly any care. They are always propagated by seed, which may be sown in the open ground. The annual species should be treated as greenhouse plants, and the shrubby kinds may be grown on rockwork or on wall-tops, where they will maintain themselves if allowed to scatter their seeds. They do very well in pots among other alpine plants, and cuttings of them may be rooted under a hand-glass. In general they are however short-lived and apt to rot.

(Don, *Gardener's Dictionary*; Babington, *Manual Brit Bot.*; Burnett, *Outlines of Botany*.)

LIVERWORTS, or LICHENS, a family of plants belonging to the class Cryptogamia, of which a definition is given under LICHENS, P. C. The order consists of between fifty and sixty genera, which are divided by Fries into four sub-orders:—Hymenothalami, Gasterothalami, Idiothalami, and Coniothalami: to these some systematists add Byssaceæ. [BYSSOIDEÆ, P. C. S.] These are again subdivided into several tribes, each tribe comprising several genera.

The tribe *Usneaceæ* are characterised by having an open disk, and being destitute of an hypothallus. It embraces the genera *Usnea*, *Everina*, *Roccella*, *Ramalina*, and *Cetraria*. Several species of *Usnea* are known by the common names of Jupiter's-beard, Tree-beard, &c., on account of their hair-like appearance. They are amongst the most common of the Lichens which cover the trunks of aged trees, and give to them a picturesque appearance. *Usnea plicata* is a common species on old trees, park palings, &c., and has been recommended as a remedy in hooping-cough.

The species of the genus *Everina* are common in Great Britain. One of them, *E. prunastri*, has a peculiar power of imbibing and retaining odours, and on this account is in much request as an ingredient in perfumed cushions and sweet pots. It has been recommended as a remedy in pulmonary affections. It is frequently found on the oak and other trees. Evelyn says of it, 'This very moss of the oak that is white composes the choicest cypress-powder, which is esteemed good for the head; but impostors familiarly vend other mosses under that name, as they do the fungi for the true agaric (excellent for hæmorrhages and fluxes), to the great scandal of physic.' It is said that *E. vulpina* is poisonous to wolves, hence its name, but little is known of its real properties.

The genus *Ramalina* is found associated with the last two on the trunks and branches of trees, especially of the fir, the birch, the ash, the oak, the sloe, and the hawthorn. Lightfoot says that the *R. scopulorum* 'will dye a red colour, and promises in that intention to rival the famous Lichen roccella or argol which is brought from the Canary Islands.'

For the properties and uses of the species of Roccella and Cetraria see ORCHIL, P. C., and CETRARIA, P. C. S.

The tribe *Parmeliaceæ* is characterised by a horizontal thallus. To it belong the genera *Peltigera*, *Sticta*, *Borrera*, Parmelia, &c.

Two of the species of *Peltigera*, *P. canina* and *P. aphthosa*, have been used in medicine; the former as a remedy in hydrophobia; the latter is boiled in milk and administered in the thrush.

The species of *Parmelia* are exceedingly numerous; one of the most common throughout Europe is the *P. parietina*, yellow moss. The thallus and shields are both of a yellow colour; and Lightfoot says, 'It is affirmed to die a good yellow or orange colour if mixed with alum.' It has also a very bitter taste, which has caused it to be used as a tonic in medicine, and it has been recommended as a remedy in intermittent fever. *P. tartarea* yields the dye known by the name of Cudbear. [PARELLA, P. C.] *P. Parella* affords the substance known as Litmus, or Lacmus. [LITMUS, P. C.]

One of the species of the genus *Sticta*, *S. pulmonacea*, has been used as a substitute for the Iceland moss. [CETRARIA,

P. C. S.] It is used in Siberia for giving a bitter flavour to beer. It is a native of Great Britain, and is found on the trunks of trees in mountainous districts, almost entirely covering them with its large shaggy fronds.

A species of Borrera [BORRERA, P. C. S.], *B. furfuracea*, is reputed to be astringent and febrifuge. It is found on the trunks and branches of old trees, especially when decaying, and on old pales.

The tribe *Lecidinæ* embraces the important genus *Cladonia* [CLADONIA, P. C. S.], and also *Cenomyce* and *Scyphophorus*, which are often only regarded as subgenera of Cladonia. Tho *S. pyxidatus* and *S. cocciferus* are elegant lichens, having their apothecia elevated above the thallus in the form of little cups, those of the latter species being coloured scarlet. They have both been used in medicine as astringent and febrifuge.

The tribe *Sphærophoreæ* contains tho genera *Sphærophoron*, *Plocaria*, and *Isidium*. They are an exceedingly elegant group of Lichens, but the species have not been much used for economical purposes. *Isidium corallinum* is said to be rich in colouring matter.

The genera *Endocarpon* and *Porina* belong to the tribe Endocarpeæ. The species of the former genus are found on rocks and stones, whilst those of the latter are interesting as forming distinguishing marks between various kinds of barks used in medicine. Fée, in his 'Méthode Lichénographique,' has endeavoured to apply a knowledge of the various species of Lichens to the distinguishing not only between the bark of different species of Cinchona, &c., but also between good and bad barks of the same species.

Tho principal genus of the tribe *Verrucarinæ* is *Verrucaria*, of which the species are very numerous. [VERRUCARIA, P. C.]

The tribe *Graphideæ* is remarkable for the forms which the apothecia assume, bearing a resemblance to the letters of Eastern alphabets. This may be seen in Opegrapha scripta in *Fig.* 7 of the woodcuts illustrating the article LICHENS, P. C. As an indication of the value of the Lichens in distinguishing the various species of Cinchona bark, Fée states that the *Graphis interrupta* is only found on the bark of *Cinchona lancifolia*. Although the study of the Lichens on the officinal barks has not produced all the advantages anticipated by Fée, there can be no doubt of its value in many cases. Referring to this subject, Burnett observes, 'Until the publication of Fée's memoir on the cryptogamic epiphytes of the officinal barks, the study of the Opegraphas and their allies seemed to be one rather of speculative amusement than of practical utility. But now the case is wholly changed, since these graphic plants, these living letters, written by Nature's hand, are shown to constitute inscriptions legible by men. Always curious indeed, and admirable even to the least tutored eye, did the examination of these mimic characters appear; and as fancy traced the likeness to various Oriental signs, so were these little plants called Scripture-worts, some Hebrew (*Opegrapha Hebraica*), some Chinese (*Arthonia Sinensigraphia*), and so forth. But, like the hieroglyphics of the Egyptian fanes, their meaning was buried in obscurity, and so little guessed at, that it often was doubted whether they had any secrets to reveal. They were sources of wonder rather than wisdom, until the Young and the Champollion of the vegetable world arose, and by means of a natural Rosetta-stone deciphered these hitherto unknown manuscripts, and taught us to peruse this part of the sacred Scriptures of creation.'

(Burnett, *Outlines of Botany*; Lindley, *Natural System*; Lindley, *Flora Medica*; Fries, *Lichenographia Europæa reformata*.)

LIVERYMEN OF LONDON. [LONDON, P. C.]

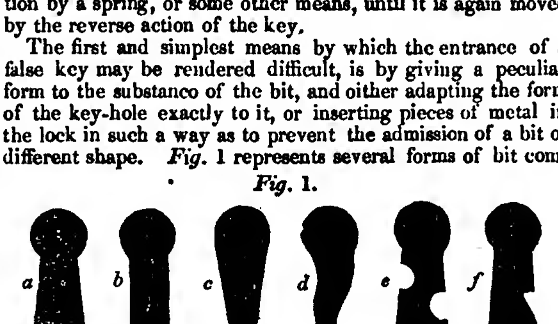
LOCK, a kind of secret fastening in which a moveable piece, termed a *bolt*, may be projected by the action of a separate instrument, called a *key*, introduced iuto the lock in such a manner that it cannot be returned to its nriginal position, so as to release the door, cover, or other article to which the lock is applied, excepting by another application of the key. While, however, the above appears to be the distinguishing characteristic of a lock, there are many locks in which the bolt is projected by the action of a spring, without the aid of the key, and in which it may be drawn back upon one side of the door to which it is applied by means of a handle, although it cannot be moved from the other side without the application of the key. Many such locks fall under the general denomination of *latches* or *latch-locks*. In other locks, again, there are two or more bolts, one of which only is under the control of the key, the others being moved by handles; while in another class of locks two or more bolts are shot or projected by the action of the key alone. In addition to such differences, the varieties in the form and size of locks, and in the arrangement of their parts, are almost infinite. In door and closet locks, which are sometimes attached to the surface of the door on the inner side, and sometimes inserted in the thickness of the woodwork, the bolt is usually projected into a fixed socket. In various kinds of box and cabinet locks the bolt is not under any circumstances projected beyond the casing of the lock, but is caused to shoot into or through a staple which drops into the lock to receive it. In desk-locks and some others the bolts project permanently, and are of a hooked shape, adapted to catch, by a lateral movement, into cavities or staples provided to receive them. *Padlocks* are a kind of detached lock in which a curved bar of iron, pivoted to the lock at one end, may be passed through a staple, and then so secured by shooting the bolt into a cavity in its free end, which is inserted into the lock for the purpose, that it cannot be removed from the staples or links through which it has been passed.

By far the greater part of the almost innumerable ingenious contrivances for rendering locks inviolable may be classed under one of two systems of security, the distinction between which was pointed out by Mr. Ainger iu a paper read before the Royal Institution in 1827 (an abstract of which was published in the first volume of the 'Quarterly Journal of Literature, Science, and Art'), and is further illustrated by the same gentleman in the article 'Lock,' in the seventh edition of the 'Encyclopædia Britannica.' Of these means of security, the first consists in the insertion in the lock of fixed obstacles, commonly called *wards*, which prevent the entrance or revolution of any instrument or key which is not formed with corresponding openings, so as to thread its way among them, and thus render the bolt inaccessible to any but the proper instrument; while the second consists in the use of moveable impediments, which in their most general form are called *tumblers* (a term which, for convenience, we may apply generically), to the motion of the bolt itself, the security arising from the difficulty of bringing these moveable impediments, by the use of any but the proper key, to the actual and relative positions necessary to allow free motion to the bolt. In many locks both of the above means of security aro used, but for convenience we shall here notice the peculiarities of each system independently of the othor. In dealing with the first system we may include under one general head all contrivances whatever by which the approach of the key to that part of the bolt by which it is capable of being shot backwards and forwards is impeded.

The key of an ordinary lock consists of a cylindrical shank with a loop-shaped handle at one end, and a piece called the *bit* projecting from it at a right angle at or near the other end. The bit end of the shank is, in the keys of locks which are to be entered by the key from one side only, made hollow or tubular, to fit on to a pin or axis fixed in the lock; but in locks which may have to be opened from either side, such as ordinary room-door locks, as no pin can be fixed in the lock, the shank is made solid, and is prolonged beyond the bit, so as to enter, and turn as in a socket within, the upper part of the key-hole of that plate of the lock which happens to be farthest from the person applying the key. The projecting bit, after being introduced into the body of the lock by a narrow opening (the key-hole), is turned round within tho lock by a rotatory motion imparted to the shank, until it comes in contact with a part of the bolt which is so shaped that the bit of the key cannot pass it, to complete its revolution, without shooting the bolt either backwards or forwards, as the case may be. When thus moved the bolt is retained in its position by a spring, or some other means, until it is again moved by the reverse action of the key.

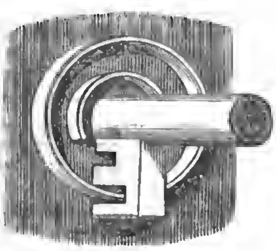
The first and simplest means by which the entrance of a false key may be rendered difficult, is by giving a peculiar form to the substance of the bit, and either adapting the form of the key-hole exactly to it, or inserting pieces of metal in the lock in such a way as to prevent the admission of a bit of different shape. *Fig.* 1 represents several forms of bit com-

Fig. 1.



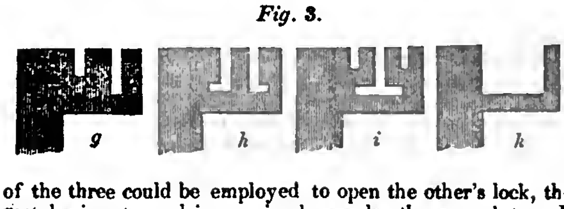
monly used, the keys, which are all represented as of the pipe or tubular make, being presented to the eye endways. Of these *a*, *b*, *c*, and *d* are adapted for key-holes of various corresponding forms, while *e* and *f*, though suitable for key-holes of the same general form as the bit *a*, admit of further security by forming projections upon the sides of the key-holes, which are cut through the plate of the lock, to fit the notches and grooves cut in the sides of the bit. The next and principal means of security of the first class mentioned above is the use of pieces of iron or brass of various forms, fixed within the lock in such a way that no key can be turned round within it unless corresponding notches or slits are cut in its projecting bit. *Fig.* 2, which represents a portion of the interior of a lock in isometrical projection, with the bit end of the key in its place, will illustrate this. The tinted surface in this cut represents part of the back-plate of a lock with a tubular key turning upon a central pin in the plate. Attached to this plate are two concentric prominent rings, of different degrees of elevation, one of which, for the sake of variety, is represented as complete or unbroken, while the other is cut away for a small space at the under side. These prominent rings are the *wards*, or, in technical language, *wheels*, which impede the introduction of a false key. It is obvious that no key could be put into a lock provided with them as in the cut, unless a slit or notch were made in its bit to correspond with the larger and more prominent of the two rings; and it is equally evident that, although it might be put into the lock, no key could be turned round without having also a notch to correspond with the smaller and less prominent circle, which, being cut off near the key-hole, could not be discovered by an inspection from the outside of the lock. In the commoner kind of locks the wards seldom form a complete circle, but their effect is the same if they occupy only a small segment of it. They are commonly made of thin sheet iron, riveted to the plates of the lock; but locks with similar wards of copper are made for use in cellars, and other places exposed to damp, where iron wards would become rusty. A thicker kind of ward, known as solid wards, formed by casting in brass, and finished in the lathe, is used in many superior locks. The above cut represents wards of the simplest possible shape, which require nothing but a simple straight notch in the key to fit them. Many wards, however, are of a more complicated character, such as what are termed L, T, or Z wards, from the resemblance of their sectional form to those letters respectively. The keys must, of course, be cut of a corresponding form, by which the difficulty of imitation is greatly increased.

Fig. 2.



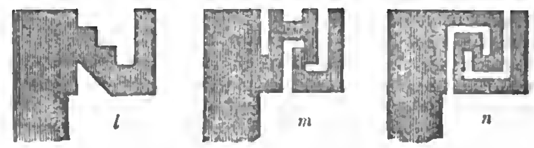
By referring to the various forms of key represented in *Figs.* 3, 4, 5, and 6, the peculiar advantages and defects of that principle of security which depends on the use of wards, may be readily comprehended. The first and greatest defect of the system arises from the circumstance that, in ordinary cases, it is not absolutely necessary that a surreptitious instrument should perfectly thread the mazes of the wards. Thus the form and arrangement of the wards in the three keys marked *g*, *h*, and *i*, *Fig.* 3, is so different, that none

Fig. 3.



of the three could be employed to open the other's lock, the first having two plain or simple wards, the second two L wards, and a third a T ward between two plain wards; but while these afford security against ordinary keys, they afford none whatever against a *pick* or *skeleton key* like *k*, *Fig.* 3, which would also open any other lock which is guarded merely by wards attached to the back-plate; the only part essential to the moving of the bolt being the extremity of the bit, which is retained in the skeleton key with nothing but a slender piece to connect it with the pipe or shank. The security may be greatly increased by the use of other wards, attached to the opposite plate of the lock, and requiring notches in that part of the bit of the key which is represented by the slender connecting piece in the skeleton *k*. Such is the case in all the keys represented in *Figs.* 4, 5, and 6. In *Fig.* 4, *l* represents

Fig. 4.



sents a key for a solid-warded lock, which might, however, be easily picked by a skeleton key resembling *r*, *Fig.* 6. The greater complication of the wards in *m*, *Fig.* 4, increases the difficulty of picking; while by the adoption of the arrangement shown at *n*, *Fig.* 4, the difficulty of introducing a false key is made perhaps as great as possible, since no instrument that does not thread all the intricacies of the wards could answer the purpose. This form, however, requires very accurate workmanship, and unavoidably weakens the key to such an extent that it is in danger of breaking in the lock. All the keys hitherto represented, as well as those in *Fig.* 6, are pipe-keys, adapted for such locks as have a fixed pin or axis, and can only be opened from one side. It is, therefore, of no consequence that the wards attached to the back and front plates of the lock should resemble each other. In ordinary door-locks, however, in which the key may have to be inserted from either side, it is essential that the wards attached to the two plates, if such be used, should either be precisely similar, or should bear such a relation to each other that notches may be cut in both sides, or rather edges of the bit, or, as it is sometimes called, the *web*, of the key to suit both sets of wards, it being a necessary condition that the two sides of the bit, marked *a* and *b* in the cut, *Fig.* 5, should be perfectly alike. In such locks there is, very commonly, an intermediate plate, which enters the opening marked *c* in the annexed figure, and which carries, on one or both of its sides, the principal wards; and in many cases the bit of a key divided by such an opening may be considered as constituting a double key, of which only one-half is used at one time, that half being either *a* or *b* according to the side through which the key is put into the lock. Such is in some measure, the case in the key from which *Fig.* 5 is drawn; although, as it is the key of a tumbler lock, both halves are brought into use at once, whatever may be the direction in which the key is applied, with this difference, that when the key is applied from the outer side of the door the part marked *a* moves the tumbler and *b* the bolt, while when the key is put into the lock from the inner side *a* moves the bolt and *b* the tumbler. Our remaining illustrations of warded keys are intended to explain the theory of *master-keys*, which was early understood by the ingenious locksmiths of Wolverhampton. In *Fig.* 6 the wards of the keys o, *p*, and *q* are so far different from each other that neither of those three keys

Fig. 5.

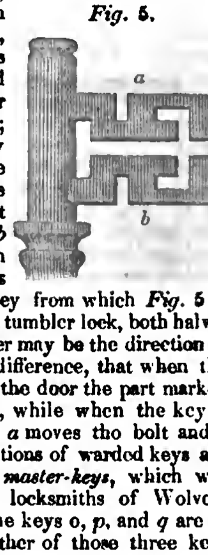
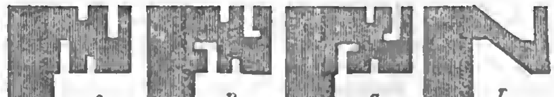


Fig. 6.



would open the lock designed for either of the other two, but a key formed like *r* would readily open any of the locks of the other three, or any other of a more extensive series, or *suit*, of locks constructed on the same principle.

One defect of the principle of security by wards is that, however complicated they may be, an ingenious picker will mostly be able to detect their form and position, by inserting a blank key with the bit covered with wax or tallow, so as to receive an impression of the concealed obstructions in the lock. It is well to observe that it is a very common practice to cut more notches in the key than there are wards in the lock, so that the complex appearance of a key is no certain proof of the secure construction of the lock to which it belongs. Indeed some of the commonest locks are manufactured without any wards at all, although the keys are invariably made as if wards were employed.

As above stated, some contrivance is necessary to keep the bolt steadily in the position in which it is left by the key; and in locks which depend upon wards for their security, this is usually effected by means of a spring, as illustrated by *Fig.* 7, which represents the interior of a small cupboard lock, with the bolt, *a b*, *half shot*, or in a position intermediate between locking and unlocking, and capable of being moved either backwards or forwards by the action of the bit of the key at *c* in a curved hollow formed in the lower edge of the bolt. The end *a* of the bolt is divided into two parts, shooting through separate holes in the rim of the lock; the top of the bolt carries a long elastic piece formed by nearly separating a stout lamina of metal from the body of the bolt, and giving it an inclination to diverge from the bolt at the end *b*; and the lower edge of the bolt, behind the curved part acted upon by the key, is indented with two deep notches, *b* and *d*, with a smooth convexity between them. The opening in the back rim of the lock through which the end *b* of the bolt passes, is so small as to compress the spring with considerable force. If, therefore, the key be so applied as to shoot the bolt forward, the re-action of the spring will cause the notch *b* to hold firmly on the edge of the rim, from which it cannot be disengaged without raising the bolt, and compressing the spring, so as to allow the convexity between *b* and *d* to pass over the edge of the rim, after which the notch *d* will hold on the rim in like manner. The necessary raising of the bolt and compression of the spring is properly effected by the action of the key, but as it may be effected by pressure upon the end of the bolt, the security of locks in which such an arrangement is adopted, which are called *back-spring* locks, is inferior to that of *tumbler* locks, which form the next branch of our subject, in the means of retaining the bolt in its position, as well as from the defects already explained as incident to the use of wards.

Fig. 7.

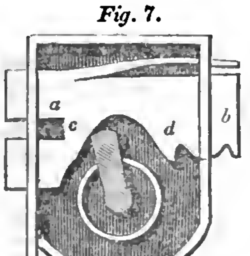
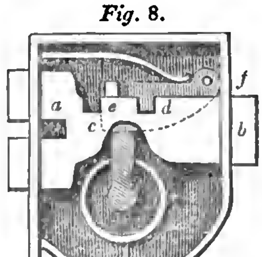


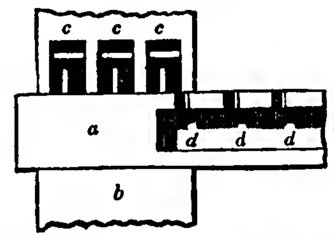
Fig. 8.



We pass naturally from the consideration of the back-spring as an essential feature in a lock protected by wards alone, to the explanation of one of the simplest modes of applying the second principle of security, that which consists in the use of moveable impediments to the motion of the bolt, and which may be applied, as an additional security, to locks in which the most ingenious arrangements of wards is employed to prevent the access of a false key to the bolt. *Fig.* 8 represents, side by side with our figure of a back-spring lock, a similar lock provided with a common tumbler. In this figure the bolt *a*, *b*, though shot backwards and forwards in the same manner as that of *Fig.* 7, has no spring, or notches to catch on the back rim of the lock, to hold it in any required position; but it is provided with two notches in its upper edge, at *c* and *d*. Behind the bolt is a piece of metal called the tumbler, pivoted to the plate of the lock at *f*, and continually forced downwards by a spring which presses upon its upper edge. The upper part of the tumbler, which is visible above the bolt, is distinguished in the cut by being covered with a light tint, while the shape of the lower part, which is concealed by the bolt, is indicated by dotted lines. At the angle *e* the tumbler carries a projecting stud, which, when the bolt is fully shot, falls into the notch *d*, and holds it firmly until, by the application of the key, the bit of which reaches the lower edge of the tumbler, the tumbler is lifted up to the position shown in the cut, by which the bolt is released, so that the further turning of the key shoots it back, when the stud of the tumbler falls into the notch *c*, and again secures the bolt. It is obvious that so long as the tumbler remains in its proper notch, the bolt cannot be moved backwards or forwards by any pressure upon its ends; and also that the lock cannot be opened by any pick or false key unless its bit be so formed as to reach the tumbler as well as the bolt. To render this more difficult the tumbler is often made to fall a little lower than the bolt, so as to be acted upon by a *step* formed on the bit of the key; while further complication and security may be obtained by the use of two or more tumblers, which may be acted upon by different steps on the key. The great exactness requisite in the length of the bit forms a strong recommendation of even the commonest tumbler locks; for if the bit be ever so little too short it will not lift the tumbler out of its notch, while if it be but a very little too long, it will not enter the curved portion of the bolt.

According to Mr. Ainger, the principle of security by tumblers, though of comparatively modern application in this country, has been known to the Egyptians from a very remote period. In the lock now commonly used in Egypt and Turkey, the bolt is secured by a number of pins, which, though contained at other times in holes or sockets in a solid piece through which the bolt slides, fall into holes in the bolt when it is shot. This contrivance is illustrated by the an-

Fig. 9.



nexed diagram, *Fig.* 9, in which *a* is a part of the bolt, capable of sliding through the solid piece *b*, in which are a number of hollows, *c*, *c*, *c*, each containing a moveable pin. As it is only by a sectional diagram that these pins can be represented, they are drawn as if all were in one straight line, which, however, is not the case in practice. In the present position of the bolt the pins rest upon its upper surface, and offer no impediment to its motion; but if the bolt be slid forward until the holes *d*, *d*, *d*, come under the pins *c*, *c*, *c*, the lower ends of the pins will drop into them, and the bolt will consequently be held fast. It can only be released by the application of a kind of key which has a series of fixed pins exactly corresponding with the holes in the bolt, and which, being introduced into the bolt by the hollow or cavity *e*, is pressed upwards in such a way as to lift the pins clear of the bolt. The security arises from the concealment of the obstacles to the motion of the bolt, and from the circumstance that, supposing a person to obtain a correct impression of the holes, it would be difficult to ascertain the exact length necessary for the pins of the key. If too short they would not raise the pins clear of the bolt, and if too long they would enter the holes in the solid part above the bolt, and so impede its motion. This kind of lock, Mr. Ainger observes in the 'Encyclopædia Britannica,' 'appears to be extensively, or rather universally, employed for gates of towns and of houses, as well as for the smallest articles of furniture. The evidence of its alleged antiquity is derived,' he adds, 'according to M. Denon (in whose magnificent work on Egypt it was published), from the circumstance of finding one sculptured among the bas-reliefs which decorate the great temple at Karnak, from which also it was ascertained that during forty centuries the lock had undergone no sensible change.'

Notwithstanding the high antiquity of the tumbler principle, its first important application in this country appears to have been made by Barron, in 1774, according to most authorities, or in 1778, according to the 'Encyclopædia Britannica.' In the simple form of the tumbler represented in *Fig.* 8, there is the disadvantage that, while it effectually prevents the removal of the bolt unless the tumbler be raised high enough, it presents no obstacle to its removal when, by the use of a false key, the tumbler is thrown up beyond the proper degree. This defect is remedied in Barron's lock, and in many more recent contrivances which are based upon it, by the use of several tumblers, each of which requires to be raised to a different degree, and any one of which, if lifted too high, will form as effectual a barrier to the motion of the bolt as if it were not lifted at all. To illustrate this, let *a*, *Fig.* 10, represent a tumbler pivoted at *b*, pressed downwards by the action of a spring, not shown in the cut, at *c*, but having its downward motion limited by the contact of the tail *d* with a fixed pin. Underneath, or behind the tumbler lies the bolt, a part of which only is shown in the cut, where it is distinguished by a dark tint, and at *e* an opening, somewhat resembling the letter H in shape, is cut through the tumbler, to allow a prominent square pin, or stud, which is attached to the bolt, and is shown in the cut by a light tint, to pass through it. It is obvious that the bolt secured by such a tumbler can only be shot when the tumbler

Fig. 10.

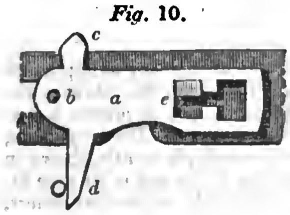
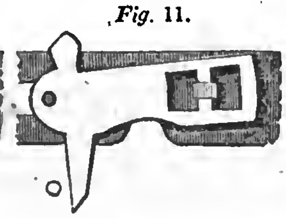
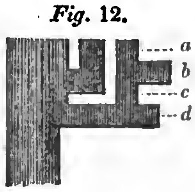


Fig. 11.



is raised precisely to such a degree as to bring the horizontal portion of the H-shaped aperture opposite to the stud, so that the stud, which fits it accurately, may slip through it. *Fig.* 11 shows the tumbler raised to this position, and the bolt half shot. When fully shot the tumbler again falls; the stud is secured in that division or notch of the H-shaped aperture which lies nearest the end of the tumbler; and an equal security is afforded against any attempt to return it to its first position by any key which does not lift it precisely to the proper height. Several such tumblers may be placed in one lock, the whole being mounted upon one pivot; and if the horizontal connecting portion of the H-shaped aperture be placed at a different elevation in each, each will require to be raised to a different degree to allow the stud of the bolt to pass. These different degrees of motion are provided for by variations in the curved portion of the lower edge of the tumblers, against which the bit of the key acts, and by dividing the end of the bit into a series of steps and notches, each acting upon a single tumbler. *Fig.* 12 represents the bit of such a key, adapted for a lock with three tumblers. As may be seen from the cut, the lock to which this key is adapted is guarded by two wards, of different forms, and the end of the bit is divided into four portions, of various degrees of projection, of which that marked *a* is employed for moving the bolt, while *b*, *c*, and *d* act upon the three tumblers.

Fig. 12.



In the event of such a key being lost, or it being suspected that an impression of it had fallen into wrong hands, the tumblers of the lock might be taken out and returned on to their common axis in a new order, so as to require a key in which the members *b*, *c*, and *d* would stand in a different relation to each other, by which means the old key would be rendered utterly useless.

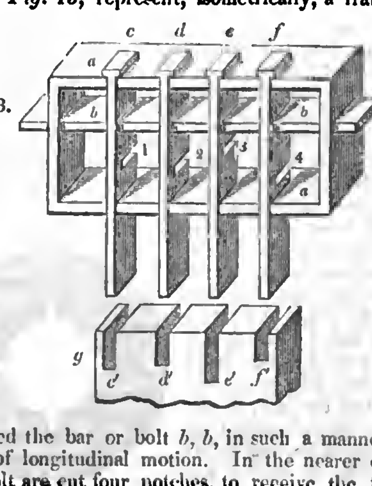
In many very ingenious locks of this character the same object is attained by the use of solid tumblers, carrying studs which pass through H-shaped openings in the bolt. As each stud requires a separate opening, this arrangement can hardly be adopted when more than two tumblers are used. The action of such a lock forms an excellent illustration of the principle, since it renders evident to the eye, when the lock is opened, the necessity of not only raising each tumbler to the requisite degree, and no more, but also of doing so in a certain preconcerted order of time, so that at the moment of shooting the bolt, they may be in the precise position for passing through their respective openings in the bolt, or rather for allowing those openings to pass over them, although the motion of the key before it begins to affect the bolt may cause them both to rise above and to fall below the required position. In a very well contrived lock of this description invented by Mr. Somerford, of which an account is given in the thirty-sixth volume of the 'Transactions of the Society of Arts,' one of the tumblers is drawn downwards by the key while the others are raised, thus introducing a new complication which greatly increases the difficulty of picking, without adding materially to the cost of the lock. In this case the tumbler, which is drawn downwards by the key, is placed on the opposite side of the bolt to the others. It may be observed of all such locks, that while the tumblers afford the main security, the judicious use of wards very greatly increases the difficulty of picking.

Chubb's detector lock, the original patent for which was obtained in 1818, though an important improvement upon it was secured by a second patent in 1824, is one of the most celebrated locks made on the principle above described. Its peculiar merits consists in the addition of a lever, called the *detector*, which is so fixed that, while it does not affect the bolt at all under ordinary circumstances, it cannot fail to move so as to drop a catch into the bolt if any one of the tumblers be lifted a little too high, as some of them must inevitably be by any attempt at picking the lock. By thus fixing the bolt immoveably, it not only renders useless any further attempt at picking the lock, but also gives notice of the attempt which has been made, when the proper key is next applied. By a very ingenious contrivance the proper key is enabled, after lifting all the tumblers to the proper degree for shooting the bolt, to release the detector by a peculiar movement, and thus to restore the lock to its usual state.

In Bramah's lock, which was invented and patented about 1784, the principle of tumblers or moveable obstacles is applied in a very different manner to that above described, and the use of wards is entirely abandoned. In a kind of prefatory record which was attached to his specification, and is quoted by Holland, Bramah alludes to the insufficiency, for the purpose of security, of all contrivances of the ward, or fixed obstacle character, not only on the grounds above noticed, but also because, according to Holland's abstract of his argument, 'the variations capable of being made in the disposition of such wheels or wards, and in the form of the key's bit, are not sufficient to produce the required number of locks, without having large quantities exactly alike, and their keys capable of opening one another reciprocally; in consequence of which they become a very imperfect security against violation, as any ill-disposed person might, by furnishing himself with a number of old keys, be enabled to open almost all the common locks in the kingdom with as little difficulty as if he had in his possession the key belonging to each lock.' In devising a remedy for these defects, Bramah contrived a method of applying moveable impediments very different to that adopted by Barron. Retaining the principle which required that every such impediment should require its own peculiar movement, he provided for restoring them, by the application of an elastic force, to such a position as should leave no trace of, and afford no possible clue to the discovery of, the extent of their motion under the pressure of the key, so that the opening of his lock without the true key is, to use his own expression, 'as difficult as it would be to determine what kind of impression had been made in any fluid, when the cause of such impression was wholly unknown; or to determine the separate magnitudes of any given number of unequal substances, without being permitted to see them; or to counterfeit the tally of a banker's cheque, without having either part in possession.'

To explain, more readily than could be done by a mere representation of the lock itself, the nature of the ingenious contrivance by which the above effect is produced, we may adopt, with some alteration, a diagram of a supposed apparatus illustrative of its principle, which is given by Holland from the original drawings attached to Bramah's specification. Let *a a*, *Fig.* 13, represent, isometrically, a frame in which

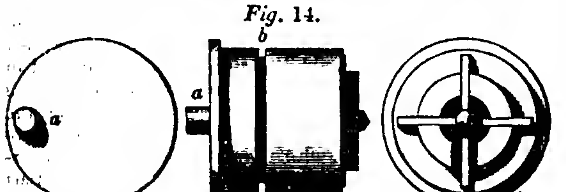
Fig. 13.



is mounted the bar or bolt *b*, *b*, in such a manner that it is capable of longitudinal motion. In the nearer edge of this bar or bolt are cut four notches, to receive the four vertical sliders, *c*, *d*, *e*, and *f*, which, when they are in the position represented in the cut, serve to hold it immoveable. In the further edge of each of these sliders, however, is cut a notch of such size and depth, that if it be brought to the same level as the bar *b b*, the bar will be capable of sliding through it. These notches in the sliders, shown by 1, 2, 3, and 4 in the diagram, are cut at various degrees of elevation, so that, in order to bring them all to tally with the bar at once, which is necessary to enable it to slide through them, each slider must be lifted up to a certain degree, different from the elevation of either of the others. As, however, the lower ends of the sliders, which pass through the bottom of the frame *a*, *a*, and which are the only parts of the apparatus intended to be visible, have a uniform degree of projection, it is impossible to tell how high each of them must be lifted in order to make its notch tally with the bar; and this can only be done by the application of an instrument resembling that marked *g* in the figure, in which are a series of slits, *c'*, *d'*, *e'*, and *f'*, corresponding with, and capable of fitting on to the lower ends of the sliders *c*, *d*, *e*, and *f*, and each slit being cut to exactly such a depth that when the instrument, or key, is put upon the ends of the sliders, and pushed up until its lower end comes in contact with the bottom of the frame, its corresponding slider will be raised to the degree necessary to make its notch tally with the bar *b b*. While the key, *g*, is held in this position, the bar *b b* may be slid backwards or forwards; but the instant it is returned to its original position, and the key is withdrawn, the sliders fall, by their own weight, into the position represented in the cut, and the bar is again held fast.

In order to explain how the principle of security illustrated by the above imaginary contrivance is applied in Bramah's lock, we must premise that the ordinary mode of shooting the bolt, by the action of the bit of the key, is entirely abandoned in it; the office of the end of the bit being performed by a stud attached to the end of a cylindrical barrel which is mounted in the lock, and which contains all its essential parts, or, rather, all the parts essential to its security. *Fig.* 14 represents this barrel, of the actual size, drawn from a street-door latch-lock, the central figure being a side view of the barrel, and the others representations of its back and front ends, respectively. In this cut *a*, in the side and back views, represents the stud by which, when the barrel is caused to revolve on its axis, the bolt is moved as by the bit of an ordinary key. This revolving motion is imparted to the barrel by the

Fig. 14.



insertion of the proper key, which is represented in *Fig.* 17, and which has a very small bit adapted to the square notch at the bottom of the key-hole shown in the front end of the barrel; but the barrel is prevented from revolving, excepting when the proper key is applied, by a contrivance similar to that represented in *Fig.* 13, but arranged, for convenience, in a circular form within the barrel. In this modification of the apparatus, the barrel, which contains four sliders radiating from its centre or axis, and having a motion in the direction of its length, represents the frame with its series of vertical sliders; the sliders, instead of being kept in their ordinary position by gravity, are continually pressed forward to the front or key-hole end of the barrel by a helical spring; and the bar *b b* is represented by a circular plate of steel, represented of the actual size in *Fig.* 15, which is cut into two halves by a division shown in the cut at top and bottom, and is inserted, by its inner edge, in the slit or opening *b b* in the barrel, *Fig.* 14. The four notches in the inner edge of the plate are thus placed upon the edges of the four sliders in the barrel; and as the plate is screwed by the holes shown at its two sides to an immoveable part of the lock, it follows that the barrel cannot be turned round unless the four sliders are so far pushed in by the key that their notches may all tally with the edge of the plate, *Fig.* 15. *Fig.* 16 is a longitudinal

*Fig.*15.

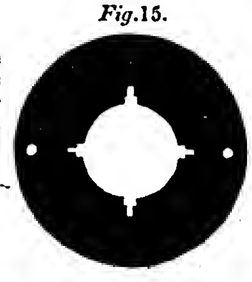


Fig. 16.

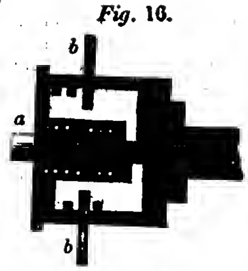


Fig. 17

section of the barrel with the end of the key as applied to bring the sliders into the required position for allowing the barrel to turn; and *Fig.* 17 represents, at *a* in profile, and at *b* in an end view, the key itself separately. The key, being tubular, is put upon the fixed central pin or axis, shown in *Fig.* 16, the four radiating notches in the end of its pipe fitting, at the same time, on to the ends of the four sliders, which are shown in *Fig.* 14. These sliders, two of which are shown white in the section, *Fig.* 16, are, in the absence of the key, kept pressed against the front of the barrel by means of a collar which slides upon the central pin or axis, and is pushed forward by a helical spring which surrounds the pin, and abuts upon the back plate of the barrel; but when the key is pushed into the lock it comes in contact with the sliding collar, compresses the spring, and thus allows each slide to be pushed forward to a degree exactly proportionate to the depth of that notch in the key which acts upon it. By this means the deepest of the three notches represented in the outer edge of each slider is brought to tally with the edge of the circular plate, which is represented detached in *Fig.* 15, and shown edgeways, at *b b* in *Fig.* 16, and thus all impediment to the rotation of the barrel is removed, and consequently, by moving the key, the barrel, with its stud *a*, may be caused to revolve, and to shoot the bolt just as an ordinary key would do. When the barrel is returned to its original position, the key is withdrawn, and the action of the spring restores the sliders to their ordinary situation, in which they lock into the notches of the circular steel-plate, and keep the barrel stationary.

In order to render the above description as simple as possible, we have omitted in it several minor points which tend to the security and efficiency of the lock. The whole of the apparatus above explained is securely enclosed in a turned brass box, so that even the ends of the sliders are only visible at the farther extremity of the deep and very small key-hole, the centre of which is occupied by the end of the pin or axis, which, projecting considerably beyond the sliders, greatly increases the difficulty of bringing any false instrument to act upon them. The small bit of the key, the main use of which is to cause the barrel to revolve whenever the key is turned, forms also a stop to prevent it from being pushed in too far, and to indicate when the sliders are brought to the proper position. To prevent the sliders from working too loose, or from dropping too far into the barrel, in advance of the key, when by the compression of the helical spring they are released from its influence, they are made of a thin piece of metal doubled, as shown at *c*, *Fig.* 17, so that their inner ends, having an inclination to spring open, press with sufficient force against the sides of the grooves in which they slide to keep them in whatever position the pressure of the key may place them, until such pressure is withdrawn, and they are exposed to the counter-pressure of the helical spring. The portability of the key constitutes a great advantage of this kind of lock, as a key which may always be carried in the waistcoat pocket, or even attached to a watch-chain, is less likely to be mislaid, or to fall into the hands of improper persons, than a large key. Again, both locks and keys, being made almost wholly by machinery, may be made with great accuracy at a moderate cost, while the production of a false key from an impression of the true key, or even from the key itself, would be no easy task to a person not possessed of the requisite machinery. The two additional small notches represented in the tumblers of *Fig.* 16 and 17, to which no allusion has yet been made, add greatly to the security of this kind of lock. For some time after its introduction it was deemed absolutely inviolable, but ingenuity at length overcame the difficulty of picking it. This was accomplished by what has been aptly termed the *tentative*, or *trying*, process. Force being applied to the barrel in such a way as to give it an inclination to revolve on its axis, the picker tried all the sliders in succession, to ascertain which of them, by the inevitable inaccuracy of workmanship, pressed with most force against the circular locking-plate. This slider he then gently pushed until, by the cessation of the resistance of the locking-plate, he found that its notch was in the required position, when, having secured it, he proceeded to adopt the same course with each of the other sliders in succession. Thus, by an extraordinary exercise of patience and delicacy of hand, a very skilful operator was able, in many instances, to accomplish the apparently impossible feat of picking a Bramah lock. No sooner, however, was this fact made public, than an efficient remedy was provided by a person named Russell, who was then in Bramah's establishment, by the simple device of cutting one, two, or more additional or false notches on each slider, and enlarging, as shown in *Fig.* 15, the inner portion of each notch in the locking-plate. The result is that it is utterly impossible for a picker to know whether he gets the true notch, or one of the false notches, on to the edge of the locking-plate, while, supposing him, against all probability, to find the right notch in a majority of the sliders, the fact of one only hanging on a false notch would be sufficient to prevent the barrel from turning, owing to the depth of such notch being insufficient to clear the plate. The enlargement of the notches in the locking-plate, which allows of a degree of motion far exceeding any which could arise from mere inaccuracy of workmanship, adds to the baffling effect of the false notches, by the use of which the Bramah lock may be fearlessly said to be rendered, so far as any mechanical contrivance can be, perfectly secure from picking. The same principle of picking, and the same kind of expedient for security against it, with variations of detail which need not be noticed here, have been applied to tumbler locks of the more ordinary construction.

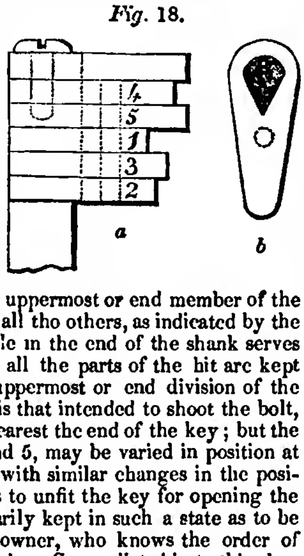
The infinite variety attainable in the manufacture of locks on this principle forms one of its great recommendations. Our illustrations refer to one of its simplest forms, in which only four sliders are used; but even in this form the variety attainable, without any difference in the size of the key or the diameter of the central pin, is very great. By the use, however, of five, six, or seven sliders, the number of different locks, each of which may have the same external appearance, but can be opened only by its own proper key, is increased almost to infinity. Bramah himself showed that if twelve sliders were employed the number of changes which might be produced by simply varying their relative positions, would amount to 479,001,500; while by adding one more slider the number would be increased to 6,227,019,500; so that, as he observes, 'one lock, consisting of thirteen of the above-mentioned levers, sliders, or other moveable parts may (by changing their places only, without any difference in motion or size), be made to require the same immense number of keys. It may be observed that in the event of a key being lost, or the owner desiring, on any account, to have a lock altered, it is possible to change the relative positions of the sliders, so as to render the old key useless; and also that *master-keys* may be made, if required, by constructing a suit, or set, of locks alike in everything but the position of their notches, and then applying to each of them in succession the intended master-key, which must have notches different to any of the ordinary keys, and cutting new additional notches in the sliders to suit it. Such, indeed, is the principle upon which the notches of ordinary Bramah locks are cut, the key not being fitted to the lock, but made first, and having its notches cut by a machine which provides for a continual change in their order and depth. This done, each key is applied to a separate lock, with blank or uncut sliders, and the notches in the sliders are cut while they are thus held in the proper position by the key. By any other arrangement it would be almost impossible to secure the requisite accuracy.

Owing to the very small size of the protecting apparatus, the Bramah lock has been applied to many ingenious purposes for which other kinds of lock are less suitable, among which we may notice the locking of liquor-cocks. Mr. Russell's contrivance for thus applying it is referred to under Cock, P. C. S., p. 385; and we see no reason why, for small cocks, a more simple arrangement should not be adopted, in which the revolving barrel of the lock should be attached to, and indeed form the upper part of, the revolving plug of the cock itself, so that a single motion of the hand should be sufficient both to unlock and to open the cock. The proposed arrangement would have this advantage, that it would be impossible, by inadvertence, to leave the cock unlocked, since the act of turning off the liquor would both lock it and, by the force of the spring, so far eject the key that it could only be left in the lock by design. In the forty-eighth volume of the 'Transactions' of the Society of Arts (part i. p. 132) is a paper by Mr. S. Mordan, who has gained much celebrity by the manufacture of beautiful locks on the Bramah principle, on a curious application of this invention to what he calls a 'lock-protector,' which is, in fact, a scutcheon, or shield, adapted to cover the key-hole of a room door, and having in its centre a minute lock with seven sliders or guards. By applying this scutcheon to a key-hole on the outside of a door, and turning its key a quarter round, two lancet-shaped pieces of steel are projected from a little box at the back of the scutcheon, in such a manner as to dig into the wood on the opposite sides of the key-hole, and to hold the scutcheon so firmly in its place that nothing short of the application of violence can remove it, until, by a fresh application of the little key, the blades are withdrawn. The chief object of this contrivance is to enable travellers at inns to prevent their chamber doors from being opened in their absence, by closing up the key-hole.

A lock was invented by Mr. Kemp, of Cork, in 1816, in which the peculiarities of both Barron's and Bramah's locks are combined in such a way as to afford, in the inventor's opinion, greater security than can be attained by either alone. In this lock, which he calls the union lock, a number of pins or sliders, which detain the bolt much in the same way as the sliders of Bramah's lock detain the locking-plate, are acted upon by the ends of a series of tubes, of various lengths, which are placed within one another, inside the pipe or barrel of the key. This kind of key, its inventor justly pleads, must be far more difficult to imitate than either Barron's and Bramah's, so that it affords greater security against any attempt to make a false key in imitation of the true one. Hebert, in noticing this invention, observes, that until a complete remedy is provided against the possibility of copying or imitating keys, the art of lock-making is imperfect, and no locks are inviolable; and he adds 'that he had in his possession a lock the key of which *cannot be copied*—a locksmith possessing no tools by which an exactly similar one can be made.' The machine by which the original one was made, he adds, is so arranged as to be deprived of the power of producing another like it. The lock is very simple and strong, and might, he says, be manufactured cheaply; but as the inventor was waiting for an opportunity of bringing it before the public, Hebert gives no account of its construction.

As a means of security somewhat differing from any of the above, and affording certain advantages peculiar to itself, we may here notice the *permutation* or *combination* principle, of which the simplest application is in a kind of padlock often termed a puzzle-lock, which opens without a key, but is regarded rather as an ingenious toy than as an available substitute for locks of the more usual construction. In the commonest form of these locks a bar, with square or other projections from one or more of its sides, is slipped through a series of circular plates or discs, each of which is capable of being turned round upon it as an axis. The holes or apertures through the centres of these circular plates, discs, or rings, are so formed that unless the whole of them are turned round to the exact position which they occupied when the bar was slipped in, it cannot be withdrawn. To provide for bringing the rings to this position after they have been disturbed from it, the periphery of each is marked with a series of letters or numbers, a certain predetermined combination of which, which should be known only to the possessor of the lock, must be brought into a straight line by turning the several rings round with the thumb and finger. As the number of combinations which may be effected, like the number of changes in the relative positions of the tumblers or sliders of a Barron's or Bramah's lock, is almost infinite, while only one combination will enable a person to open the lock, a high degree of security may thus be attained. The essential defect of this arrangement is, that the secret of the lock must be known to the person who made it, and is liable to become known to persons from whom it is desirable to secure the lock. The Marquis of Worcester, in whose 'Century of Inventions' several different kinds of lock, which lay claim to the most marvellous properties, are enumerated, would appear, from the seventy-second article in the 'Century,' to have devised an improvement upon this apparatus, as he refers to 'an escutcheon to be placed before any of these locks,' one of the properties of which he describes as being that 'the owner, though a woman, may, with her delicate hand, vary the ways of coming to open the lock ten millions of times beyond the knowledge of the smith that made it, or of me who invented it.' The details of this invention are not given, but in the third volume of the 'Transactions' of the Society of Arts, pp. 160-165, is a description of an escutcheon of similar character, invented by Mr. Marshall, and rewarded by the Society in 1784, in which the escutcheon or door by which the key-hole is closed is held by a pin passing through a similar series of rings to those used in the common letter or puzzle padlock, but with this important difference, that instead of the rings or plates being formed each of a solid piece of metal, each consists of an inner and outer ring; the inner one, which contains the notches for allowing the bar to pass through, being so mounted within the outer one, which has the letters or numbers on its periphery, that it may be turned round within it, or held fast in any required position, at pleasure. The result is, that the relative positions of the internal notches, and the external letters which serve as an index of their situation, may be varied almost infinitely; and thus, whenever the owner suspects that the secret is known to any improper person, he can vary the combination of letters by which the opening is determined. The details of this ingenious contrivance are fully given in the volume above referred to. In the thirty-eighth volume of the 'Transactions' of the Society of Arts, pp. 111-115, is a minute account of a lock invented by Mr. Ainger, in which, in addition to other ingenious features, is an application of the principle of permutation to a key, which provides, without any great complication, the means of not only rendering the imitation of the key all but impossible, but also of so throwing the key itself out of order, that there would be 512 chances to one against a stranger being able to make use of it should it fall into his hands. This paper also describes a means of rendering a draw-back lock or latch as difficult to pick when on the first shoot as when double-locked. Another, and a beautifully simple permutation lock, invented by Mr. Mackinnon, of Sheffield, is described in the fiftieth volume of the same work, part ii. pp. 86-88. It is a tumbler lock, in which each tumbler is numbered, and a corresponding number is stamped upon each of a series of small plates, which, when put together upon an axis at the end of the shank of the key, as represented in *Fig.* 18, which gives a side and end view of the key, constitute, collectively, a bit resembling that of the key of an ordinary tumbler lock. The end view at *b* shows the general form of the several members of the bit, each of which is pierced with two holes, one of such a shape as to fit upon the pear-shaped end of the shank, represented by a tint in *b*, while the other is round, a little in front of that which fits on the shank, to receive a pin which is attached to the uppermost or end member of the bit, and which passes through all the others, as indicated by the dotted lines in *a*. A small hole in the end of the shank serves to receive a screw by which all the parts of the bit are kept firmly in their place. The uppermost or end division of the bit, which is not numbered, is that intended to shoot the bolt, and must always be placed nearest the end of the key; but the others, marked 1, 2, 3, 4, and 5, may be varied in position at pleasure, so as to correspond with similar changes in the positions of the tumblers, or so as to unfit the key for opening the lock. It may thus be ordinarily kept in such a state as to be quite useless to any but the owner, who knows the order of numbers necessary to set it right. Somewhat akin to this class of contrivances is the curious secret lock invented by Mr. Friend, and described in the forty-third volume of the Society's 'Transactions,' pp. 114-118, in which it is impossible to open the lock even with the proper key, without the application, at the same time, of an apparatus which is called the guide, and which is so portable that it may be put into a pocket-book. As the action of the guide depends on the permutation principle, even it will not enable a person unacquainted with the number or cipher to which it is set, and which may be varied as often as necessary, to open the lock.

Fig. 18.



In some locks increased complexity, though it may be doubted whether any practical advantage in increased security, is obtained by the use of two distinct sets of tumblers, capable of impeding each other's motion except when rightly acted upon. Hebert refers to locks of this character, which possess some other features worthy of notice, but which are too much matters of detail to be given here; and Holland gives an engraving of a lock invented by one of the ingenious Strutt family, in which the shooting of the bolt is effected by a knob or handle which raises an ordinary tumbler, which, however, can only be lifted by previously bringing a series of other tumblers into such a position that a notch cut in all their edges shall be brought over a projection from the ordinary or bolt tumbler. The most noticeable feature of this contrivance is, that while the motion of the bit of the key, and consequently of that part of the series of tumblers upon which it acts, is not greater than usual, those edges of the tumblers in which the notch is cut are capable of moving through a large arc, thus affording the opportunity for cutting a great number of serrations, or false notches, upon their edges, to baffle any attempt at picking by the tentative process.

Of some other curious inventions for additional security we can only give a passing notice. Some locks have been made in which the action depends on the key being a powerful magnet. In others the difficulty of opening is increased by requiring a peculiar method of applying the key; but in addition to the circumstance that the secret must be known to several persons, these contrivances have the disadvantage of being very inconvenient in use. As a mere mechanical curiosity we may refer to one, contrived by Mr. Thomas Arkwright, and described in the eighteenth volume of the 'Transactions' of the Society of Arts, pp. 239-242, in which a key with two bits, and requiring eight or nine distinct movements in the act of unlocking, is used with a double lock capable of shooting two distinct bolts. In Mr. Lawson's lock, referred to by Holland, there is a sliding curtain, by which, it is stated, 'the key-hole is so perfectly closed during the act of unlocking, that it would be impossible to move the bolt while a pick remains in the aperture.' In Gottlieb's lock, patented in 1829, a piece of paper is so placed that no key can be put in without perforating it, and that it cannot be removed excepting by an application of the proper key; and to prevent the possibility of substituting a fresh paper, its inventor proposed to use pieces bearing some device, and torn from a cheque-book which would serve as a tally. In 1831 a patent was obtained by Mr. Rutherford, of Jedburgh, for the application of a stop-plate to the bolt of a lock in such a manner that it should be impossible to open the lock with its own key until, by the action of clockwork within or connected with the lock, the stop-plate should be brought into a certain position. By this contrivance a person locking up a bank-safe, cash-box, or a package intended to be sent to a distance, may so arrange the lock that it cannot be opened until the expiration of a certain number of hours. Many contrivances have been effected for attaching an alarum to locks, by which the introduction of a false key should ring a bell or fire a pistol. A good alarum-lock, acting upon a bell enclosed within the case or box of the lock itself, invented by Mr. Meighan, is described in the 'Transactions' of the Society of Arts, vol. li. part i. pp. 128-130.

The compound locks used for the doors of iron safes, and for similar purposes, though ponderous and complicated in their appearance, are, in reality, of simple construction. Although they often throw out two or three bolts in every direction, that is to say, on each side, and towards the top and bottom of the door, these are usually but so many branches of four massive pieces of iron, capable of being simultaneously projected or retracted by a fixed or removeable handle in the centre of the door; the actual lock being but small, and merely intended to move an apparatus by which the great bolts are themselves locked or held fast; so that the key need not bear any proportion to the magnitude of the bolts by which the door is secured. In such cases a single lock may be made to serve for securing all the bolts; but in an excellent quadruple lock invented by Mr. D..ce, of Wolverhampton, rewarded by the Society of Arts in 1823, and published in the forty-second volume of their 'Transactions,' p. 125, four bolts, each secured by a distinct set of tumblers resembling those used in Chubb's locks, are shot in succession by a single key, in one complete revolution. To pick this lock, therefore, would require as much time and trouble as to pick four distinct locks of the same kind.

In conclusion, without attempting even to enumerate the various kinds of lock in common use, we may notice two useful inventions relating to street-door locks. Of the contrivances for moving draw-back and other bolts by means of fixed handles we have said nothing, as these are matters readily understood by an inspection of any common door-lock, and are not essentially connected with the principles of security. It is a defect of ordinary draw-back locks that occasionally, from want of oil, from the bevelled end of the bolt becoming rusty, or from some other cause, they will not close without slamming the door violently, and are liable not to act at all, so that the door may be, to all appearance, shut properly, without the bolt shooting into its socket. To remedy these inconveniences, Mr. Bullock devised, and submitted to the Society of Arts in 1801, a very simple addition to the ordinary door-lock, consisting of an internal catch which detains the bolt when it is drawn back, but is released the instant the door is thoroughly closed, by the pressure of a small projecting piece against the check or jamb of the doorway. The details are fully given in the Society's 'Transactions,' vol. xix. pp. 290-293. The second invention referred to is Chubb's combination latch, which combines the simple lifting action of the ordinary French latch, or that which opens with a handle inside the door, and with a key from without, with much of the security of a tumbler lock. In it two, three, four, or more distinct latches are mounted, like a series of tumblers, upon one axis, and made to shut into or behind a double catch, in such a way that they can only be disengaged from it by being all of them raised at once to one exact height, by an arrangement similar to that by which a series of tumblers are raised.

LOCUST (the *Gryllus migratorius* of Linnæus, *Locusta migratoria* of modern entomologists), a well-known insect, belonging to the order *Orthoptera* and family *Locustidæ*. Locusts are endowed with great strength for leaping and flying, and, being gregarious, are thus enabled to commit great devastation, so that when a swarm has destroyed the vegetation of one district, they are enabled to take flight to and traverse another even though at a considerable distance. The migratory locust has occasionally visited England, and about the middle of the last century did some damage in many parts of our own country. In Southern Europe, the East and Northern Africa, this species and its allies are exceedingly destructive, the swarms being so vast as to destroy all vegetation, whilst the putrifying carcasses of their dead infect the air. The Arabs and people of Nigritia use these insects as food. For full details of the habits, &c. of the Locusts, see Kirby and Spence, *Introduction to Entomology*.

LODGE, THOMAS, is supposed to have been born about the year 1556. He was entered at Trinity College, Oxford, in 1573, took a degree, and then, going to London, became an actor and play-writer. About 1580, in an answer to Gosson's 'School of Abuse,' he wrote a 'Defence of Stage-plays,' which was suppressed by authority, and is now one of the rarest of English books, only two copies being known. Another work of Lodge, his 'Alarum against Usurers,' which takes up incidentally the defence of the stage, was printed in 1584. In the same year he was a student of Lincoln's Inn. Afterwards, it has been conjectured, he became a soldier; and it is known that, in some capacity or other, he accompanied the expeditions of Clarke and Cavendish. According to the opinion most commonly received by the historians of our early literature, this flighty person went through yet another change; for he is usually identified with a Doctor Lodge, who took his degree in medicine at Avignon, printed in 1603 'A Treatise on the Plague,' and in 1616 obtained a passport from the Privy Council to 'travel into the Archduke's country,' and recover debts owing to him. Lodge is believed to have died of the plague in 1625.

He was a voluminous and versatile writer. He translated Josephus and Seneca ('The Works of Josephus,' Lond. 1602, fol.; 'Seneca's Works, both Moral and Natural,' Lond. 1614, fol.); he wrote several novels, volumes of verses, and miscellaneous pamphlets; and he was a distinguished contributor to the drama in the years immediately preceding the appearance of Shakspere. His extant dramatic works are two: 1, 'The Wounds of Civil War, lively set forth in the True Tragedies of Marius and Sylla,' 1594, 4to., reprinted in the last edition of Dodsley's Old Plays, vol. viii.; a stately historical play, with some eloquence, much action, and little interest either of character or incident. 2, 'A Looking Glass for London and Englande; made by Thomas Lodge, Gent., and Robert Greene, in Artibus Magister,' 1594, 1598, 1602, 1617, 4to.; a whimsical but animated dramatic picture, alluded to already in our notice of Greene. But Lodge's own exertions as a dramatist, although they entitle his name to a place beside those of Greene and Peele, are less interesting to us than the assistance which one of his works furnished to a greater than himself. One of his novels is entitled 'Rosalynde: Euphues Golden Legacie; found after his death in his cell at Silexedra. Bequeathed to Philantus Sonnes, noursed up with their Father in England. Fetcht from the Canaries;' 1590, 1592, 1620, 1623, 1642, &c., 4to.; reprinted in Mr. Collier's 'Shakespeare's Library,' 1840. From this novel Shakspere borrowed closely the leading incidents (indeed many also of the minor ones), the grouping of the characters, and many of the strokes of portraiture, for his 'As You Like It.' While a perusal of the novel cannot diminish our admiration of the play, it is yet an agreeable duty. In the midst of much that is unskilful, somewhat that is dull, and a good deal in the bad taste of Lyly's Euphues, the novel is yet interesting, lively on the whole, and in many places finely poetical, both in its prose descriptions and narratives, and in the interspersed verses.

LODGINGS, THE LAW OF, differs according to the custom which regulates each particular case from the general rules of law between landlord and tenant. [TENANT AND LANDLORD, P. C.]

As the length of the term for which lodgings are let seldom exceeds or even extends to a year, it is rarely the case that a six months' notice to quit is necessary to be given by the party wishing to determine the tenancy. This can only happen when it is clearly understood that the tenancy is from year to year. But if the taking be for less than a year, as for a quarter, a month, or a week, which may be presumed from the rent being paid at the lapse of those terms, or other circumstances, the length of notice will be regulated accordingly, as a month for a month, and a week for a week, the expiration of the notice being that of the term. Unless the lodger gives up possession paying the rent for a whole term in advance, notice must always be given, and he will not be released from such a necessity merely from an apprehension, however just, of his goods being distrained for his landlord's rent.

A contract to let lodgings being a contract for land under the interpretation of the Statute of Frauds, unless such contract be in writing an action for use and occupation cannot be maintained against the party refusing to enter.

Lodgers are entitled without special contract to the use of such things as, though situated in another part of the house, are necessary to their convenience, as the knocker, door-bell, skylight, &c.

It has been held that a covenant by the lessee not to underlet, is not broken by taking in a lodger, and on this ground may be rested the right of the original landlord to enter and distrain the goods and chattels of the lodger for arrears of rent due from the lessee, it being considered that the occupation of the lodger is that of the lessee. The lodger however can resort to his right to recover against the lessee for the loss so incurred.

The 7 & 8 Geo. IV. c. 29, § 45, protects the property of those who let lodgings from the dishonesty of their tenants by making it felony for the person in occupation to steal or appropriate any chattel or fixture allowed to be used in any house or lodging.

(For the law relating to this subject see Woodfall, *Landlord and Tenant*; and Coote, *Landlord and Tenant*.)

LOGAN, JOHN, was born at Fala, in the county of Edinburgh, in 1748. He was the son of a small farmer, and, being destined to the clerical profession, was educated in the University of Edinburgh; after which he became tutor to the late Sir John Sinclair. In 1773, almost immediately on being licensed as a preacher in the Established Church of Scotland, he was appointed to be one of the ministers of the town of Leith. In 1770 he had edited the posthumous poems of his friend Michael Bruce, incorporating with them some pieces which he claimed (and probably justly) as his own, and among which was the well-known Ode to the Cuckoo. His poetical talents were further shown by several pieces of sacred poetry, some of which are inserted in the collection of hymns and paraphrases of Scripture annexed to the psalmody of the Scottish church. In 1779, patronized by Blair, Robertson, and other literary men, he delivered in Edinburgh a course of Lectures on the Philosophy of History; the reputation of which justified him next year in aspiring, though unsuccessfully, to the Professorship of Universal History in the University. Outlines of a part of his lectures were published under the title of 'Elements of the Philosophy of History, Part I.,' 1781. In the same year appeared his 'Dissertation on the Government, Manners, and Spirit of Asia;' and a volume of Poems, which reached a second edition before the year was closed. Logan, if not a learned divine, or a very profound thinker, was a man of much eloquence, and a highly popular preacher. But his poetical endowments, strongly lyrical in their tendency, were the highest he possessed; and unfortunately he was tempted to apply these in a path where he was ill calculated to shine, and the adoption of which proved fatal not only to his professional usefulness, but to his happiness. In 1783 he printed and caused to be acted in Edinburgh a tragedy called 'Runnamede,' which had been rehearsed at Covent Garden, but refused a licence by the Lord Chamberlain. This publication brought on him the anger of his Presbyterian associates; and these and other annoyances, aggravated by an hereditary tendency to hypochondria, drove him to intoxication for relief. In 1785 he quitted his parochial charge and repaired to London. There, retaining by agreement a part of his clerical income, he eked out his livelihood by literary labour, writing papers for the 'English Review,' and publishing, in 1788, two works. The one was 'A Review of the principal Charges against Mr. Hastings,' which brought on Mr. Stockdale, the publisher, a prosecution for breach of privilege; the other was a useful summary, entitled 'A View of Ancient History, including The Progress of Literature and the Fine Arts, by William Rutherford, D.D., Master of the Academy at Uxbridge,' 2 vols., 8vo. He died in London on the 28th of December, 1788. His friends Drs. Blair, Robertson, and Hardy, published a volume of his Sermons in 1790, and a second in 1791. These sermons long enjoyed very great popularity, and have been several times reprinted. They are among the most eloquent that the Scottish church has produced. A third edition of his poems, with an account of his life, appeared in 1805; and the poems are included in Dr. Anderson's collection.

LOGARITHMS, GAUSS'S. These are tables suggested by the celebrated Gauss for supplying an inconvenience connected with the use of logarithms described in § 21 of the following article. Though they have been suggested more than thirty years, they are only beginning to receive the attention which they merit.

If log a and log b be given, and log $(a+b)$ or log $(a-b)$ be wanted, the ordinary tables can only be applied by finding a and b from their logarithms, adding or subtracting them as found, and then finding the logarithm of the sum or difference. This requires three uses of the tables, and one process of addition or subtraction. Gauss's table substitutes one use of a table, and two processes of addition or subtraction. When the above necessity occurs only now and then, it may be hardly worth while to have recourse to such a table; but in any series of calculations in which the determination of log $(a \pm b)$ from log a and log b is a frequent constituent part, the table is a very great relief.

The construction of the table is as follows: There are three columns, styled A, B, C; the first, A, containing the *arguments*. [TABLE, P. C.] Also B and C are furnished with differences and tables of proportional parts, in the same manner as the seven-figure logarithms. In column A are entered successive decimal fractions, in a manner depending upon the extent of the table. In the one we shall mention, A contains ·0000, ·0001, ·0002, &c., up to 2·0000; then 2·001, 2·002, &c., up to 3·000; then 3·01, 3·02, &c., up to 4·00; then 4·1, 4·2, &c., up to 5·0, followed by 6 and 7. And whatever an A may be the logarithm of, say N, then its B is the logarithm of $1+\frac{1}{N}$, and its C is the logarithm of 1 + N. Thus, opposite to 2·00 in A, which is the logarithm of 100, the B is log 1·01, the C is log 101; accordingly in one part of the table we see

A	B	C
2·00	·0043214	2·0043214

Again, in another part of the table we see

A	B	C
·4845	·1031058	·6076058

And it will be found that ·4845 being the logarithm of N (not mentioned; it is 3·041406), ·1031058 is the logarithm of $1+1 \div N$, and ·6076058 of 1 + N.

The manner of using this table is as follows: Let x and y be two numbers, of which x is the greater, and let log x and log y be given. Then

1. To find $\log (x+y)$. Let $A = \log x - \log y$
   $\log (x+y) = \log x + B = \log y + C$
2. To find $\log (x-y)$. Let $B = \log x - \log y$
   $\log (x-y) = \log y - A = \log x - C$

Or thus: Let $\log x - \log y = C$
   $\log (x-y) = \log y + A = \log x - B$

It seems as if this were two tables, each of which might serve all purposes. And it is true that $\log (x+y)$ can always be found from either table. But the B table begins from ·3010300 or log 2, and *descends*, while the C table begins from the same, and *ascends*. Consequently ·23, for instance, cannot be found about the C's, nor ·32 among the B's. So that in finding $\log (x-y)$, $\log x - \log y$ must not be made B if it be greater than log 2, nor C if it be less.

For a list of tables published in aid of the above method, see TABLES, P. C. S.

LOGARITHMS, HYPERBOLIC. As tables of hyperbolic logarithms are not very frequently met with, the following table is given to facilitate the finding of the hyperbolic logarithm by means of the common one. It is in fact a table of the hyperbolic logarithms of the powers of 10: thus opposite to 12 we see 27·63102112, which is the hyperbolic logarithm of 10^{12}, or a million of millions.

To find the hyperbolic logarithm of a number, multiply the common logarithm of that number by 2·30258509, by means of the table. Set down the number opposite to the integer of the logarithm, then that opposite to the first pair of decimal figures, leaving out the two last figures, then that opposite to the second pair, leaving out the four last figures, and so on. Add the results together. But if the characteristic of the common logarithm be negative, subtract the united results of the pairs of decimal places from the result of the characteristic, and make the answer negative. For example, required the hyperbolic logarithms of 327 and of ·00142. The common logarithm of 327 is 2·5145478.

2·	4·60517019
51	1·17431839
45	1036163
47	10822
80	184
Hyp. log. 327	5·78996027

The answer can be depended on to about a unit in the seventh decimal place, and 5·7899602 is the answer to seven places.

Again, the common logarithm of ·00142 is $\bar{3}$·1522883

−3·	−6·90775528	
15	34538776	Subtract
22	506568	
88	20262	
30	69	
	−6·55709853	

Hence the hyperbolic logarithm of ·00142 is −6·5570985.

1	2·30258509	34	78·28789316	67	154·27320123
2	4·60517019	35	80·59047826	68	156·57578632
3	6·90775528	36	82·89306335	69	158·87837142
4	9·21034037	37	85·19564844	70	161·18095651
5	11·51292547	38	87·49823353	71	163·48354160
6	13·81551056	39	89·80081863	72	165·78612670
7	16·11809565	40	92·10340372	73	168·08871179
8	18·42068074	41	94·40598881	74	170·39129688
9	20·72326584	42	96·70857391	75	172·69388198
10	23·02585093	43	99·01115900	76	174·99646707
11	25·32843602	44	101·31374409	77	177·29905216
12	27·63102112	45	103·61632919	78	179·60163725
13	29·93360621	46	105·91891428	79	181·90422235
14	32·23619130	47	108·22149937	80	184·20680744
15	34·53877640	48	110·52408446	81	186·50939253
16	36·84136149	49	112·82666956	82	188·81197763
17	39·14394658	50	115·12925465	83	191·11456272
18	41·44653167	51	117·43183974	84	193·41714781
19	43·74911677	52	119·73442484	85	195·71973291
20	46·05170186	53	122·03700993	86	198·02231800
21	48·35428695	54	124·33959502	87	200·32490309
22	50·65687205	55	126·64218012	88	202·62748818
23	52·95945714	56	128·94476521	89	204·93007328
24	55·26204223	57	131·24735030	90	207·23265837
25	57·56462733	58	133·54993539	91	209·53524346
26	59·86721242	59	135·85252049	92	211·83782856
27	62·16979751	60	138·15510558	93	214·14041365
28	64·47238260	61	140·45769067	94	216·44299874
29	66·77496770	62	142·76027577	95	218·74558384
30	69·07755279	63	145·06286086	96	221·04816893
31	71·38013788	64	147·36544595	97	223·35075402
32	73·68272298	65	149·66803105	98	225·65333911
33	75·98530807	66	151·97061614	99	227·95592421

LOGARITHMS, USE OF. We have thought it advisable to add to this work directions on the method of using logarithms, independent of all considerations connected with the meaning and theory of these numbers. Thus a person who has a table of logarithms, and finds its preliminary explanations not sufficiently clear or complete, may possibly receive help from this article, which is not written to accompany any system of tables in particu... There are many reasons against our inserting the table of logarithms itself in a large work of reference, as was frequently done a century ago: we are pretty certain that it would not be used. ..

1. The object of logarithms is the performance of the second and third operations in the following ascending scales by means of the more easy one which precedes it:—

Addition,	Multiplication,	Raising of Powers.
Subtraction,	Division,	Extraction of Roots.

Thus multiplication is reduced to addition, raising of powers to multiplication, division to subtraction, extraction of roots to division.

2. The sum of the logarithms of two numbers gives the logarithm of their product, the difference of two logarithms gives the logarithm of the quotient, and so on. These rules are best expressed in symbols, thus:

$$\log A + \log B = \log (A \times B)$$

$$\log A - \log B = \log \left(A \div B \text{ or } \frac{A}{B}\right)$$

$$\log (A^m) \quad = m \times \log A$$

$$\log (\sqrt[m]{A}) \quad = \log A \div m$$

3. The logarithms wanted are taken partly from a table, partly from an easily remembered rule. The integer part of the logarithm is found by the rule; the fractional part by the table.

4. The integer portion of the logarithm is called the *characteristic* of the number: thus 2167·3 has 3·33592 for its logarithm, and 3 is the characteristic of 2167·3. It is very common to call this 3 the characteristic of the logarithm itself; but it is better to fix this appellation upon it in connection with the number from which it arises.

5. The characteristic of a number depends entirely upon the place which the decimal point occupies. But the rest, or fractional part, of the logarithm of that number depends upon the significant figures only of the number, and has no connection with the meaning which those figures gain by their position relatively to the decimal point. Thus ·21673, 21·673, ·00021673, 21673, 21673000, &c. are numbers with different characteristics, or different integer portions in their logarithms. But the fractional portions are the same in the logarithms of all, namely, ·33592.

6. The characteristic of a number may be either *positive* or *negative*. For our present purpose, it will be sufficient to lay down the rules for using these quantities, directing the reader who is not used to the distinction to try to explain them by considering positive quantities as gains, negative quantities as losses, addition as junction, subtraction as removal. Thus the addition of a positive quantity (annexation of a gain) is the same thing as the subtraction of a negative quantity (removal of a loss); and so on. The following examples will illustrate this; the negative quantity being distinguished from the positive one by a bar drawn above it:—

8 and $\overline{5}$ make 3.	$\overline{2}$ from $\overline{3}$ gives $\overline{1}$.
8 and $\overline{11}$ make $\overline{3}$.	$\overline{2}$ from 3 .... 5.
$\overline{2}$ and $\overline{7}$ make $\overline{9}$.	3 from $\overline{2}$ .... $\overline{5}$.
4 times $\overline{6}$ is $\overline{24}$;	$\overline{3}$ from $\overline{2}$ .... 1.
carry 3, which gives $\overline{21}$.	$\overline{8}$ from $\overline{3}$ .... 5.

7. The rule for finding the characteristic is as follows. When there are significant figures before the decimal point, the characteristic is one less than the number of them. But when the significant figures begin after the decimal point, the characteristic must be marked negative, and must point out *the place in which significance begins.* Thus the characteristic of 2791·68 is 3; that of 17462 is 4; that of 29·137 is 1; that of 9·999 is 0; that of ·763 is $\overline{1}$; that of ·0198 is $\overline{2}$, that of ·000072 is $\overline{5}$.

8. It is worth while to remark that this broken rule, as it seems to be, requires subdivision only on account of the notions generally attached to the *decimal point*, which is treated as if it were one of the places of the number. But if the decimal point were, as it ought to be, considered as part and parcel of the *unit's place*, so that 12·34, for instance, is not | 1 | 2 | · | 3 | 4 |, but | 1 | 2· | 3 | 4 |, then the two rules might be given under one, as follows. The characteristic of a number is the number of places by which the first significant figure is distant from the unit's place; and is positive when that first figure falls to the left, negative when to the right. Thus in 1234·567 or 123 (4·) 567 it is 3; in ·00029 or (0·) 00029 it is $\overline{4}$.

9. A mixed number, such as $\overline{3}$· 92741, is thus multiplied and divided:

$$\begin{array}{r} \overline{3}\cdot\ 92741 \\ 6 \\ \hline \overline{13}\cdot\ 56446 \end{array} \qquad\qquad \begin{array}{l} 6)\overline{8}\cdot\ 92741 \\ \hline \quad\overline{1}\cdot\ 65457 \end{array}$$

In multiplication, the multiplication of the negative figure produces a negative result, and the carriage from the positive part goes in diminution of this number. The last step is:— 6 times $\overline{3}$ is $\overline{18}$, and 5 is $\overline{13}$. In division, a divisible figure must be sought above the negative characteristic, not below it; and the units necessary to make up that divisible figure must be afterwards carried to the right in the usual way. Thus when $\overline{21}$·116 is divided by 5, the first step is:—5 is contained in $\overline{25}$, $\overline{5}$ times, carry 4; then 5 is contained in 41, 8 times, &c.

$$\begin{array}{l} 5)\overline{21}\cdot 116 \\ \hline \quad\overline{5}\cdot 823 \end{array} \qquad \begin{array}{l} 11)\overline{8}\cdot 212 \\ \hline \quad\ \overline{1}\cdot 292 \end{array} \qquad \begin{array}{l} 10)\overline{31}\cdot 606 \\ \hline \quad\ \overline{4}\cdot 961 \end{array}$$

10. The decimal part of the logarithm is taken out of the tables. These are not complete logarithms, which could not be given, since the real logarithms are generally interminable decimals. The only numbers which have logarithms capable of finite expression (in the system commonly used) are those in the series .... ·0001, ·001, ·01, ·1, 1, 10, 100, 1000, ... of which the complete logarithms are the characteristics themselves, or .... $\overline{4}$, $\overline{3}$, $\overline{2}$, $\overline{1}$, 0, 1, 2, 3, ... The tables give only a certain number of the first decimal places, and may be named after the number of decimals in the logarithms they give. Thus a table which gives four decimals in each logarithm may be called a four-figure table; and so on. A calculator chooses his table according to the degree of accuracy he wants: the general rule being that, so many decimals as there are in the logarithms, so many significant figures of the answer may be found correct, with perhaps an error of a unit or two in the last figure. Thus if the real answer to a question were ·00123769728, we might expect from four-figure tables to get ·001236, ·001237, ·001238, or ·001239. But seven-figure tables would probably give from ·001237695 to ·001237699. Perhaps the liability of the last figure to error is, for the general run of questions, rather over than under stated in the above. Four figures is very often enough; five figures almost always. When five figures are not sufficient, we should recommend having recourse to seven at once, for a reason presently mentioned.

11. We insert specimens of a four-figure, five-figure, and a seven-figure table.

Four-figure Table.

		0	1	2	3	4	5	6	7	8	9	1 2 3	4 5 6	7 8 9
	..	..	..	..	..	..	..	..	..	..	..	. . .	. . .	. . .
Logarithms.	40	6021	6031	6042	6053	6064	6075	6085	6096	6107	6117	1 2 3	4 5 6	8 9 10
	41	6128	6138	6149	6160	6170	6180	6191	6201	6212	6222	1 2 3	4 5 6	7 8 9
	42	6232	6243	6253	6263	6274	6284	6294	6304	6314	6325	1 2 3	4 5 6	7 8 9
	43	6335	6345	6355	6365	6375	6385	6395	6405	6415	6425	1 2 3	4 5 6	7 8 9
	..	..	..	..	..	..	..	..	..	..	..	. . .	. . .	. . .

		0	1	2	3	4	5	6	7	8	9	1 2 3	4 5 6	7 8 9
	..	..	..	..	..	..	..	..	..	..	..	. . .	. . .	. . .
Antilogarithms.	·60	3981	3990	3999	4009	4018	4027	4036	4046	4055	4064	1 2 3	4 5 6	6 7 8
	·61	4074	4083	4093	4102	4111	4121	4130	4140	4150	4159	1 2 3	4 5 6	7 8 9
	·62	4169	4178	4188	4198	4207	4217	4227	4236	4246	4256	1 2 3	4 5 6	7 8 9
	·63	4266	4276	4285	4295	4305	4315	4325	4335	4345	4355	1 2 3	4 5 6	7 8 9

Five-figure Table.

Num.	Log.	D.		Num.	Log.	D.
..	..			..	..	.
1120	·04922	39		5832	·76582	7
1121	·04961	38		5833	·76589	8
1122	·04999	39		5834	·76597	7
1123	·05038			5835	·76604	
..	..	.		..	...	.

Seven-figure Table.

No.	0	1	2	3	4	5	6	7	8	9
4550	6580114	0209	0305	0400	0496	0591	0687	0782	0877	0973
4551	1068	1164	1259	1355	1450	1545	1641	1736	1832	1927
4552	2023	2118	2213	2309	2404	2500	2595	2690	2786	2881
....	....	....	....	....	....	....	....	....	....	....
4559	8696	8791	8886	8982	9077	9172	9267	9363	9458	9553
4560	9648	9744	9839	9934	0029	0125	0220	0315	0410	0506
4561	6590601	0696	0791	0886	0982	1077	1172	1267	1362	1458

Pro. P. 95.	
1	10
2	19
3	29
4	38
5	48
6	57
7	67
8	76
9	86

12. To find the logarithms of numbers and the numbers to logarithms, from the four-figure table, proceed as follows:— From inspection of the number, take the proper characteristic, and then note the first four *significant* figures. In the row which begins with the *first two*, find the figures which are in the column headed by the *third;* and add to them tho figures out of the side table which are in the column headed by the *fourth*. For instance, required, as well as it can be given from a four-figure table, the logarithm of 4275898·116. The characteristic is 6: and the first four significants are 4276 (reading 58 rather as 60 than as 50). In the row 42, and under 7, we see 6304, and in the side tablo opposite to 6 is 6, and 6304 + 6 is 6310. Hence 6·6310 is the logarithm of 4275898·116, as far as the four-figure table will give it. Similarly the logarithm of ·4 (which must be read ·400) is $\bar{1}$·6021, that of 430 is 2·6335, that of ·04179 is $\bar{2}$·6210.

To find the number to a logarithm, *in the four-figure table*, use the *decimals* of the logarithm with the antilogarithmic table in the same manner as the four significants of the number were used in the other table to find the logarithm; and then settle the place of the decimal point by means of the *integer* of the logarithm. The four-figure table goes into so small a space that it is worth while to print an inverse table of *antilogarithms*, or of numbers to logarithms; of which table we have also given a specimen above. Thus the number to the logarithm 5·6234 being required, we neglect 5, and, going into the anti-table with ·6234, opposite to ·62 and under 3 we find 4198, and under 4 in the side table wo find 4. Hence 4198 + 4 or 4202 are the first four significants of the number required; and its characteristic is 5: whence 420200 is the number to the logarithm, as near as the four-figure table will give it. Similarly the number to ·6111 is 4·084, that to $\bar{3}$·6208 is ·004177, that to 9·6000 is 3981000000.

13. We give an instance of the application of each of the rules in § 2. Let it be required to find, as nearly as four-figure tables will do it, the product of 17798 and 63426; the quotient of 17·293 divided by ·942942; the eighth power of 1·9273, and the eleventh root of ·00005569181. The processes are as follows:—

Log. of 17798 (say 17800) 4·2504 } Add
Log. of 63426 (say 63430) 4·8023 }

Log. of product 9·0527

Answer 1129000000 from the table.
True Answer 1128855948

Error 144052, about ·0001 of the whole.

Again, log. 17·293 (say 17·29) 1·2377 } Subtract
log. ·942942 (·9429) $\bar{1}$·9745 }

log. of quotient 1·2632
Answer 18·33.

log. 1·9273 (say 1·927) 0·2849
multiply by 8

log. of $(1\cdot927)^8$ 2·2792
Answer 190·2.

In raising powers, the errors are generally larger than in other processes, seeing that the necessary error of the logarithm is multiplied as many times as the logarithm itself.

log ·00005569181 (say ·00005569) $\bar{5}$·7458
Divide by 11 $\bar{1}$·6133 log $\sqrt[11]{\cdot00005569}$
Answer ·4105.

14. Before beginning to use five-figure tables, it is advisable to practise the formation of the tenths of numbers not exceeding 50, in the head. For instance, which is the nearest integer to 7-tenths of 37. The process at length would of course be

$$\begin{array}{r} 37 \\ 7 \\ \hline 10)259 \\ \hline 25\cdot9 \end{array}$$

Nearest integer 26

It should be done thus: Having multiplied 7 by 7, and got 49, reject the units, and carry 5 as the *nearest* number of tens. Then add 5 to 21 obtained from the three. When 5 units are thrown away, consider the ten next above as the nearest. Thus 9-tenths of 45 should be considered as 41, not 40, and 5-tenths of 17 as 9, not 8. Similarly, 8-tenths of 21 is 17; 3-tenths of 19 is 6. But 2-tenths of 32 is 6; 7-tenths of 42 is 29; 9-tenths of 28 is 25.

15. In the specimen of the five-figure table will be seen four figures of number, followed by five figures of logarithms, and an additional column marked D, which contains nothing but the differences between the successive sets of five figures in the logarithm. This column D is referred to under tho name of the column of *tabular differences*. To take the logarithm of a number, tako the characteristic as before, and five significants of the number. Find out the first four significants in the table, and to their five figures of logarithm *add* as many tenths of the tabular difference as there are units in the fifth significant. Thus to find the logarithm of ·011217, we find 1121 in the specimen, opposite to which is 04961, with 38 for a tabular difference. Now 7-tenths of 38 is 27, and 61 and 27 is 88; so ·04988 is the decimal part of the logarithm. Similarly if the significants of the number be 11223, the decimals of tho logarithm are ·05011; also 11201 gives ·04926; 11209 gives ·04957; 58332 gives ·76591; 58333 also gives ·76591; 58334 gives ·76592; and so on.

16. There is no antilogarithmic table to a five-figure table; and the way of finding the number to a logarithm is as follows: Seek out among the logarithms tho decimals *next under* the decimals of the given logarithm, and take the four figures of number belonging to them for the first four significants of the number. Find by how much the decimals just used fall short of the given decimals, and call this difference the *unattained part*. Annex a cipher to the unattained part, and divide by the tabular difference; the digit which most nearly expresses the quotient is the fifth significant of the number. For instance, what is the number to the logarithm $\bar{3}$·05016. Looking into the table, we find that the next under ·05016 is 04999, opposite to 1122. Tho unattained part is 17; the tabular difference 39: and 170 contains 39 4 times moro nearly than 5 times; so that 4 is the fifth figure. The fivo significants of tho number required are then 11224; and, looking at tho integer part of the logarithm, the characteristic is seen to be $\bar{3}$; whence ·0011224 is the number to the logarithm, as correctly as five-figure tables will give it.

17. The four questions worked above with four-figure logarithms are thus worked with five-figure logarithms:—

17798	4·25037
63426	4·80227
1128900000	9·05264
	05231
	38)330
1·9273	0·28495
	8
190·37	2·27960
	27944
	23)160

17·293	1·23787
·94294	$\bar{1}$·97449
18·339	1·26338
	26316
	24)220
·000055692,	11)$\bar{5}$·74580
·41044	$\bar{1}$·61325
	61321
	10)40

18. The seven-figure tables have five figures of number, with seven decimals of logarithm; and the sixth and seventh significants of the number are to be provided for by means of the tabular differences. But as these tabular differences run to three and four places of figures, their tenths are written down in small separate tables. [PROPORTIONAL PARTS, P. C.] To take out a logarithm, take out the seven decimals belonging to the first five significants of the number, and add from the table of proportional parts the number opposite to the sixth significant, and one-tenth of that opposite to the seventh significant. Thus to find the logarithm of 455173689, of which the first seven significants are 4551737, look in the table for 45517, and we have

	45517 ..	gives	6581736
Tab. Pro. P.	3	..	29
Do. do.	7		7
			6581772

So the logarithm required, as far as seven-figure tables will give it, is 8·6581772.

A little practice will enable the calculator to add together, without writing them down, the two contingents derived from the table of proportional parts. The computer must be careful not to miss the change of the third figure of a logarithm, which usually takes place in the middle of a line, though it can only be marked at the beginning. Thus, in the specimen the logarithm of 45603 has the decimals 6589934, but that of 45604 has 6590029, not 6580029. Some mark is usually made to give warning that the change has taken place; but those whose attention is so little alive to the circumstance as to stand much in need of this mark will often make the mistake in spite of it.

19. To take the number to a given logarithm out of seven-figure tables proceed as follows: Find the nearest decimals under the given decimals, and by subtraction find the *unattained part*. Take out the five number-figures belonging to the attained part, for the first five significants of the number. Look in the table of proportional parts for the nearest under the unattained part, and take the digit opposite to it for the sixth significant. Annex a cipher to the remainder of the unattained part, and take the digit opposite to the result (or its nearest) in the table of proportional parts for the seventh significant. For instance, required the number to the logarithm 1·6590176:

	6590176
45605 ..	6590125
	51
5	48
3	30

Number required 45·60553

20. The following is the working of the four questions already worked with four-figure and five-figure tables:

17798	4·2503712
63426	4·8022673
	9·0526385
11288	0526170
	215
5	193
6	220
Answer	1128856000
17·293	1·2378703
·942942	$\bar{1}$·9744850
18·33941	1·2633853
1·9273	0·2849493
	8
190·3682	2·2795944
00005569181	11)$\bar{5}$·7457913
·4104439	$\bar{1}$·6132538

21. More complicated questions may be *directly* solved by logarithms, that is, without requiring to seek the number to a logarithm until the end of the process, as long as the multiplications, divisions, involutions, and evolutions are not broken by additions or subtractions. Thus to calculate $\sqrt[10]{\{a^2 b \sqrt[3]{c} \div d\}}$ we form for the logarithm of the answer

$$\frac{1}{10}\left\{ 2\log a + \log b + \tfrac{1}{3}\log c - \log d \right\}$$

But if additions or subtractions intervene, the process must be broken to produce the result; that is, the logarithmic process must be suspended, and the results exhibited in numbers for the performance of the additions and subtractions (unless indeed the logarithms described in the next article be employed). Thus to find $\sqrt{(a^2 b + cd)}$, it would be necessary, not merely to form the logarithms of $a^2 b$ and cd, or $2\log a + \log b$ and $\log c + \log d$, but to find the numbers to them: these numbers being then added, and the logarithm of the sum being taken, half the last logarithm is the logarithm of the answer.

22. There is nothing in the trigonometrical logarithms more than is described in TRIGONOMETRICAL TABLES, P. C. Many young students, from seldom or never using the actual sines, cosines, &c. of angles, but only their logarithms, are apt to confound the former with the latter.

23. Some little additional correctness may be obtained by annexing to the use of the tables, as given above, an attempt to add something for one more figure of the number. Thus, suppose it required to find the logarithm of 11·374928. In the four-figure table 113 has 0531 and ...7 adds 26. The next figure is 4, which, had it been the fourth significant, would have added 15; being the fifth, let it add the tenth of 15, or its nearest integer, 2. Hence we add 28 instead of 26 to 0531, and get 0559 instead of 0557, as a nearer approach to the logarithm. Again, in the five-figure table, 1137 gives 05576, and the tabular difference is 38. The 4 gives 15, or 4-tenths of 38, and the 9 ought to give 9-hundredths of 38, or 3. Consequently 15 + 3, or 18, is added, giving 05594. Had 49 been read as 50, in the usual way, 19 would have been added. In the seven-figure tables 11374 gives 0559132; 9 adds 345, the 2 should add the tenth of 77, and the 8 should add the hundredth of 306: hence 3 more should be added than arises from the figures 92. This plan may be followed when the greatest accuracy is desirable, especially in the four-figure table. It is most useful when the tabular differences are large, that is, at the beginning of the table.

24. It may sometimes save a mistake if the computer remember that the significants of the number generally read less than those of the decimals in the logarithm. Thus 200.... has 301.... for the decimal figures of the logarithm. It is not so however at the beginning of the table, and the figures of the logarithm overtake those of the number between 13712 and 13713.

25. The rule of the characteristics, when well learnt, furnishes one of the easiest modes of assigning the place of a decimal point in a common division. For example, in dividing ·0017643 by ·018416, the characteristics being $\bar{3}$ and $\bar{2}$, we shall have to carry 1 to $\bar{2}$, because the significants of the divisor, 18, are greater than those of the dividend, 17. Take $\bar{1}$ then from $\bar{3}$, which leaves $\bar{2}$, the characteristic of the quotient, which has therefore ·0 before its significants. The rule is, to find the characteristic of the quotient, from that of the dividend subtract that of the divisor, carrying 1 if the significants of the divisor be greater than those of the dividend.

26. In using the trigonometrical tables, or any other, careful attention must be paid to the right choice of the method of interpolation. If the argument and tabular result [TABLE, P. C.], or the numbers with which we enter the table and those which we take from it, increase together or diminish together, then the alterations introduced by the table of proportional parts consist in adding to either for every addition to the other, and subtracting for every subtraction. But if

the tabular result diminish as the argument increases, then every addition to the one is accompanied by a subtraction from the other, and *vice versa*. In the tables of logarithmic cosines and cotangents, the young computer frequently falls into error from neglect of the last-mentioned direction. Thus the logarithm of the cosine of 84° 9′ in a five-figure table is 9·00828, and the tabular difference is 124, diminishing. Hence the log cosine of 84° 9′·5 is not 9·00828 + ·00062, but 9·00828 − ·00062. And if we ask for the angle whose log-cosine is 9·00840, we find the next underneath this in the table to be 9·00828, and 22 for the unattained part. Divide 220 by 124, and 2 is the nearest integer. But the angle required is not 84° 9′ + 0′·2, but 84° 9′ − 0′·2, or 84° 8′·8.

27. The equation $a^x = b$, in which x is unknown, is solved by taking the logarithm of both sides, which gives $x \log a = \log b$, or $x = \log b \div \log a$. The process may perplex a beginner when the logarithms have negative integers. We therefore subjoin an example. Let it be required to solve the equations

$$\left(\frac{4}{7}\right)^x = \cdot00163 \text{ and } 182^y = \cdot6$$

(The reader is supposed to know the complete interpretation of algebraical exponents.) We have then

$$x = \log(\cdot00163) \div \log\left(\frac{4}{7}\right) = \bar{3}\cdot21219 \div \bar{1}\cdot75696$$

$$y = \log\ \cdot6 \div \log 182 = \bar{1}\cdot77815 \div 2\cdot26007$$

Now throw the three logarithms which have negative integers into the more usual algebraical forms.

$$\begin{array}{lccc} & \cdot21219 - 3, & \cdot75696 - 1, & \cdot77815 - 1 \\ \text{Or} & -\ 2\cdot78781, & -\ \cdot24304, & -\ \cdot22185 \end{array}$$

And make the divisions, which give for the quotients 11·471, and − ·098161; or

$$\left(\frac{4}{7}\right)^{11\cdot471} = \cdot00163, \quad (182)^{-\cdot098161} = \cdot6$$

LOGGAN, DAVID, a line-engraver and designer, of considerable eminence in England in the time of Charles II., was born at Danzig in 1635. He appears to have first learnt his art from Simon de Pas in Denmark, and to have worked subsequently with Hondius in Holland. He came to England during the Commonwealth, and spent some time in engraving heads in London. But his first work of consequence in this country was a set of plates of the colleges of Oxford—'Oxonia Illustrata,' for the sale of which he had fifteen years' privilege; he executed afterwards a similar series of the colleges of Cambridge. He also engraved on eleven folio plates 'Habitus Academicorum Oxoniæ à Doctore ad Servientem.' Loggan is himself entered on the books of the University; in the matriculation registry there is the following entry—'David Loggan Gedanensis, Universitate Oxon. Chalcographus, July 9, 1672.'

He married Mrs. Jordan, of a good family, near Witney, Oxfordshire, by whom he had a son, who became a fellow of Magdalen College, Oxford. He died at his house in Leicester-fields in 1693.

Loggan engraved many portraits of illustrious persons in the time of Charles II., many of the drawings of which were executed in lead by himself from the life—as George, prince of Denmark; the Duke of Albemarle; the Earl of Clarendon; the Earl of Argyle; the Duke of Ormond: the Lord Keeper Guildford; Archbishop Sancroft; the Bishops Mew, Seth Ward, and Pearson; and many others. There are prints also by Loggan of Archbishops Usher and Boyle, and of Bishops Sprat of Rochester, Lake of Chichester, Crew of Durham, Compton of London, Gunning of Ely, Reynolds of Norwich, and Lloyd of St. Asaph. He engraved also three portraits of Charles II., in one of which the king is leaning his hand on Archbishop Sheldon; James, duke of York; the Duke of Monmouth; the Queens Catherine and Henrietta Maria; Pope Innocent XI.; the Earl of Derby, Sir Edward Coke, Sir John Chardin, Thomas Barlow, Titus Oates, and many others, which are enumerated by Vertue.

Loggan had the following assistants—A. Blooteling, G. Valck, Vanderbanck, and Peter Williamson; the first two came from Holland with Loggan.

(Vertue, *Catalogue of Engravers*, &c.)

LOGIC. [ORGANON, P. C. and P. C. S.]

LOIR, NICOLAS, a distinguished French painter and etcher, was born at Paris in 1624. His father was an eminent jeweller, and he placed Nicolas with Sebastien Bourdon, and sent him afterwards, in 1647, to complete his studies in Rome. Here Loir studied chiefly the works of N. Poussin, and so carefully that in some instances it is said to be scarcely possible to distinguish Loir's copies from the originals. He had great facility of execution, and excelled in various styles, as history, landscape, and architecture. He also composed with elegance, and his colouring is very agreeable; but his design is somewhat affected, and is not always vigorous or correct in its outline.

He painted at Rome an excellent picture of Darius opening the Tomb of Semiramis, which obtained him a great reputation. He returned to Paris in 1649, and was shortly afterwards employed by Louis XIV., at the Tuileries and at Versailles. He painted two apartments in the Tuileries—the Antichambre du Roy and the Salle des Gardes, where, by the mythical representation of the sun and other figures, he illustrated the distinctive character of the life and reign of Louis XIV.; and so far to the monarch's satisfaction, that he obtained by these works a life-pension of 4000 francs.

In 1663 he was elected a member of the French Academy of Painting, and he presented on the occasion, as his reception-piece, a picture representing the Progress of Painting and Sculpture during the reign of Louis XIV.; but his masterpiece is considered Cleobis and Biton drawing their Mother in a chariot to the temple of Juno, from the story of Herodotus (i. 31); Loir himself has made an etching of it. Another of his best works is Paul before Sergius depriving the Magician of sight, in the Cathedral of Notre Dame at Paris. He excelled in painting women and children, and particularly the Virgin Mary. He is said to have designed twelve Holy Families in a single day, which did not contain two figures alike. He died at Paris, rector of the Academy, in 1679. Loir's own etchings amount to 159 pieces, which, together with 80 engravings after his works by other artists, make a total of 239 prints. Several of the latter were engraved by his brother Alexis Loir.

Felibien describes several of the works of Loir at considerable length; his account of this painter contains also some curious digressions relating to the superstitions of the modern Romans, and other matter. Felibien and Loir were at Rome together, and Felibien's dates have been for this reason adopted in this article, where they differ from those of D'Argenville and Gault de Saint-Germain.

(Felibien, *Entretiens sur les Vies et sur les Ouvrages des Peintres*, &c.; D'Argenville, *Abrégé de la Vie des plus fameux Peintres*, &c.)

LOMBARDUS, LAMBERT, the designation of a painter whose actual name is not known. He is sometimes called Lamprecht Susterman or Suterman, and, according to some, Lambert Suavius, and also Lamprecht Schwab. The place of his birth is equally unknown: it is said to be Liege or Amsterdam, more probably Liege, as he settled there after his return from Italy in 1538, and he died there, in 1560, aged fifty-four. Vasari mentions Lamberto Lombardo as the most distinguished of all the Flemish painters, and styles him a great *letterato*, a judicious painter, and an excellent architect; but his account of him is contradictory: he had it from D. Lampsonius, who wrote Lambert's Life in Latin: it was published at Bruges in 1565, five years after his death. Lombardus studied under Jan de Mahuse before he visited Italy. Frans Floris, Hubert Golzius, and Willem Key were his scholars. His works consist chiefly of drawings with the pen in chiaroscuro: his coloured paintings are scarce; there are two of small dimensions in the Gallery of Berlin; there is a Pietà in the Pinacothek at Munich, which used to be attributed to Daniele da Volterra. Lambert's style is strictly Italian: he is said to have studied under Titian at Venice, and he lived some time in Rome. The surname of Lombardus was probably given to him by his Flemish countrymen on account of his style, which, different from their own, they distinguished as the Lombard style, Lombardy being formerly the general name for the northern part of Italy.

There are many prints supposed to be after Lambert's designs, some of which are marked Lam. Lombardus, and others Lam. Suavius; and it is not yet decided whether these names indicate one or two artists; Heineken considers them as two, and Van Mander notices Suavius as an engraver, without making any allusion to Lombardus. In a note to De Yongh's edition of Van Mander, Suavius is styled the pupil of Lombardus.

(Vasari, *Vite de' Pittori*, &c.; Van Mander, *Het Leven der Schilders*, &c.; Sandrart, *Teutsche Academie*, &c.; Heineken, *Nachrichten von Künstlern*, &c.; Fiorillo, *Geschichte der Zeichnenden Künste*, &c.)

LONDONDERRY, ROBERT STEWART, MARQUESS OF, was born at the family seat of Mount Stewart, in the county of Down, Ireland, on the 18th of June, 1769 (the same year which gave birth to the Duke of Wellington and to Napoleon Bonaparte). His father, of the same names, after representing the county of Down for many years in the Irish parliament, was made Baron Stewart of Londonderry in 1789, Viscount Castlereagh in 1795, Earl of Londonderry in 1796, and Marquess of Londonderry in 1816—all in the peerage of Ireland. Robert was his only child that survived by his first wife, Sarah Frances, daughter of Francis Seymour, First Marquess of Hertford, whom he married in 1766, and who died in 1770.

The estate of Mount Stewart was purchased by Mr. Alexander Stewart, father of the first marquess, who sat in the Irish parliament for the city of Londonderry. Beforo this the family were known as Stewarts of Ballylawn in the county of Donegal, of which property John Stewart, the great-great-grandfather of Alexander, the first of them who settled in Ireland, obtained a grant from King Charles I. There seems to be ground for believing that he was nearly related to some ennobled branch of the Stewarts: but the connexion appears not to be distinctly traceable, and is variously given in the several accounts. The descent of tho family is commonly deduced, or rather assumed to be, from Sir Thomas Stewart of Minto, who lived in the latter part of the fifteenth century, the ancestor of Lord Blantyre, and a younger brother of Sir Alexander Stewsrt of Dalswinton and Garlies, the ancestor of the Earl of Galloway. John Stewart is stated to have emigrated from Scotland to Ireland in the reign of James I.

The subject of the present notice received the first part of his education at the free grammar-school of Armagh; whence he was removed in 1786 to St. John's College, Cambridge. He was not yet of age when, on his father being raised to the peerage in 1789, he offered himself for the vacant seat in the representation of the county of Down, and was returned, though not without a severe contest, which lasted for three months, and is said to have cost the family 25,000*l*. or 30,000*l*. Nor did he come in without pledging himself, in contradiction to what had hitherto been the family politics, to the cause of parliamentary reform, which had for some time been a popular watchword in Ireland. For three or four years, accordingly, he was considered as belonging to the party of the opposition, though to the aristocratic and more moderate section of it. He very early began to take part in the debates.

His conversion from liberalism seems to have taken place about 1793 or 1794; and it may be fairly considered to have been the natural result of his family position cooperating with the more alarming aspect which popular politics in Ireland were every day assuming. Up to this time he appears to have been universally regarded as an unusually amiable as well as honourable young man: after his change of principles he was commonly represented as a prodigy both of perfidy and of heartlessness.

In the summer of 1794 he was returned to the British parliament for the borough of Tregony; and after remaining silent for a session he made his maiden speech in the House of Commons in seconding the Address on the 29th of October, 1795. It is said to have greatly disappointed the expectations excited by the reputation he had brought over with him. He was to the last a remarkably unequal speaker; at one time rising above, at another time—sometimes on the same night—falling below his ordinary or average style of execution in a degree scarcely credible, and the more wonderful in a person of so much nerve and self-possession.

Ho does not appear to have ever spoken again during this parliament, which was dissolved after the close of that its sixth session, in May, 1796. That year he became Viscount Castlereagh; and he was again returned to the next British parliament, which met in September, for the borough of Orford. But he vacated his seat in July, 1797; upon which he was re-elected to the Irish parliament for the county of Down, and was made Keeper of the Privy Seal for Ireland. In the beginning of 1798 he was appointed Secretary to tho Lord Lieutenant and an Irish privy counsellor: and from this date he may be regarded as having been distinctly the ministerial leader in the Commons. The credit or discredit of the measures adopted for the suppression of the Rebellion, which broke out and was put down in this year has also been commonly assigned to him, although it does not appear that he really did more than carry out the system which he found already in action when he came into office. He was no doubt one of the principal managers of the project of the Union, which followed two years after.

He was returned for tho county of Down to the first Imperial Parliament, which met in February, 1801; and also to the second, which met in November, 1802; though upon the latter occasion not till after a severe struggle with the interest of the Downshire family, whose hostility had been provoked hy the dismissal of the late marquess from the command of his militia regiment and tho lord-lieutenancy of the county for his opposition to the Union.

In the beginning of 1802 he had been made a privy counsellor of Great Britain, and President of the Board of Comtrol; and he retained that office after Mr. Pitt retired and throughout the Addington administration. After Mr. Pitt returned to power, Viscount Castloreagh was, in July, 1805, promoted to be one of his majesty's principal secretaries of state (taking the department of War and the Colonies). He was now, however, thrown out of the representation of Down, and was obliged to take refuge in the borough of Boroughbridge, for which he was returned in January, 1806, on a vacancy made by the death of the Hon. John Scott, son of Lord Eldon. He resigned with the rest of the cabinet on the death of Mr. Pitt shortly after this; and to the next parliament, which met in December, with a new ministry, he was returned for the borough of Plympton Earle.

Upon the formation of the Portland administration, in April, 1807, Lord Castlereagh was reappointed to his former office of Secretary of State; and he was again returned for Plympton to the parliament which met in May of this year. He was now considered the individual principally answerahle for the conduct of the war; and the failure of the disastrous expedition to Walcheren in the summer of 1809 not only drew upon him much general unpopularity, but involved him in a personal quarrel with his colleague Mr. Canning, the Secretary for Foreign Affairs, which led first to the resignation of both, and then to a duel between them, in which Canning, on tho second fire, was severely wounded. In the esrlier part of this same year, also, some sensation had been made by two reports of select committees of the Commons which charged Lord Castlereagh, along with other persons, the one with corrupt practices in obtaining the returns of members for Irish boroughs, tho other with irregularities in the disposal of Indian patronage.

Lord Castlereagh remained out of office till February, 1812; when, on the resignation of the Marquess Wellesley, he was appointed Secretary of State for the Foreign Department. After the death of Mr. Perceval, which followed in May, he was regarded as ministerial leader in the Commons. To the new parliament which met in November, 1812, he was once more returned as representative for the county of Down; and he also retained that seat in the next two parliaments, which met in August, 1818, and in April, 1820. The return to office of Mr. Canning, however, in 1816, had relieved him from a considerable part of his lahours in the conduct of puhlic business in the House, till that gentleman again retired in 1820.

Meanwhile in the end of the year 1813 Lord Castlereagh had gone as British plenipotentiary to the negotiations opened with the French government at Châtillon, which however broke off after a few weeks without any result; and he had also appeared as representative of the King of England at the Peace of Paris, in May, 1814; at the Congress of Vienna, in October of the same year; at that of Paris after tho battle of Waterloo in the following year; and at that of Aix-la-Chapelle in 1818. On such occasions as these, his fine figure and grace of manner showed to great advantage. He likewise attended George IV. to Ireland in 1820, where he had for the moment the gratification of being extremely popular among his countrymen. He had been made a Knight of the Garter in 1818, and he became Marquess of Londonderry hy the death of his father on tho 8th of April, 1821.

Lord Londonderry died by his own hand at his seat of North-Cray-Place, in the county of Kent, on the 12th of August, 1822. Something unusual in his manner had been occasionally observed for some months, and for a few days before the melancholy catastrophe his extreme irritability and other symptoms of mental disease had strongly excited the notice of his domestics and friends. On the 9th, the Duke of Wellington wrote to Dr. Bankhead:—'I sincerely hope that you will contrive, by some pretence, to go down to his lordship. I have no doubt he is very unwell; he appears to me to have been exceedingly harassed, much fatigued and over-worked during the late session of parliament; and I have no doubt he labours under mental delirium; at least this is my impression.' The coroner's jury which sat upon the body brought in a verdict of lunacy. He had married in 1794 Lady Emily-Anne Hobart, youngest daughter of John, second Earl of Buckinghamshire, but he died without issue, and the title went to his half-brother, the present Marquess.

There was no brilliancy of intellect in Lord Londonderry, scarcely even the ordinary amount of literary cultivation and taste. His speaking, though fluent and sometimes spirited, was always inelegant and slovenly, and occasionally so to a ludicrous degree. To any acquaintance with the philosophy of politics he made no pretension; nor did even his practical views commonly evince any superior sagacity. But he had great business talents; and that qualification, with his charm of manner, fitted him admirably for managing men, and was the main secret of his success in life. Something too, however, is to be attributed to certain moral qualities which he possessed. Whatever difference of opinion might be entertained about some of his political proceedings, or acts done in his political capacity, his personal character was admitted by all who knew him to be that of an honourable and high-minded man, upon both whose firmness and fearlessness every reliance could in all circumstances be placed. His integrity in this sense had even something of a roughness or sternness that might almost be said to contrast with the amenity of his manner.

(Memoir in *Annual Register* for 1822, which, however, abounds with omissions and inaccuracies; *Parliamentary History*, and other records of the time.)

LONGHI, GIUSEPPE, an Italian painter, and one of the most distinguished engravers of the nineteenth century, was born at Monza in 1766. His father was a silk-mercer, and intended his son for the church, but, through his own determination, Giuseppe was finally placed with the Florentine Vincenzo Vangelisti, professor in the Brera at Milan, under whom he learnt engraving. He studied afterwards some time in Rome, where he became acquainted with Raphael Morghen, a very celebrated engraver; and Longhi soon obtained a reputation himself by his print from the Genius of Music, a picture by Guido in the Chigi Palace.

After his return to Milan he was chiefly employed in miniature painting, until he was ordered by Napoleon to make an engraving of Gros's portrait of him; and he was appointed about the same time (1798) to succeed Vangelisti, deceased, as professor of engraving in the Academy of the Brera, to which, during Longhi's professorship, many distinguished engravers of the present time in Italy owe their education. It was one of Longhi's first principles to make the means subservient to the end, and not the end to the means: he always deprecated cleverness of line as a principal object, and in his own works manual dexterity is invariably subordinate to conformity of style. His first object was to give, as nearly as possible, the general character, colour, and texture of the original, and the etching-needle was accordingly his chief instrument. He excelled in light and shade. Among his principal works are—tho Vision of Ezekiel, after Raphael; the Sposalizio, or the Marriage of the Virgin, and a Holy Family, after the same; the Entombment, after D. Crespi; the Magdalen, after Correggio; the Madonna del Lago, after Da Vinci; Galatea, after Albani; and many heads, after Rembrandt. The Sposalizio was engraved as a companion-piece, or *pendant*, to Morghen's large print of the Transfiguration, by Raphael. He commenced in 1827 to engrave the Last Judgment, by Michelangelo, from a drawing by the Roman painter Minardi, but he died without finishing it: it was however considerably advanced, and, if not already finished, will probably be completed by some one of his distinguished scholars. The Madonna del Velo, after Raphael, Longhi also left unfinished, but it was completed in 1834 by his pupil the Cav. Toschi. Longhi died of apoplexy in 1831. He was a Knight of the Iron Crown, and member of many academies.

Besides a few poems and other essays, there is a treatise on engraving, by Longhi ('La Calcographia'), which has been translated into German by C. Barth; and contains a Life of the author, by F. Longhena. A Life of him, also, with a list of his works, was published at Milan in 1831; and there are notices of him in the *Kunstblatt*, and in Nagler's *Neues Allgemeines Künstler-Lexicon*.

LONGICORNES, the fourth family of tetramerous Coleoptera in Latreille's arrangement of insects. It includes a vast number of large and beautiful beetles, all remarkable for the length of their antennæ, which in many species are several times longer than their bodies. They inhabit woods, where the females deposit their eggs beneath the bark of trees, effecting the operation by means of a long, strong, horny ovipositor with which they are provided. The females are usually larger than the males. The larvæ live beneath the bark of trees or in the wood, in which they bore deeply and do much damage. The greatest assemblage of species and the largest forms are found in South America; but longicorn beetles are very generally dispersed. This family is divided into three great groups, of which the genera *Prionus*, *Cerambyx*, and *Leptura* are the respective types.

LONICE'RA, a genus of plants named after Adam Lonicer, a German botanist, who was born in 1528 and died in 1586. He practised as a physician at Frankfort-on-the-Main, and wrote a Herbal, which was merely a compilation of what had been done by others. There is also a John Lonicer mentioned who wrote a commentary on Dioscorides.

This genus is the type of the natural order Caprifoliaceæ, and has the tube of the calyx 5-toothed, the corolla tubular, campanulate or funnel-shaped, with a 5-cleft usually irregular limb; 5 stamens; a filiform style, a capitate stigma; 3-celled berries, and crustaceous seeds. The species are erect or climbing shrubs, with opposite exstipulate leaves and axillary flowers. There are about 60 species of Lonicera, most of which have handsome flowers and emit a delicious perfume.

L. caprifolium, Goatsleaf, or pale perfoliate Honeysuckle, has ringent whorled terminal and sessile flowers, deciduous obtuse leaves glabrous on both sides, the upper leaves connate perfoliate, the style glabrous. It has a twining stem, with white or purplish flowers and orange-coloured berries. It is a native of the middle and south of Europe, and is found in woods and thickets in many parts of England and the south of Scotland.

L. Periclymenum, the Woodbine, or Honeysuckle, has climbing branches, the leaves all separate, deciduous, sometimes downy, glaucous beneath, ovate, obtuse, attenuated at the base, upper ones the smallest; the heads of flowers all terminal ovate, imbricated; the flowers ringent. The flowers are pale yellow, the berries red, and accompanied with permanent bracts. This plant in early times was supposed to possess powerful medical properties, but it is not now used. It is however extensively cultivated in the gardens and shrubberies of Europe on account of the delicious perfume of its flowers. This plant is the true 'woodbine' of the poets, and Milton has applied to it the name 'twisted eglantine.' This plant has obtained the name of woodbine, a corruption of wood-bind, from its habit of twisting round the stems of trees. Thus Shakspere says—

> So doth the woodbine, the sweet honeysuckle,
> Gently entwist the maple.

The name honeysuckle is derived from the habit of children, who draw the corolla out of tho calyx, and suck the collected honey from its nectary. Several varieties of this plant are recognised by botanists. All these are beautiful climbers and very fragrant; and trained against a wall, twining round a pole, or climbing and rambling amongst bushes, are very ornamental in gardens. It is a native of middle Europe, and very abundant in some parts of Great Britain.

L. Xylosteum, Fly Honeysuckle, has 2-flowered woolly peduncles as long as the flowers, the calyx-limb deciduous, the berries slightly connected at the base, the leaves oval, downy, the stem erect. The flowers are of a pale yellow, and the berries are scarlet. It is a native of nearly the whole of Europe, in thickets, hedges, and rocky places, and by the side of woods. It is found in the same situations, but is a rare plant, in Great Britain.

L. Tartarica, the Tartarian Honeysuckle, has a glabrous erect stem; cordato-ovate sub-acute leaves; the peduncles shorter than the leaves; the berries distinct when young and nearly globose, but at length connate at the base; flowers rose-coloured, short, somewhat gibbous at the base; the fruit black with one of the berries usually abortive: the peduncles 2-flowered. It is a native of Tartary, and is one of the most hardy of European shrubs, growing in the open air in the gardens of Petersburg and Stockholm. It is very common in British gardens and is valued much on account of its early leafing and flowering.

L. Iberica, the Georgian Honeysuckle, is an erect plant with petiolate, cordate, roundish, tomentose or pubescent leaves; the peduncles 2-flowered, shorter than the leaves, the bracteas oblong, ciliated; the berries globose, blood-coloured, joined together to the middle globose; the ovarium tomenlose. This plant is a native of Georgia, about Teflis, and is a neat little bush with which to form garden-fences.

All the species of Lonicera may be cultivated, and are well adapted for gardens, shrubberies, &c. The climbing species may be trained on trellis-work, or in arbours or against walls. The upright hardy species are best adapted for shrubberies. They will grow in any common garden-soil, and may be propagated by cuttings planted in autumn, either in a sheltered situation or under a hand-glass, according as they are more or less tender.

(Don, *Gardener's Dictionary*; Loudon, *Arboretum et Fruticetum*; Babington, *Manual of British Botany*.)

LOOM. [WEAVING, P. C.]

LOPHIADÆ, a family of Acanthopterygious fishes, named *Pectorales pediculati* by Cuvier. Their pectoral fins are so constructed and placed as to perform the office of feet. The *Lophius piscatorius*, or fishing-frog, is a British example.

LOPHOBRANCHII, a family of fishes in which the gills, instead of being pectinated, are separated into small rounded tufts, which are arranged in pairs along the branchial arches, and covered by a large operculum, so fixed as to leave only a single small orifice for the passage of the water outwards. The pipe-fishes, *Syngnathus*, *Hippocampus*, *Solenostomus*, and *Pegasus*, are the genera included in this family.

LOPHOTES. [TÆNIOIDES, P. C. S.]

LORANTHUS (from *lorum*, 'a strip of leather,' and ἄνθος, 'a flower,' in allusion to the long linear shape and leathery substance of the petals), a genus of plants the type of the natural order Loranthaceæ. It has diœcious or hermaphrodite flowers, the calyx cup-shaped, adnate, with an entire border; the petals 5 or 6, linear, reflexed; the stamens inserted into the middle of the petals; the filaments short, anthers globose; the style thickish; stigma simple; the berry globose, 1-celled, 1-seeded. The species are evergreen shrubs parasitical on trees.

L. Europæus, the European Loranthus, is a glabrous much branched plant; the branches terete; the leaves opposite, petiolate, oval-oblong; the racemes terminal, simple; the flowers diœcious, of six petals. This plant is an evergreen parasitical plant, and has the habit of the common mistletoe (Viscum album). It is a native of the southern parts of Europe, and is found on the oak, but inhabits no other tree. 'This circumstance,' says Burnett, 'has led some naturalists to suppose the Loranthus to have been the Mistletoe of the Druids, and to believe, as it is not now indigenous to Britain, that when Druidism was suppressed, every vestige of that stupendous superstition was so completely swept away that even the sacred plant was extirpated here.' The fact however of the scarcity of the mistletoe upon the oak renders it probable that it was on this account more sought after, and thus contributed to render it an object of superstition. Several other species of Loranthus have been described, but none of them are easily cultivated, on account of their parasitical habits. The seeds of the Loranthi, like those of the mistletoe, contain tannin, and are astringent.

(Burnett, *Outlines*; Loudon, *Arboretum et Fruticetum*.)

LORDS' ACT. [INSOLVENT, P. C.]

LORENZO, or LORENZETTO, AMBROGIO and PIETRO DI, two celebrated Italian painters of the fourteenth century, were born at Siena about the year 1300. They were brothers, as we learn from the following inscription formerly in the hospital of Siena: 'Hoc opus fecit Petrus Laurentii et Ambrosius ejus frater, 1330:' it was attached to pictures of the Presentation and of the Marriage of the Virgin, which were destroyed in 1720; and was preserved by the Cav. Pecci. This inscription explains the name given by Vasari to Pietro, whom he calls Petrus Laurati or Laureati, which is evidently an erroneous reading of Petrus Laurentii—Pietro di Lorenzo.

Some of the works of these painters still remain, though the principal of their works, by Ambrogio, which is described by Ghiberti (in 'Cod. Magliabecchiana,' f. 8 & 9), is destroyed. It was painted in the Minorite convent at Siena, and represented the fatal adventures of some missionary monks. In the first compartment a youth was represented putting on the monastic costume; in another, the same youth was represented with several of his brother monks about to set out for Asia, to convert the Mohammedans; in a third, these missionaries are already at their place of destination, and are being chastised in the Sultan's presence, and are surrounded and mocked by a crowd of scoffing infidels; the Sultan judges them to be hanged; in a fourth, the young monk is already hanged to a tree, yet notwithstanding he continues to preach the gospel to the astonished multitude, upon which the Sultan orders their heads to be cut off; the next compartment is their ceremonious execution by the sword, and the scaffold is surrounded by a great crowd on foot and on horseback; after the execution follows a great storm, which is represented in all the detail of wind, hail, lightning, and earthquake, from all of which the crowd are protecting themselves as they best can, and this miracle, as it was considered, is the cause of many conversions to Christianity. Such is the description of this picture by Lorenzo Ghiberti, the first sculptor of his time, and he finishes it by declaring it to be, as a painted story, a wonderful thing—'per una storia picta mi pare una maravigliosa cosa;' many of the actors, he says also, appeared to be living beings.

There is still in the Sala delle Balestre, in the public palace of Siena, a *tempera* painting of Peace, represented by a view within and without the city of Siena, with numerous inhabitants variously occupied in business and in pleasure. War was likewise represented in this hall, but is now defaced; there are however other allegorical works still remaining, and Rumohr observes that what remain justify Ghiberti's praises of what have disappeared, speaking with relation to the time of their production—1337, 1338.

Of the several pictures by Ambrogio Lorenzetti mentioned by Ghiberti, only one remains—the Presentation of the Virgin in the Temple, in the Scuole Regie, and in this some of tho women are excellent.

Ghiberti does not mention any works by Pietro Lorenzetti, and there is only one authenticated work by him; it is in the Stanza del Pilone, a room against the sacristy of the cathedral of Siena, and is marked 'Petrus Laurentii de Senis me pinxit, A. M.CCC.XLII.' It represents, according to Rumohr, some passages from the life of John tho Baptist, his birth, &c.

Vasari mentions many works by Pietro in various cities of Tuscany, where he says his reputation was greater than either Cimabue's or Giotto's. He attributes to him a picture of the early fathers and hermits in the Campo Santo at Pisa; it is engraved in Lasinio's 'Pitture del Campo Santo di Pisa.'

In 1355 Pietro was invited to Arezzo to paint the cathedral, in which he painted in fresco twelve stories from the life of the Virgin, with figures as large as life and larger, but they have long since perished; they were however in good preservation in the time of Vasari, who completely restored them. He speaks of parts of them as superior in style and vigour to anything that had been done up to that time.

The works of these painters, though relatively good, are not exempt from any of the errors and defects of the prevailing style in Italy previous to Donatello, Masaccio, and Ghiberti; and they display even some of the barbarities of the Byzantine school. Several pictures are attributed to them in various collections, but wholly without evidence as to their authorship.

(Vasari, *Vite de' Pittori*, &c.; Della Valle, *Lettere Sanesi*; Lanzi, *Storia Pittorica*, &c.; and especially Rumohr, *Italienische Forschungen*, in which the two Lorenzetti are treated of at considerable length.)

LOSS ISLANDS. [SIERRA LEONE, P. C.]

LOTTO, LORENZO, a celebrated Venetian painter of the sixteenth century. He is supposed to have been one of the scholars of the Bellini, and also an imitator of Lionardo da Vinci. He lived long at Bergamo and was generally considered a native of that place, 'but,' says Lanzi, 'we are indebted to Sig. G. Beltramelli for showing, in a work published in 1800, that Lotto was a native of Venice:' he found him thus noticed in a public contract, 'M. Laurentius Lottus de Venetiis nunc habitator Bergomi'—Master Lorenzo Lotto, of Venice, now a resident of Bergamo. Lotto lived also some time at Trevigi, at Recanati, and at Loretto, where he died. His works range from 1513 to 1554. Lanzi ventures an opinion that Lotto's best works could scarcely be surpassed by Raphael or by Correggio, if treating the same subject. His masterpieces are the Madonnas of S. Bartolomeo, and Santo Spirito, at Bergamo.

(Vasari, *Vite de' Pittori*, &c.; Tassi, *Vite de' Pittori, &c. Bergamaschi*; Lanzi, *Storia Pittorica*, &c.)

LOVAT, LORD. Simon Fraser, afterwards Lord Lovat, was born in 1668, at Beaufort near Inverness, in Scotland. He belonged to the family of the Frasers, who were powerful as early as the reign of Malcolm IV. about 1153, and who had large possessions in Tweedale and elsewhere in the south of Scotland. Simon Fraser's father died when his son was very young. After receiving the usual instruction at a grammar-school, he was sent to the University of Aberdeen, where he distinguished himself by his acquirements in classical learning.

In 1692 Fraser, through tho interest of the Marquis of Athol, received a commission as captain of a company in Lord Tullibardine's regiment, but soon afterwards resigned in consequence of a dispute with the Marquis, who was grandfather to the eldest daughter of the last Lord Lovat, and claimed the estates for her. Simon Fraser, on the coutrary, asserted his own right, as nearest male heir, not only to the estates, but to be chief of the Frasers. In 1694 he succeeded in winning clandestinely the affections of the heiress, then fifteen years of age and living with her mother, the dowager Lady Lovat, near Inverness, and she consented to elope with him. She did elope, but the man whom Fraser had engaged to conduct her changed his mind, took her back, and disclosed the plot to Lady Lovat. The heiress was immediately sent under an escort to Dunkeld, the seat of the Marquis of Athol. Fraser made some daring efforts to obtain possession of her, but without success.

About 1700 Fraser went to France, and to ingratiate himself with James II., then living at the court of St. Germain, formally renounced the Protestant faith, and embraced that of the Roman Catholics. James II. having died in 1701, his son, James Francis Edward, resolved to make an attempt to regain his father's kingdom, and Fraser was appointed by the courts of Versailles and St. Germain to stir up an insurrection in the highlands of Scotland. He was made a colonel (some say a major-general), was furnished with credentials to treat with noblemen, gentlemen, and chiefs of clans, and was supplied with arms, ammunition, and money. He embarked at Dunkirk, and landed in Scotland about the end of 1702. He pretended to perform his engagement, but after his return to France in 1703 it was discovered that he had abused his trust, and had disclosed the plot to the Duke of Queensbury. He was confined in the Bastile, where he remained till 1708, when, in order to obtain his release, he offered to enter into holy orders. By the influence of the pope's nuncio and other Roman Catholic clergymen he was set at liberty, took orders, retired to St. Omer, entered the College of Jesuits, and discharged for some years the duties of a priest with apparent sincerity and much diligence.

When the Rebellion broko out in 1715 Fraser repaired to London, and with some difficulty and risk got to the highlands of Scotland under the assumed name of Captain Brown. His great object was to obtain his hereditary estates; a large part of the clan of the Frasers received him as their chief, and were willing to act according to his decision; and as Fraserdale, who had married the heiress and held the estates, had joined the Pretender, Fraser adhered to the king. He took Inverness from the rebels, and after the Rebellion was suppressed his services was rewarded with the title of Lord Lovat and the grant of the forfeited estates.

In 1717 Lord Lovat married a daughter of the Laird of Grant, and by her had two sons and two daughters, who survived him. His wife having died, he married a young lady nearly related to the Argyle family, and had a son by her, but treated her with so much cruelty that a separation was the consequence. He was appointed governor of Inverness and lord-lieutenant of Inverness-shire, and lived in tolerable quietness till the second Rebellion broke out in 1745, when he joined the side of Charles Edward, the young Pretender, but kept himself at home, and sent his son with the Frasers, pretending, in his reply to the Lord President, who, on the 28th of October, 1745, wrote to reproach him, that his son had acted without his authority; there was however abundant evidence of his participation, and he fled aud concealed himself in the wildest parts of the Highlands; after many escapes ho was caught, and conveyed to London. He was confined in the Tower, and was not brought to trial till March 9, 1747. The trial lasted sevon days, and he was then found guilty, and sentenced to be beheaded. Both before and after his trial he amused every one near him with his jests. On the 9th of April, 1747, he was led to the scaffold on Tower-hill. He was then eighty years of age, and after sitting awhile in a chair, and talking deliberately to those about him, he laid his head quietly down on the block, and gave the sign quickly; and though he was very fat and his neck unusually short, his head was cut off at a single blow. Horace Walpolo, who was present, says, 'He died extremely well, without passion, affectation, buffoonery, or timidity, his behaviour being natural and intrepid.'

(*Memoirs of Simon Fraser, Lord Lovat*, 8vo. London, 1746; *Pictorial History of England*, vol. iv. p. 551, &c.)

LOUDON, JOHN CLAUDIUS, was born at Cambuslang, in Lanarkshire, on the 8th of April, 1783, where his mother's only sister, who was the mother of Dr. Claudius Buchanan, author of 'Christian Researches in Asia,' then resided. His father was a farmer, and lived at Kerse Hall, near Gogar, about five miles from Edinburgh. As a child, Loudon exhibited a taste for gardening, 'as his principal pleasure was in making walks and beds in a little garden his father had given him.' He was early sent to reside with an uncle at Edinburgh in order that he might be educated, and here he attended a public school, and also the classes on botany and chemistry. In addition to the Latin he learned at school, he obtained a knowledge of French and Italian, and paid his masters himself out of the proceeds of translations from these languages, which he sold. At the age of fourteen he was placed with a nurseryman and landscape gardener, and continued his attendance on the classes of botany and chemistry, and to these added agriculture, in the university of Edinburgh. During this period he acquired the habit of sitting up two nights every week for the purpose of study, a habit which he continued for many years.

In the year 1803 Loudon first camo to London, and as he brought good recommendations from Edinburgh, he found no difficulty in getting employment in his profession of a landscape gardener. One of his earliest literary efforts was made this year in the form of a paper contributed to the 'Literary Journal,' entitled 'Observations on laying out the Public Squares of London.' It was the practice when this article was published, to adorn the squares of London with a very sombre vegetation, consisting of yews, pines, and other heavy plants. This practice the author strongly condemned, and recommended the lighter trees, as the oriental plane, the sycamore, the almond, and others, which are now generally cultivated, and add greatly to the beauty of London squares. In 1804 he returned to Scotland, and in the same year he published his first work, entitled 'Observations on the Formation and Management of useful and ornamental Plantations,' 8vo., London. He returned to England in 1805, and published a small work, entitled 'A short Treatise on some Improvements lately made in Hothouses,' 8vo., Edinburgh. In 1806 he published a 'Treatise on forming, improving, and managing Country Residences, and on the choico of situations appropriate to every class of Purchasers,' 8vo., London. This work was illustrated with thirty-two copper-plate engravings of landscape scenery drawn by the author.

In 1806 an accident turned his attention to farming. Travelling one night on the outside of a coach, exposed to the rain, and neglecting to change his clothes, he became attacked with rheumatic fever, which left him so debilitated that for the sake of his health he took lodgings at Pinner near Harrow. Here he had an opportunity of observing the inferior farming then practised in England, and persuaded his father to take a farm near London. The result was that, conjointly with his father, they rented Wood Hall, and such was their success that the following year Loudon wrote a pamphlet entitled 'An immediate and effectual Mode of raising the Rental of the Landed Property of England, &c., by a Scotch Farmer, now farming in Middlesex.' This led to his introduction to General Stratton, the owner of Tew Park in Oxfordshire, and his undertaking the management of this estate as a tenant. Here he established a kind of agricultural college, in which he engaged to teach young men the principles of farming; and in 1809 he wrote a pamphlet on the subject entitled 'The Utility of Agricultural Knowledge to the Sons of the Landed Proprietors of Great Britain, &c., by a Scotch Farmer and Land-Agent.' Ho carried on bis farming so successfully that in 1812 he found himself worth 15,000*l*., and being more anxious for the cultivation of his mind than the improvement of his circumstances, he determined to give up his farm and travel on the Continent. He left England in March, 1813, and after visiting the principal cities of Germany and Russia, experiencing a variety of adventures, and recording with his pen and pencil all that he found worthy of notice in his own profession, he returned to his own country in 1814. On his return to London, finding that the chief part of his property was lost through unfortunate investments, he devoted himself with renewed energy to his old profession of landscape-gardening. He now determined to publish a large work on the subject of gardening; and in order to complete his knowledge of continental gardens, for the purpose of rendering his work more valuable, he visited France and Italy in the year 1819. In the year 1822 appeared his great work, 'The Encyclopædia of Gardening,' which contained not only a vast amount of original and valuable matter on every department of horticulture, but was copiously illustrated with woodcuts in the text. This work had a very extraordinary sale, and fully established tho reputation of the author as one of the most learned and able horticulturists of his day. A second edition was published in 1824. The success of this work led bim to engage in another equally laborious and extensive, and on the same plan, devoted to farming. This was published in 1825, with the title 'Encyclopædia of Agriculture.' Another work, though not exactly on the same plan, but similar in design and comprehensiveness, was edited by him, and published in 1829, with the title 'Encyclopædia of Plants.' This work however contained less of the author's own work than the preceding, the plan and general design being all that he claimed as his own. This was followed by another, the 'Encyclopædia of Cottage, Farm, and Villa Architecture,' which was all his own labour. 'The labour,' says Mrs. Loudon, 'that attended this work was immense; and for several months he and I used to sit up the greater part of every night, never having more than four hours' sleep, and drinking strong coffee to keep ourselves awake.' This book was published in 1832, and was very successful. He then planned a work of still greater extent, which demanded more time than any of the preceding: this was his 'Arboretum et Fruticetum Britannicum;' comprehending an account, with engravings, of all the trees and shrubs growing wild or cultivated in Great Britain. This work was brought out in 1838, and, with the preceding, was published at his own expense. After paying artists and other persons engaged in the work, 'he found at its conclusion that he owed ten thousand pounds to the printer, the stationer, and the wood-engraver who had been employed.' The sale of this work was slow, and seemed to have involved him in pecuniary difficulties, which, although they did not abate his energy, still preyed upon his mind, and hastened his death.

During the time that these works were going on he edited several periodicals. In 1826 he established the 'Gardener's Magazine,' which he carried on till his death. In 1828 he commenced the 'Magazine of Natural History,' which he edited till 1836, when it passed into other hands. In 1834 he started the 'Architectural Magazine,' which he gave up in 1838. In 1836 he commenced the 'Suburban Gardener,' a monthly publication; so that he had four monthly works, in addition to the 'Arboretum,' going on at the same time.

These labours would appear very extraordinary for a man in perfect health and with the use of his limbs, but they become more extraordinary when the circumstances are known under which be wrote them. His first attack of rheumatic fever, in 1806, was so severe as to produce permanent anchylosis of his left knee. Subsequently his right arm became affected, and this was so severe that after trying the usual remedies be was induced to submit to shampooing, during which process his arm was broken so close to the shoulder as to render it impossible to have it set in the usual manner; and on a subsequent occasion it was again broken, when it was found necessary, in 1826, to have recourse to amputation. In the meantime his left hand became affected so that he could only use the third and little finger. After this period he was obliged to employ for all his works both an amanuensis and a draftsman. With this infirm and maimed body, his mind retained its vigour to the last. Early in 1843 he was attacked with chronic inflammation in his lungs, which terminated bis existence on the 14th of December of that year. He continued working till the day of his death, and 'died standing on his feet.'

Few literary men have attempted or executed so much as Loudon, and that under circumstances of the most depressing and afflictive nature. The tendency of his mind was essentially practical, and in this will be found the cause of the success and the influence of his writings. In his works on gardening he displays great anxiety for the mental improvement and welfare of the class of men who make this their occupation; and the book on which he was employed at the time of his death is devoted to them, and is entitled 'Self-Instruction for Young Gardeners.' In all his works he never lost tho opportunity of pointing out the bearing of his subject on the moral and social improvement of his fellow-creatures.

He was married in 1831, and has left behind his wife and one daughter. Mrs. Loudon is the authoress of 'The Mummy;' 'Ladies' Flower Garden;' 'Ladies' Botany,' &c. The materials for this notice have been chiefly collected from a Memoir by Mrs. Loudon in 'Self-Instruction for Young Gardeners.' A complete list of Loudon's works is given in the 'Proceedings of the Linnean Society' for 1844.

LOVELACE, RICHARD, born in 1618, was the son of a Kentish knight. Educated at the Charterhouse and at Oxford, he was placed at court, and entered the army under the patronage of Goring. On the close of the civil war, he retired to his paternal seat, Lovelace Place, near Canterbury. The county deputed him to present their petition in favour of the king to the Long Parliament; and for doing this he was imprisoned in the Gatehouse, and released only on giving bail in forty thousand pounds. In 1646 he raised a regiment in the French service, commanded it, and was wounded at Dunkirk: and it is said that the lady he celebrated in his poems married another person, on a false report that Lovelace had died of his wound. Returning to England in 1648, he was again imprisoned, and remained in confinement till after the king's death. In 1649 be published a volume of poems, entitled 'Lucasta's Odes, Sonnets, Songs,' &c. He had spent his fortune freely in serving the Royal cause. He now fell into embarrassment and sickness, and lived for some years wretchedly. He died of consumption, in a mean lodging in London, in 1658. Lovelace was the anthor of two plays, which have never been printed. His lyrical poems, with much inequality and many other faults, are full of spirit and vigour. Specimens of them are in all the common collections; and one or two of them, such as the fine verses 'To Althea from Prison,' furnish some of the most backneyed of quotations.

LOWELL, a large manufacturing city in the United States of North America, is situated in the State of Massachusetts, on the south bank of the River Merrimack, where the Concord River flows into it, in 42° 39′ N. lat., 71° 19′ W. long., 439 miles from Washington, and 26 miles north from Boston by the railway. The site was formerly the head-quarters of the Pawtucket Indians, whose territory extended to the north of Massachusetts Bay, and included the present State of New Hampshire. The Pawtuckets amounted to about 12,000, and Wamesit, their chief town, was at the junction of the Concord River with the Merrimack, where the city of Lowell now stands. When first visited by the Europeans about 1650, the population of Wamesit was about 3000; but the Pawtuckets rapidly gave way before the white settlers; in 1674 the population of Wamesit was reduced to 250 men, besides women and children. The lands belonging to the Pawtuckets on the west of the Concord River were given up in 1686, and those on the east in 1726.

The banks of the Merrimack were covered with a forest, and it soon became an object of importance to float the timber, lumber, and fuel which it furnished down the river to Newburyport. In doing this the chief difficulty was in passing the Pawtucket Falls, where the river has a descent of thirty-two feet over a series of rapids. On the 27th of June, 1792, an act was passed which constituted certain persons into a body politic and corporate, by the name of the Proprietors of Locks and Canals on Merrimack River. A canal was forthwith commenced, and was completed in 1797; it extends from the Merrimack just above the Pawtucket Falls, in a sweep of a mile and a half, to the Concord River, near the point of junction of the Concord with the Merrimack. The descent of thirty-two feet was accomplished by four locks Into this canal the whole stream of the Merrimack could be turned, and might thus afford an immense water-power, perfectly under control, to be applied to manufacturing purposes. For upwards of twenty years this vast water-power seems to have been little noticed. In 1813 a cotton manufactory was erected on the Concord River, a little above the canal, which in 1818 was converted into a woollen manufactory; and there were two or three other manufactories on the Concord River and the Merrimack, below the Falls, but none on the Pawtucket Canal. In 1814 three large cotton manufactories were erected by a company at Waltham on the Charles River, comprising 231 looms, and were very successful. The Waltham Company, having discovered the use which might be made of the water-power of the Pawtucket Canal, purchased the shares of the Canal Company, as well as lands adjoining the canal. On the 6th of February, 1822, they were incorporated as tho Merrimack Manufacturing Company. They enlarged the Pawtucket Canal, making it sixty feet wide and eight feet deep, and at the same time dug the Merrimack Canal from the Pawtucket Canal to the Merrimack River, and on this latter canal the first manufactories were erected in 1823.

The town was at first called East Chelmsford, and in 1820 contained 200 inhabitants. In 1826 the number of inhabitants had increased to 2500, and on the 1st of March in that year East Chelmsford was incorporated into a town called Lowell. Francis Cabot Lowell, after whom it was so named, was the son of the Hon. John Lowell, LL.D., and was born in 1774, at Newburyport, Massachusetts. In 1810 he visited England, and on his return he invented, in conjunction with Patrick Tracy Jackson and Paul Moody, and erected at Waltham in 1812-13, the first power-looms which were brought into extensive operation in America, though upwards of twenty others had been patented at Washington previously. Lowell's looms, which gave rise to the Waltham Company before mentioned, were afterwards transferred to Lowell. Mr. Lowell died in 1817, at the age of forty-three.

Such was the origin of Lowell, the population of which, in 1830, had increased to 6477. On the 30th of March, 1836, it was incorporated as the City of Lowell, and the population was then 17,633; in 1840 it was 20,921; in 1844 it was 25,163; and is now (March, 1846) probably about 30,000.

Of this population about one-third, or 10,000, are persons employed in the cotton and woollen manufactories, or 'mills,' as they are called, and of these about 7000 are females and 3000 males. One interesting peculiarity connected with the Lowell mills is the superior character of these female operatives, as they are called in America, or factory-girls, as they are called in England; and of this superiority a singular proof was afforded by the periodical work called 'The Lowell Offering, a Repository of Original Articles, written exclusively by Females actively employed in the Mills;' the first number of which appeared in October, 1840, and the first volume was completed in December, 1841. A second volume was completed in 1842, and the work was still continued in 1845. A selection from the two first volumes, under the title of 'Mind amongst tho Spindles,' formed the second volume of the series of 'Knight's Weekly Volume,' in the editor's preface to which, and in a letter from Miss Martineau annexed to it, an interesting account of these female operatives is given.

There are about twelve large manufacturing companies, or corporations, besides several smaller companies. A brief description of the arrangements of a Lowell corporation will partly explain the means by which the moral if not the intellectual superiority of these girls is produced. On the bank of the river, or of one of the canals, stands a row of two, three, four, or five mills. A short distance from the mills are long blocks of brick boarding-houses, which are connected with the mills by a line of one-story brick building, containing the counting-room, superintendant's room, clerk's room, and store-rooms. The mill-yard is inclosed in such a manner that access can only be had to the mills through the counting-room. On one side are the boarding-houses, which are let only to persons of approved character, and are entirely under the superintendant's care; on the other side are the mills, in each room of which is placed an overseer, who is responsible for the work, good order, and management of the room. Thus the superintendant has the entire corporation under his inspection in the most complete manner, the whole forming a perfect system of subdivided and well-defined responsibility. Each of the long blocks of boarding-houses is divided into six or eight tenements, which are generally three stories high. No male operatives board with the female operatives, but distinct tenements are appropriated to each sex. The hour for taking meals is uniform throughout all the corporations. The number of hours which the mills run, and consequently during which the operatives are employed, taken on an average, is twelve hours ten minutes. The rate of wages varies. A young woman from the country, employed at first as a spare hand and in learning the business, receives fifty-five cents per week besides her board. In a few months she will earn a dollar or a dollar and a half per week, according to her dexterity and diligence. While however the average pay of the female operatives is somewhat less than two dollars per week, besides board, instances are not uncommon of their earning three and four dollars per week, besides board. The payments are entirely by notes, convertible at any hour into gold and silver.

As connected however with the superiority of the Lowell female operatives, it is to be observed that they are quite a different class of females from the factory girls of England. They come mostly from the country, where they have been respectably brought up in farm-houses or elsewhere, and seldom remain more than three, four, or five years, when they return to their homes, and are succeeded by others in continuous succession.

There are in Lowell twenty-three regularly constituted religious societies, and they have erected about twenty churches. Connected with these societies are 6123 Sunday-school pupils and teachers, or more than one-fifth of the entire population. There is 1 High School, 8 Grammar-schools, and 30 Primary Schools; a City-Library, of which a catalogue of 5000 volumes has been printed; a Savings-Bank, incorporated in 1829, which has about two thousand depositors, half of whom are factory girls, the amount of whose funds at interest is estimated at 100,000 dollars. Two per cent. interest is paid for every six months. The Lowell Dispensary was incorporated in 1836; the Lowell Hospital was established in 1839. There is a large Almshouse, a Poor-Farm, and a Gaol. The Lowell Cemetery is on the east bank of the Concord River, a mile above its junction with the Merrimack; it comprises about forty-four acres, and was consecrated June 20, 1841. The Lowell Institute is an association of gentlemen for the management of a course of lectures which are delivered every winter in the City-Hall, at which many of the female operatives attend. The City-Hall, for town purposes, with committee-rooms and stores underneath, was completed in 1830; another public hall with reading-rooms and library-rooms was built in 1835 for the use of the Middlesex Mechanics' Institution. In 1837 a large market-house was completed. There are two bridges over the Merrimack: one just below the Falls, called the Puwtucket Bridge; the other near the mouth of the Concord River, called the Central Bridge, which is connected with a new portion of town on the north bank of the Merrimack.

There are two railroads connected with Lowell. The Boston and Lowell railway, 26 miles in length, was opened July 4, 1835; in 1844 the dividend was 8 per cent. The Nashua and Lowell railway is 14 miles in length; it paid a dividend in 1844 of 10 per cent.

The following table is given in the 'American Almanac' for 1846:—

Lowell Statistics, January 1, 1845.

Capital stock . . . dollars	10,850,000
Number of mills, exclusive of print-works, &c.	33
Spindles	204,076
Looms	6,304
Females employed	6,320
Males employed	2,415
Yards made per week . . .	1,459,100
Bales of cotton used in ditto .	1,175
Pounds of cotton wrought in ditto .	464,000
Yards dyed and printed ditto .	287,000
Tons of anthracite coal per annum .	12,500
Cords of wood per annum . .	3,270
Gallons of oil per annum . .	64,842
Flour for starch, barrels, per annum	4,000
Charcoal, bushels, per annum .	600,000
Yards of cloth per annum . .	75,873,200
Pounds of cotton consumed . .	24,128,000

A pound of cotton averages 31·5 yards; 100 lbs. of cotton will produce 89 yards of cloth. Average wages of females, clear of board, per week, 1·75 dollar. Average wages of males, clear of board, per day, 70 cents. Average amount of wages paid per month, 138,500 dollars.

(*Lowell, as it was and as it is*, by the Rev. Henry A. Miles, 18mo., Lowell, 1845; *American Almanac*, 1846; *Knight's Weekly Volume*, vol. ii.)

LOXONE'MA. A group of spiral Gasteropoda is thus named by Phillips. The species occur in Silurian, Devonian, and carboniferous strata. (*Palæozoic Fossils of Devonshire.*)

LOYOLA, IGNATIUS. Don Iñigo Lopez de Recalde, more generally known under the name of Loyola, was the youngest child of Don Bertram, lord of Ognez and Loyola, a nobleman of high birth and distinction in his province, and of Marina Saëz de Baldi. He was born in the year 1491, at the castle of Loyola, in that part of Spanish Biscay afterwards called the province of Guipuzcoa. In early youth he was attached to the court of Ferdinand and Isabella, in the quality of a page; but the vivacity of his disposition little suited him for a situation so devoid of excitement, while the recital of the noble deeds of the Spanish knights, who had lately freed their country from the yoke of the infidel, rendered him desirous of emulating their fame. His father, when he sent him to the court of Spain, had placed him under the care of his relation Don Antonio Manriquez, duke of Najara. This nobleman, perceiving the military bias of his young ward, got him instructed in the art of war, and afterwards received him in his suite. The ardent imagination of Ignatius was in the meanwhile kept in constant excitement by the eager perusal of the various romances in which were idealized the religious spirit of Spanish chivalry; to this was added the example of his brothers, who were following with distinction the profession of arms. After joining the army he soon rendered himself conspicuous by his gallant bravery on every occasion; his conduct, in other respects, is described as having partaken in all the dissipations generally incident to a military life; one vice, however, that of gambling, he appears constantly to have avoided. He was in his thirtieth year when he assisted in the defence of Pampeluna, against the French; in the assault he was severely wounded, his right leg having been fractured by a cannon ball, and his left, at the same time, injured by a splinter. The French, into whose hands he had fallen prisoner, respecting his misfortune and admiring his bravery, had him conveyed to the castle of Loyola, which was situated at a small distance from Pampeluna. A long and painful confinement was the result of his wounds, and a cruel operation was resorted to, which, though endured with characteristic courage, reduced him to the last extremity. His recovery from the effects of the operation, though he saw in it a miracle, appears to have produced no change of conduct. A second operation, however, became necessary, owing to a deformity which had resulted from the first, and its consequences entailed a longer and more tedious confinement. To relieve its weariness he requested to be provided with those records of antient chivalry which had been the delight of his former years, but instead of them he was furnished with works of mystical devotion and the lives of saints. Of a disposition naturally visionary and romantic, deprived of the means of pursuing a career in which he hoped to attain the highest honours, the attentive perusal of these records of the zeal and suffering of holy men infused in his mind an ardent desire to imitate them. As he eagerly pondered over the recital of the actions of a St. Dominick, or a St. Francis, he was wont to ask himself what prevented him from imitating their deeds? But often were these heavenly aspirations clouded by the intervention of worldly thoughts and of temporal affairs. At other times, when in this spiritual combat the spirit was obtaining a mastery over the flesh, his vivid imagination would portray to him visions of celestial glory which, in that hour of struggle, encouraged and inspired him. He has graphically described the various scenes through which he passed in his introduction to a religious life, in his 'Spiritual Exercises,' the origin of which may be referred to the same time as his first awakening from worldly slumber. This remarkable work is not a book of doctrine, it is the description, to use his own words, of 'the longings of a soul seeking to be appeased, not by much knowledge, but by the sense and relish of inward things.' He first minutely details a variety of rules for the guidance of spiritual life; he then exhorts to the study of sacred history, to whose events he too frequently gives a fanciful interprotation; he afterwards gives an allegorical representation of the convert's progress from the prison of this world to the realms of celestial bliss. Loyola but detailed his own feelings in this extraordinary production. From this time all his desires were directed to one great object, an entire devotion to the service of God. For this purpose, renouncing all worldly pursuits, he tore himself from the paternal home, from his kindred, and from his friends. Regardless of the kindly opposition of his eldest brother, become by the death of his father the head of the house of Loyola, he resolved upon retiring to a Benedictine monastery at Mount Serrat, in order to prepare himself for a pilgrimage to the Holy Land. He became acquainted in that monastery with one of the brothers named John Chanones, of high reputation for austere and self-denying piety, and he was anxious to unfold to him the confession of his former sins and the confidence of his religious aspirations. While journeying towards Mount Serrat, he arrived at a village at the base of the hill on which it is situated, and he was then struck with the reflection that, though a destined pilgrim for Jerusalem, he was still clad in the garments of Babylon, and he exchanged his usual dress for the coarse raiment of a beggar. The night of the 24th March, 1522, the vigil of the Annunciation, was a memorable period in the life of Loyola; he passed it in the exercise of the most austere devotions in the church of the Holy Virgin at Mount Serrat; on its altar he hung up his arms, the trophies of his worldly triumphs, and, in the spirit of chivalry, vowed constant obedience to the demands of God and of his church. The better to put into execution his holy resolutions he determined to perform barefoot his intended pilgrimage, in order that this severe penance might excite in his mind a deeper remorse for sin. On leaving Mount Serrat, he directed his steps towards Manresa, a small town within three leagues of this monastery. There he repaired to the hospital of the Dominican convent, and, while attending upon the poor and sick, imposed upon himself a series of new and severe penances. His deeds of charity soon acquired for him celebrity in that town, and, though clad in the rags of destitution, he was unable to walk the streets without attracting the importunate admiration of the multitude. To avoid the temptation of vain glory, he retired to a cavern hollowed in a rock at a short distance from Manresa, where he redoubled the severity of his penances, and was one day found in a state of inanimate exhaustion at the door of his cell, and was borne back to the Dominican hospital. On his recovery, his mind, weakened by mortifications and fastings, fell into a state of spiritual despondency. His doubts and despair, his fears and temptations, are described with edifying minuteness in his own writings and by his early historians. It does not appear that any particular doctrine had made an impression on the mind of Loyola, as that of justification by faith alone had made on that of Luther. He lived, as it were, within himself, and his emotions were actuated by the alternate inspirations of good and evil; he has taught us in his 'Spiritual Exercises' the manner in which he distinguished their influences; the soul being gladdened by the one and depressed by the other. One day, at length, he awakened as from a dream, his imagination had portrayed to his mind the visible representation of heavenly mysteries. With tears of joy, he gratefully acknowledged the blessings vouchsafed to him, and, refreshed in spirit, he arose a new and a mightier man.

After residing ten months at Manresa, he left that town for Barcelona, from whence he embarked for Rome. In that city he remained a few days, in order to obtain the blessing of the Pope Adrian VI. upon his enterprise; he then resumed his journey, passing through Padua and Venice, travelling alone and on foot, fasting daily, and begging alms as he went. His voyage from Venice to Cyprus presented a fresh trial for his patience and constancy, his pious efforts for the conversion of the crew of the vessel in which he sailed being met by coarse insults and contumelies. From Cyprus he embarked with some pilgrims for the Holy Land, and reached Jerusalem on 4th September, 1523. He there visited with holy veneration the hallowed spots which religious tradition has consecrated. To accomplish the objects of his journey, he was desirous not only of contributing to the edification of the believers, but also to the conversion of the infidels. His projects, however, were defeated by the refusal of a permission of residence from the primate of the Church of Rome at Jerusalem. He then re-embarked for Europe, and arrived at Venice in January, 1524, and from thence he returned to Barcelona. In this town he determined upon making some stay, in order to acquire by study a greater influence in the conversion of souls. He addressed himself for that purpose to Jerome Ardebala, while a pious lady, Isabella Rosel, undertook to provide him with the necessary means. His early education had been greatly neglected, and the dissipations of a camp had obliterated from his mind the little he had learnt. At the age of thirty-three, he began with zealous industry to apply himself to the rudiments of grammar. But his active mind found extreme difficulty in applying itself to its tedious minutiæ; and absorbed in religious contemplation, each word he met with excited a train of pious thoughts. Still by constant application he appears to have made some progress in learning. He continued at Barcelona till the zealous attempts on his part to reform some irregularities which existed in a convent of nuns exposed him to the vengeance of those who had partaken in their disorders. He then retired to the University of Alcala, which had lately been founded by Cardinal Ximenes, in order to prosecute his studies. A religious address which he delivered to the students was the occasion of his dismissal from that University, and the obligation to study theology during four years, before he could again be permitted to teach in public, was imposed upon him. In 1527 he retired to Salamanca, where, having imprudently resumed his public teaching, he fell under the displeasure of the Inquisition, who punished him by a severe confinement, and dismissed him from their city with a similar injunction.

Discouraged by the rude reception which his pious labours had met with in his native country, he repaired to Paris, at that time the most renowned seat of learning in Europe. He arrived in February, 1528. The slender means which had been provided for him by the charitable generosity of his friends were purloined by the dishonesty of a fellow-student, and he was again compelled to have recourse to begging for his subsistence. He, however, zealously applied himself to the studies of the University: obliged to recommence his rules of grammar and tho principles of philosophy before he could be admitted as a theological student, he humbly placed himself in the class of the youngest and least advanced scholars, and besought their teacher to treat him as one of them. His time in Paris appears to have been spent partly in the laborious acquisition of knowledge, and partly in the endeavour to obtain a salutary influence over his companions. In the latter pursuit he was eminently successful. Two students shared his rooms, Peter Faber (called Le Fevre in Art. JESUITS), a native of Savoy, of humble origin and simple manners, and Francis Xavier of Navarre, of noble ancestry and aristocratic demeanour. These young men, of such different dispositions and habits, were the first-fruits of Loyola's labours. From that time the three companions formed the closest intimacy, dividing their gains, and sharing each other's toils. Shortly after three more students acknowledged the influence of Loyola, and joined his small society: their names are recorded in the article JESUITS, P. C. On 15th August, 1534, they assembled together at the Church of Montmartre, in one of whose subterraneous chapels Faber, who was a priest, administered to them the Sacrament of the Eucharist. They then took the solemn vows of chastity, absolute poverty, devotion to the care of Christians, and to the conversion of infidels. They further resolved on proceeding to Jerusalem, but, in case impediments to the accomplishment of this object should be put in their way, they decided upon placing themselves under the guidance of the Pope, and implicitly submitting to his directions. Such was the humble origin of the famous Order of the Jesuits, so called because they placed themselves under the banners of Jesus, as soldiers under their chief. The history of the founder now becomes mingled with that of the Order itself. Its early progress, the oppositions it met with, the history of its success, and the rules and constitutions by which it is governed, are fully and clearly detailed in another part of this Cyclopædia. [JESUITS, P. C.] We will only, therefore, briefly state the principal events in Loyola's life which are not alluded to in that article.

After revisiting his native country, where he religiously repaired the effects of some early faults, he proceeded to Venice, in which city he was joined by his companions, and from thence proceeded to Rome. Their intended departure for Palestine was interrupted by the war which broke out, in 1537, between the Venetians and the Turks; they therefore presented the offer of their services to the See of Rome. They were gratefully accepted by the reigning pontiff, who gladly availed himself of the support of a society of men full of zeal and enthusiasm, and bound together by the common tie of implicit obedience to his orders. 'Deeply shaken by open schism and lurking disaffection, the Church of Rome found an unexpected source of strength in her own bosom, a green shoot from the yet living trunk of the aged tree.' (Hallam.) On the 27th September, 1540, Paul III. published a bull sanctioning, under some limitations, the establishment of the Order; another was finally issued in 1543, which removed these limitations, and made the sanction unconditional. Meanwhile six of the oldest members met together to elect a president subject to no control but that of the See of Romo; their choice fell on Loyola. He remained at Rome as the centre from which he was to control and direct the movements of the Society. His time was spent there in revising its rules and constitutions, and in works of charity. He founded an asylum for the protection of Jews who had become proselytes to Christianity, and a penitentiary whero the victims of sensual seductions might, without binding themselves by any religious vow, lament their sins and reform their lives. In the year 1546 Francis Borgia, whom the Church of Rome honours as a saint, caused their first college to be founded at Gandia in Spain; the statutes were drawn up by Loyola, and the same privileges were accorded to it which belonged to the universities of Alcala and Salamanca. Not twenty years had elapsed since from these very universities Loyola, then a poor and despised student, had been contumeliously expelled as a factious and illiterate pretender.

On the 31st July, 1556, this extraordinary man, worn down by infirmities and self-inflicted mortifications, left a world which for so many years he had looked upon only as the scene of charitable labours. It were a useless task to attempt a delineation of Loyola's character; it is best known by his works. Whatever difference of opinion may be entertained respecting the order of the Jesuits, there can be but little respecting their founder.

The memory of Ignatius was consecrated by a ceremony known in the Church of Rome by the name of Beatification in 1609, and he was canonized as a saint by Pope Gregory XV. in 1622. His festival is celebrated on the 31st July.

His Life has been written by Gonzales and Ribadeneira, two of his early companions, the latter his confessor; also by Maffeus in Latin, Bartoli, and Bouhours in French. His 'Spiritual Exercises' were published at Rome in 1548, and have been translated into French by Drouet de Maupertuis and Clément. His 'Maxims' translated were published at Paris in 1683.

An elegantly written sketch of the life of Ignatius Loyloa is contained in 'The Portrait Gallery' published by Knight, vol. vii. By a misprint in this sketch of Knight's, his death is made to take place in 1566. Further information respecting him may be obtained in Ranke's 'History of the Popes,' vol. i. p. 181-200 of Miss Austin's translation; Alban Butler's 'Lives of the Saints;' Fabre's Continuation of Fleury, vol. xxvii.; De Thou, 'Hist. Universello,' vol. iii.; and Bayle, 'Dict. Historique.' Bayle is chiefly useful in correcting some errors of preceding writers; but the whole is written in a cold and sarcastic spirit.

LUCA'NIDÆ, the family of Stag-beetles, a name popularly applied to these insects on account of the very large and powerful mandibles with which the males are furnished. These in the genera *Chiasognathus* and *Pholidotus* equal the entire length of the body, and in the Lucanus cervus of our own country are very formidable instruments of offence. They live during the day in the trunks of trees and old wood, and take flight at dusk. The females are sluggish and not so numerous as the males, which fight with great ferocity among themselves for possession of their mates. The larva, which is supposed to have been the animal called Cossus by the Romans, and esteemed by them as a delicacy, lives in the willow and tho oak, and remains untransformed for several years. When full-grown it forms a cocoon of the dust of wood which it has ground down by its powerful jaws, and after remaining some time as a pupa it undergoes its final transformation to pass a very brief portion of its life as a perfect insect. Some of the foreign genera of Stag-beetles are remarkable for their brilliant colouring. In Britain we have four species which belong to as many genera. (See Westwood's *Introduction to the Modern Classification of Insects*, vol. i., and the writings of Macleay, Kirby, Roesel, and Hope.)

LUCERNAL MICROSCOPE. This is a hollow pyramidal box, of wood, at the smaller extremity of which is a tube carrying the usual system of lenses for magnifying objects. At the larger end, which is towards the observer, there are two lenses in frames; their axes, as well as those of the small lenses at the opposite extremity, being coincident with the axis of the box; and between the exterior of the two lenses and the eye of the observer thero is usually placed a plate of glass, rough-ground on one side, which serves as a screen to receive the rays of light proceeding from the object whose representation is to be viewed: the object is fixed in a small frame, as usual, and is placed in a groove made for the purpose immediately beyond the tube containing the system of lenses, at the small end of the pyramidal box.

This box, the axis of which is in a horizontal position, is mounted on a brass stand, which may be placed on the floor or on a table, and the parts of the apparatus are capable of being correctly adjusted by means of screws. The instrument was invented by Mr. George Adams, a distinguished optician in London, and it received its name from the images of the objects being projected on the ground-glass screen by the rays of light transmitted from a lamp through the lenses, the observations being made by night or in a darkened room.

The correct definition of the image depends upon tho achromatism of the lenses at the object end of the instrument, a subject which has been treated in the article MICROSCOPE, P. C.; and therefore it will be sufficient to notice here only the means employed to enlighten the field of view.

For this purpose, in general, an Argand lamp is placed beyond the object, with respect to the microscope; or, if thought necessary, two or more such lamps may be so situated: the light, after passing through a hemisphere of glass, is, when an opaque object is to be viewed, made to fall in a convergent state upon a small concave mirror, which is so inclined as to reflect the light back upon the object; and from the different points on the surface of the latter the pencils of rays proceed through the object-lenses and the box to tho glass screen.

By the refraction of the light in passing through the lenses a highly magnified image of the object is formed; and several persons may then place themselves so as to see the image on the screen at the same time; or, by placing the eye at a small aperture in the produced axis of the instrument, one person may, with a pencil, draw on the glass, or on tracing-paper laid over it, the figure of the object; it being understood that, by means of the proper adjusting-screws, the rays in each pencil are made to unite accurately in one point on the screen.

When the object to be viewed is transparent, the light is made to fall in a condensed state upon it, after having been transmitted through a convex lens, or two such; and, from the object, the rays proceed as before to tho screen through the system of lenses which constitute the compound object-glass of the microscope, and through those at the opposite extremity of the box.

Instead of having a plate of ground-glass to receive the image, the pencils of light from the object, after passing through the lenses, may be allowed to fall on a board painted white or covered with white paper; the distance of the board from the instrument (about 6 or 8 feet) being such that the rays in each pencil may converge to a point upon it: thus there will be obtained a greatly magnified image of the object, which may be observed by many spectators at one time. Such a screen should have the form of a segment of a hollow sphere, the light being received on its concave surface; for by that construction the image will be nearly equally distinct at the centre and about the margin.

The solar microscope, which was invented by Dr. Lieberkhun in 1738, produces a greatly magnified image of a small object in a similar manner by means of the sun's light. It consists of a conical tube fixed by its base to a frame of wood; the latter being screwed to a closed window-shutter at an aperture purposely made in the latter: the tube projects into the room, which, when the observations are to be made, is rendered quite dark, and is sometimes lined with black cloth. The magnifying power is produced by a system of lenses contained in the tube, as in other microscopes. On the exterior of the window is a frame carrying a rectangular piece of looking-glass; this frame is attached by a joint at one of its sides to a ring of wood or brass which is made to surround the aperture in the shutter. The mirror, by turning on the hinge, is capable of being fixed at any angle with the wall of the building; while the ring to which it is attached can, by means of a rack and pinion, be made to turn on the horizontal axis of the instrument, so as to permit the rays of the sun, whatever be the position of the latter, to be reflected into the tube. By means of lenses disposed for the purpose, these rays are made to converge on the object; and from thence, after refraction through the system of object-glasses, they proceed to a screen on which they depict the magnified image.

When the object is transparent, the rays of solar light are allowed to pass from the mirror directly through the lenses to the screen; but when it is opaque, a convex lens placed at the aperture in the window-shutter causes the solar rays to condense on a small mirror placed in a box at that end of the instrument which is within the room, and from this mirror the rays are reflected to the object. The condensed light thus thrown on the object diverges from thence and passes through the system of lenses, by refraction in which the magnifying power is produced; these lenses being placed in a tube which, as well as the object, is within the box containing the mirror last mentioned, but a little above the latter, so that the rays of light proceeding from the object to the magnifying lenses may not be intercepted.

The mirror by which the sun's light is reflected into the instrument is sometimes connected with a clockwork apparatus, by which its position is continually varied correspondently to the apparent change of the sun's place; and thus the reflected light is made constantly to pass through the tube. [Heliostat, P. C.]

Sir David Brewster has given, in his 'Treatise on New Philosophical Instruments,' p. 405, &c., a method of preparing objects of natural history for observation by the microscope, that their parts may preserve their proper shape and colour, and thus be seen to the greatest advantage.

The solar microscope will, probably, never be generally employed, on account of the necessity which it involves of having an apartment particularly situated, and of being used only when the sun shines. The lucernal microscope can, of course, be employed at any time; and if, for an Argand lamp, the oxy-hydrogen light be substituted, the lenses also being achromatic, the image will be distinct and correctly defined. [Microscope, P. C., p. 188.]

LUCHETTO DA GENOVA. [Cambiaso, Luca, P. C. S.]

LU'CUMA (a native name for one of the species), a genus of plants belonging to the natural order Sapotaceæ. It has a 5-parted calyx; a 5-cleft corolla; 10 stamens, 5 of which are sterile, and 5 fertile, alternating with each other; an ovarium 5-10-celled; the fruit 1-10-seeded; nuts or seeds bony, marked by a large umbilical areola without albumen. The species are trees, yielding a milky juice, with scattered entire coriaceous leaves, and 1-flowered axillary or lateral peduncles.

L. Mammosa, the Common or Mammee Sapota, has obovate lanceolate, oblong cuspidate, glabrous leaves, with solitary flowers. This plant grows from fifty to one hundred feet in height. It is a native of the tropical parts of South America, and of many of the West India Islands, where it is also cultivated. The fruit of this tree is eaten in the West Indies. It is of a large size, oval-shaped, and covered with a brownish rough skin, under which is a soft pulp of a russet colour, very luscious, and which, on account of its flavour, is called Natural Marmalade. P. Browne calls a variety of this tree Bully-tree, because it grows the tallest of all the trees in the woods of Jamaica.

Several other species of this genus have been described. They are all natives of various districts of South America, and yield edible fruits similar to the preceding species. They were at one time referred to the genus Achras, the species of which also yield edible fruits. [Achras, P. C.]

(Don, *Gardener's Dictionary*.)

LUIGI, ANDRE'A DI, commonly called *L'Ingegno*, and sometimes *Andrea di Assisi*, was born at Assisi about the middle of the fifteenth century.

The common story of this painter, originating with Vasari, has been completely overthrown by Rumohr in his 'Italienische Forschungen.' The account of Vasari, which has been invariably followed by all subsequent writers on the subject, down to the time of Rumohr, is that L'Ingegno was the rival of Raphael in the school of Pietro Perugino, that he became suddenly blind while assisting his master Perugino in the Sistine Chapel; and that the then pope, Sixtus IV., granted the unfortunate painter a pension for life, which he enjoyed until his eighty-sixth year. Rumohr has shown this account to be, with one exception, wholly incorrect; the only possible part of it is that L'Ingegno assisted Perugino in the Vatican; this he may have done, as he was his assistant in some works in the Cambio, or Exchange, of Perugia.

L'Ingegno cannot have been Raphael's fellow-pupil with Perugino, for he painted only one year after the birth of Raphael, in 1484, a coat of arms for the town-ball of Assisi, where he was then an established master. He also, long after the death of Sixtus IV., held official situations at Assisi, which can leave no doubt of his retaining his sight. In 1505 he was procurator; in 1507, arbitrator; in 1510, syndic—syndicator potestatis; and in 1511 he was appointed by Julius II. papal treasurer at Assisi—Camerarius Apostolicus in Civitate Assisii. L'Ingegno, therefore, instead of receiving a pension from Sixtus IV., received a salary from Julius II., 27 years after the death of Sixtus, who died in 1484. From these several appointments he had probably given up painting, which may have been either owing to weakness of sight or from greater advantages to be had elsewhere: his brother was one of the canons of the cathedral of Assisi.

The only certainly known work by L'Ingegno is the coat of arms already mentioned. The prophets and sibyls in the Cambio at Perugia are assigned to him, but it is quite uncertain what portion of those works was executed by him: the prophets and sibyls also in tho Basilica of Assisi were attributed to him, but it has been shown that they were executed in the sixteenth century by Adone Doni. There are further attributed to L'Ingegno two pictures in the galleries at Berlin and Vienna; and a Holy Family in the Louvre, a beautiful small work in the style of Perugino. Rumohr conjectures, from the style of L'Ingegno in these works attributed to him, that he was the pupil or imitator of Niccolo Alunno. He was probably called L'Ingegno more for a general aptness for business, than for any particular skill in painting.

(Vasari, *Vite de' Pittori*, &c.; Lanzi, *Storia Pittorica*, &c.;

Rumohr, *Italienische Forschungen;* Waagen, *Kunstwerke und Künstler in Paris.*)

LUI'NI or LOVI'NI, BERNARDINO, the most celebrated of the scholars and imitators of Lionardo da Vinci, was born at Luino on the Lago Maggiore, about the middle of the fifteenth century. There can be no doubt that this is the approximate time of his birth, as he painted himself as an old man in the picture of Christ disputing with the Doctors, at Saronno near Milan, which was executed, according to its inscription, in 1525. Lanzi has successfully shown that there is every probability that Luini was the actual scholar of L. da Vinci, and that Resta must be in error when he states that Luini did not go to Milan until the early part of the sixteenth century, when Da Vinci had already left it.

Luini's reputation is comparatively recent, which is owing to Vasari's silence regarding him, though he evidently alludes to Luini where he speaks of the paintings of Bernardino da Lupino in the church of the Madonna at Saronno. Luini painted much in the style of Lionardo da Vinci, and his works are in many instances, in the opinion of several judges, attributed to Da Vinci; this is the case with the Christ disputing with the Doctors, in the National Gallery, which Dr. Waagen and others have no hesitation in pronouncing to be by Luini. Fortunately many of Luini's best and greatest works, in oil and in fresco, are still in a good state of preservation, namely, the Magdalen, and St. John with the Lamb, in the Ambrosian library at Milan; the enthroned Madonna, painted in 1521, the Drunkenness of Noah, and other works in the gallery of the Brera at Milan; the frescoes of the Monastero Maggiore, or S. Maurizio, in the same city, from which, however, the ultramarine and gold have been scraped off; those already noticed at Saronno; and other extensive and equally good works in the Franciscan convent Degli Angeli at Lugano, on the lake of that name, which were painted subsequently to those at Saronno, and are among the last of Luini's works, but their colours have somewhat suffered. There are also many easel-pictures in oil by Luini, both in and out of Italy, in public and private collections.

Luini's style is something between that of Mantegna and Raphael, his earlier works approaching nearer to the style of Mantegna, and his later to that of Raphael; they are elaborately finished, beautifully coloured, and forcibly shaded, yet they want the exquisite tone, the fullness of style, and the greatness of character of the works of Da Vinci; in expression, however, they approximate very nearly to the works of that great master. Luini excelled chiefly in painting women and the more delicate qualities of human character. Several of his best works have been lately engraved in a superior style, by various masters. The Adoration of the Magi has been engraved by C. della Rocca; the Presentation in the Temple, by A. Ghiberti; and the Marriage of the Virgin, and Christ disputing in the Temple, by C. Rampoldi; all these works are at Saronno: the Madonna with the Infant Christ, and St. John, at Lugano, have been engraved by C. Artaria; St. John with the Lamb has been engraved by G. Gerriani and P. Anderloni; and Herodias with the Head of John the Baptist, in the Brera, by G. Caravaglia. The paintings at Lugano are described in the 'Kunstblatt' for 1822.

Luini was still living in 1530, but the date of his death is not known. He had two sons, Evangelista and Aurelio, who are both praised by Lomazzo, their contemporary. Aurelio assisted his father in the frescoes at Lugano. After Da Vinci, the founder or *Caposcuola* of the Milanese school of painting, Gaudenzio Ferrari and Luini are the principal masters of the school, the distinguishing characteristics of which, as a school, are simplicity of subject and composition, expression, force of colour and tone, and minute perspective.

In the gallery of the Brera at Milan there are several frescoes by Luini, and one by his son Aurelio, which have been removed from the walls, and transferred to panel or canvas. Luini was one of the most masterly of the old Italian fresco painters, and there is a marked difference between the execution of his works of this class and his oil pictures; they are painted with much more freedom. He must have painted in fresco with remarkable rapidity. According to the observation of Mr. Wilson, who was sent by the English Government to Italy to examine the state of the early Italian fresco paintings, Luini must have executed more than an entire figure of the size of life in a single day: his colouring is warm and transparent, the lights of his draperies being merely thinly glazed with the colour of the drapery mixed with a little white; the shadows are the pure colour, laid on thickly; the outlines are often strongly indicated in some dark warm colour. He does not appear to have worked from cartoons; in his faces the features are merely indicated by straight lines, yet many of his female heads, painted upon such slight preparation, are among the most beautiful of the Italian frescoes.

(Lomazzo, *Trattato della Pittura;* Lanzi, *Storia Pittorica,* &c.; Waagen, *Kunstwerke und Künstler in England.* &c.; *Report of the Commissioners on the Fine Arts,* 1843, Appendix.)

LUMBRICARIA, a genus of fossil Annelida, from the Silurian strata of Tyrone. (Portlock.)

LUNACY. [INSANITY, P. C.; LUNACY, P. C.] Some recent acts have made alterations in the proceedings under commissions of lunacy.

An act of the 3 & 4 Wm. IV. c. 36, is entitled 'An Act to diminish the Inconveniences and Expenses of Commissions in the Nature of Writs De Lunatico Inquirendo; and to provide for the better Care and Treatment of Idiots, Lunatics, and Persons of Unsound Mind, found such by Inquisition.'

An act of the 5 & 6 Vict. c. 84, is entitled 'An Act to alter and amend the Practice and Course of Proceeding under Commissions in the Nature of Writs De Lunatico Inquirendo.' The first section empowers the Lord Chancellor to appoint two serjeants or barristers-at-law, to be called 'The Commissioners in Lunacy;' and enacts that in future all Commissions in the nature of Writs De Lunatico Inquirendo shall be directed to such commissioners, and that such Commissioners shall jointly and severally have and execute all the powers, duties, and authorities now had and executed by commissioners named in commissions in the nature of Writs De Lunatico Inquirendo. The commissioners (§ 2) are to conduct all inquiries with respect to Lunatics and their estates in such manner as the Lord Chancellor shall from time to time direct; and it is provided that nothing in this act shall prevent the Chancellor from issuing any commission in the nature of a writ De Lunatico Inquirendo, addressed to any fit or proper person or persons, in addition to the Commissioners in Lunacy.

§ 3 empowers the Chancellor to refer to the Commissioners in Lunacy, or either of them, any of the inquiries and matters connected with the persons and estates of Lunatics which are usually referred to the Masters in Ordinary in Chancery; and § 4 makes the Commissioners in Lunacy visitors, under the direction of the Chancellor, of all persons found idiot, lunatic, or of unsound mind, by inquisition, jointly with the three visitors appointed by the 3 & 4 Wm. IV. c. 36.

§ 7 empowers the Chancellor from time to time to regulate the form and mode of proceeding before and by the said commissioners, and the practice in matters in Lunacy; and to regulate the number of jurymen to be sworn to try inquests on Commissions in the nature of Writs De Lunatico Inquirendo; but it is provided that every inquisition on such commission shall be found by the oaths of twelve men.

By the 8 & 9 Vict. c. 100, § 2, the two commissioners of lunacy are henceforth to be called Masters in Lunacy, and take the same rank and precedence as the masters in ordinary of the High Court of Chancery. Some other regulations as to the duties of the masters in lunacy are contained in 8 & 9 Vict. c. 100, § 95-98.

The other sections of the act 5 & 6 Vict. c. 84, make regulations as to fees and other matters, for which the act must be consulted. The salary of the commissioners is 2000*l.* a-year, free from all taxes or abatement.

The term Lunatic is only properly applied to a person who is found to be a lunatic by the verdict of a jury under an inquisition, as explained in LUNACY, P. C. But the term lunatic is also applied to those who, being considered lunatics, are confined in lunatic asylums or hospitals, under such regulations as the 8 & 9 Vict. c. 100, § 44-49 prescribe, without having been found lunatics under an inquisition; and also to any single patient who is boarded or lodged for pay as a lunatic in a house not licensed under the act, § 90; and also to any person who is under the care of any person who receives or takes the charge of such one lunatic only, and derives no profit from the charge (§ 112). As to the persons and property of such so-called lunatics, who have not been found lunatic by a jury, the 8 & 9 Vict. c. 100, § 94, enacts, That whenever the commissioners in lunacy shall have reason to suppose that the property of any person detained or taken charge of as a lunatic is not duly protected, or that the income thereof is not duly applied for his maintenance, such commissioners shall make such inquiries relative thereto as they shall think proper, and report them to the lord chancellor. § 98 enacts, That when any person shall have been received or taken charge of as a lunatic upon an order and certificate, or an order and certificate under the provisions of that act, and shall either have been detained as a lunatic for the twelve months then last past, or shall have been the subject of a report by the commissioners in lunacy in pursuance of § 94, the lord chancellor shall direct one of the masters in lunacy to inquire and report to him as to the lunacy of such person so confined, and the chancellor is authorised to make orders for the appointment of a guardian or otherwise for the protection, care, and management of such lunatic, and such guardian is to share the same powers and authorities as a committee of the person of a lunatic found such by inquisition now has, and to appoint a receiver or otherwise for the care and management of the estate of such lunatic, and such receiver is to have the same powers as a receiver of the estate of a lunatic found such by inquisition now has; and the chancellor is also empowered to make orders for the application of the income of the lunatic towards his maintenance, and the cost of the care and management of his person and estate, and also as to the investment or other application for the purpose of accumulation of the overplus; but such protection, care, and management are only to continue so long as such lunatic shall continue to be detained as a lunatic upon such order or certificate as aforesaid, and such further time, not exceeding six months, as the chancellor may fix; but the chancellor may in any such case, either before or after directing such inquiry, and whether the master shall have made such inquiry or not, direct a commission in the nature of a Writ De Lunatico Inquirendo to issue, to inquire of the lunacy of such person.

In the Roman system, persons of unsound mind (furiosi) might be deprived of the man gement of their property on application to the praetor by his next of kin. This legislation was either introduced or established by the Twelve Tables. The person who had the care of the lunatic and of his property was called a curator. [CURATOR, P. C.] The Twelve Tables gave the care of the lunatic to his agnati. In those cases where the law had not provided for the appointment of a curator, the praetor named one. (*Dig.* 27, tit. 10; *Instit.* 1, tit. 23.)

LUNATIC ASYLUMS. COMMISSIONERS IN LUNACY. STATISTICS, CONSTRUCTION, and MANAGEMENT OF ASYLUMS. HISTORY OF THE NON-RESTRAINT SYSTEM. The subject of insanity and asylums for the insane has of late years occupied a very large share of public attention; particularly as an opinion has prevailed that insanity is on the increase in this kingdom beyond the ratio of population. The want of accurate information renders this point doubtful; but it is certain that more than 20,000 insane persons are in confinement in the public asylums and licensed houses in England and Wales, of whom 16,000 are paupers. But as a great number of patients are confined separately, or in the care of their relatives, of whom no public returns are made, this number is probably far below that of the persons insane in the country.

Two acts passed in 1845 (8 & 9 Vict. caps. 100 and 126) have placed the powers vested in the Commissioners in Lunacy on an entirely new footing, and have in many respects modified the constitution of asylums. The first act repeals 2 & 3 Wm. IV. c. 107; 3 & 4 Wm. IV. c. 64; 5 & 6 Wm. IV. c. 22; 1 & 2 Vict. c. 73; 5 Vict. c. 4; and 5 & 6 Vict. c. 87. This first act appoints six commissioners, three of whom are physicians and three barristers, with salaries; and five other commissioners who act gratuitously. The rule that none of these shall be connected with any asylum is continued. No person can act as a commissioner who within one year has been directly or indirectly connected with any asylum. Licences are granted by these commissioners at each of their quarterly meetings. Any person who wishes to open a house for the reception of patients is required to send a plan upon a scale of one-eighth of an inch to a foot of every part of the premises at least fourteen days previous to his application. No additions to or alterations in a licensed house can be made without the consent of the commissioners. No licence is to remain in force more than thirteen months, and the notice of a wish to renew must give the number of patients then confined. The jurisdiction of the commissioners extends to the whole of London and Middlesex, and Southwark; and to all places within seven miles of London, Westminster, and Southwark: in the country the licences are to be granted by the justices of the peace in quarter-sessions, who are bound to appoint three of their number, together with one physician, surgeon, or apothecary, as visitors of the asylums licensed by them. Strict regulations are enforced for the reception of patients; it is required that every person, not being a pauper, received as insane, shall be certified to be so by two physicians or surgeons, who shall visit such patient separately, and shall have no interest in the asylum in which such patient is to be confined; and certain entries of these particulars are to be kept at each asylum. For a pauper, the certificate of one medical man and the order of two justices is required.

Penalties are fixed for neglecting these rules, or those which direct notice to be given of every admission, death, discharge, or escape. Houses having one hundred or more patients are to have a resident medical attendant, and those of smaller size are to be visited by a medical attendant at defined periods, according to their size. Every house within the immediate jurisdiction of the commissioners shall be visited by them at least four times in the year, and every other house at least twice in every year; these visits may be made at any hour, even by night, and it is penal to conceal any part of a house from them. Similar powers are given to the visitors in the country.

The commissioners are to present an annual report to the lord chancellor of the state of the different asylums visited by them, which Report shall be laid before parliament.

An important alteration is made in the law concerning the care of single patients. Orders and medical certificates must in future be procured for the care of one patient, similar to those used for the admission of patients into licensed houses; and copies of these documents are to be privately sent to and registered by the secretary to the commissioners. This act only extends to England and Wales, and it does not affect Bethlem Hospital, London. The persons appointed to hold commissions De Lunatico Inquirendo, heretofore styled commissioners, are in future to be termed 'Masters in Lunacy.'

The second act, which repeals 9 Geo. IV. c. 40, relates to the regulation of lunatic asylums for counties and boroughs, and the maintenance and care of pauper lunatics; and gives to the commissioners a great power over these institutions, which had previously been entirely under the control of justices of the peace. The justices of every county and borough are now to be compelled to erect or to join in the erection of an asylum, where none such already exists; and all proposals, agreements, and plans, and the rules and regulations of each asylum, are to be submitted to the commissioners, and all contracts and estimates approved by the secretary of state. Contracts for the care of insane persons in licensed houses do not exempt any county or borough from the obligation of providing an asylum. Power is given to committees to grant retiring allowances to the officers of asylums; and a medical officer must be resident in every asylum which contains more than 100 patients. Lists of all the patients are to be sent twice in every year to the commissioners by the medical officer. This act extends only to England and Wales, and does not apply to Bethlem Hospital.

Great advantages may fairly be anticipated from the restrictions imposed by these acts; and they may probably only be considered as steps towards the highly desirable result of making all insane persons immediately the care of the State. The duties of the commissioners have, until the last few years, been very imperfectly performed, and the utmost secrecy as to their names and movements was preserved. The management of private asylums must vary considerably, as such houses are rarely built for the purpose, and are frequently under the direction of persons unfitted by their want of education for such an important charge; but these circumstances can by no means be admitted as excuses for the scandalous instances of cruelty and mismanagement which have gone on under the eyes of the commissioners, and in houses which have received their praise; especially in those large private asylums, where an immense number of paupers are taken at low rates; the temptation held out in such cases to economy at the expense of the care and comfort of the patients ought to call forth an especial watchfulness on the part of the commissioners.

The patients who are confined in prisons, hospitals, workhouses, or in the houses of their relatives, are exposed perhaps more than any others to great neglect and mismanagement; and not unfrequently are treated with great cruelty, even when the intentions of the parties who have charge of them are good, through their entire ignorance of the nature and proper treatment of the disorder.

Management of Public Asylums.—There is considerable diversity in the internal regulations of different public asylums as to the power and position of the medical and non-medical officers. In some there is a resident physician who holds the supreme authority, and is also steward and general manager; in others the physician only presides in his own department; and in others the chief officer is not medical, and the physician is non-resident. The Norfolk asylum was before the passing of this act the only large one in England without a resident medical officer; and this fact is severely commented on by the commissioners in their report. Under the new act a resident medical officer has been appointed; but we understand that the chief authority still remains with the non-medical superintendent. In the 70th Report of the visiting justices of Hanwell (April, 1844) it is stated that they have appointed an officer in the army to superintend the institution, with a view to the preservation of greater order and discipline than had been maintained under medical rule; in the 72nd Report (October, 1844) the resignation of the governor is mentioned, and we cannot learn from the reports that any steps have been taken to appoint a successor, nor whether the advantages derived from his appointment equalled the expectation of the justices.

In all asylums the position of the matron is one which requires to be settled in some uniform manner; owing to the matron having been in many cases the wife of the superintendent, an undue importance has been given to her position; the appointment of the female attendants, and even the classification of the female patients, has sometimes been left in her hands. When we consider that the matron cannot possibly have had a medical education, and that in very few cases those who hold the situation possess any previous knowledge of insanity, or are even persons of good general information, it is manifestly improper to allow her too high an authority. In the French asylums, and we believe also in some of those in the United States, there is no matron; a few of the most experienced female attendants act as heads of departments, and receive the orders of the medical officers; and this arrangement, which is found to work exceedingly well at the Salpêtrière, where there are 1500 female patients, seems on the whole to be the best. The effect of placing the matron in a higher position is almost certainly to bring about interference on her part with the duties of the medical officers, which cannot fail to be injurious to the welfare of the patients. At Hanwell the salary of the matron is higher than that of the resident medical officers, or than that of any officer excepting the physician.

In the appointment of a chaplain, steward, secretary, accountant, and any other officers, the most important point is to confine their duties within certain proper limits, and to prevent their interference with the patients without the concurrence of the medical officers.

If the government should at any time take the entire supervision of asylums for the insane into its own hands, we trust that the mode of proceeding will be to appoint to each asylum one resident medical officer, who shall be responsible for the entire conduct of the asylum; and to whom, therefore, the power of appointing and dismissing all the subordinate officers shall be given. Uniformity of system, the want of which has been a great evil in many asylums, would thus be secured; and the careful selection of a competent principal officer responsible for every instance of negligence or cruelty in the asylum under his care, could not fail to improve the general management of these institutions. At Glasgow the whole authority has for some years been in the hands of the resident physician, with the most satisfactory results; and an approximation is made to this plan in the Irish district asylums, where the non-resident physician is the principal officer.

By the acts lately passed, the power which the justices who had the control of different asylums possessed of passing rules at any meeting which entirely changed the system of management, or of summarily dismissing any officer, is done away with. The caprices of the governors of some asylums have changed their entire constitution in a few years.

A great improvement has been made of late years in the class of persons appointed as attendants, or, according to the old phraseology, *keepers*. That all such persons should possess benevolence and intelligence is essential to the effective working of a humane and enlightened system; and they should be liberally paid. The proportion of attendants to patients in the different English public asylums varies from one to ten, to one to twenty; the former does not seem too much, and is far less than that in all well-managed private asylums. No ward, however small, should have less than two attendants, in order that it should never be left without one; this is enforced by the rules of several asylums. A large number of attendants renders a vigilant superintendence by night practicable, which is no less important than by day, although it is entirely omitted in some institutions.

Whilst many excellent asylums exist for the rich, and the law is providing an increase of accommodation for the poor, benevolent individuals are making efforts to secure the benefits of proper treatment for the middle classes. It is proposed to build an asylum in the neighbourhood of London for 300 patients, at a cost of 30,000*l.*, which sum is to be raised by donations and subscriptions. When once established, it will be self-supporting, and it is expected that payments of from 1*l.* to 1*l.* 10*s.* per week for each patient will cover all the expenses. No existing asylum offers to persons able only to pay such a sum the comforts to which their position in society has accustomed them.

Construction.—The site and construction of an asylum for the insane are matters of great importance. A healthy and cheerful situation should be the first consideration in an institution intended for the cure of diseased minds. In this respect some existing asylums are very well placed; Hanwell, Lincoln, and Surrey may be instanced. Others have been originally on the outskirts of towns, and have been surrounded and built in by the increase of building. The commissioners mention several so placed in proper terms of censure.

It is generally admitted that the building ought not to be larger than to accommodate 300 or 400 patients, but an additional asylum for Middlesex is projected to hold 1200. As to plan, no two of the existing asylums are alike, and the most recently erected are by no means the best. In the Surrey asylum a complete copy has been made of the worst and newest part of Hanwell, in which the bed-rooms face one another, and the galleries are lighted from the top, which renders proper ventilation impossible. To make wide galleries with rooms only on one side, would certainly increase the cost of the building; but by introducing a bow or expansion into each gallery, the necessity for a day-room will be done away with. An open fire should be in each of these expansions; it will be a great source of comfort to the patients, and an improvement in the ventilation as well as the general appearance of the gallery; and, with a light wire guard, is perfectly safe. This plan is to be adopted in the Derby asylum now building; and as a ward must occasionally be left with one attendant, there is an advantage in bringing the whole of it within sight from a central position. No ward should contain more than thirty patients; and of these from twenty to twenty-five ought to have single rooms. It is matter of regret to find that dormitories are approved by the commissioners, and supported by the officers of some asylums; they certainly lessen the cost of building, but the quiet and comfort of the institution must be much diminished. Their ventilation is also very difficult; single rooms may be warmed with a hot-water pipe passing along the floor (not over-head), and opening the window will be a sure means of making a complete change in the air; but in dormitories it will be difficult to preserve freshness of air with warmth, more especially as the great argument in favour of them is their economy, and an economy partly made by allowing to each patient a smaller number of cubic feet than would be given in a single room. For the sick, the violent, the dirty, and the noisy, single rooms are obviously necessary; and it will, we believe, generally be found that the remaining patients, those whose tranquillity and usefulness entitle them to indulgences, will consider a single room, which they can call their own, one of the greatest that can be given them.

An asylum containing 400 patients may probably be built in a straight line, which is desirable, without the necessity of carrying it higher than the first floor. The chapel and chief officers' rooms, and the rooms used for the work or amusement of the patients, should form the centre; behind which the kitchen may be conveniently placed, with the laundry on the side next the wards of the women, and the workshops on that of the men. In the wards branching off from the centre, those patients who are quiet and convalescent and the sick should be placed, and the most refractory at the extreme ends of the building, to prevent them from disturbing the others. Six classes of patients may usually be found, for each of which some modification of management will be required:—

1. Tranquil: convalescent and melancholic.
2. Moderately tranquil.
3. Refractory.
4. Sick and infirm.
5. Idiots and other dirty patients.
6. Epileptics of the better class. These are frequently in

the intervals of their fits the most intelligent of the patients, but during the fits they require great attention.

All the sick, idiots, and epileptics should be on the ground floor, which will be easily arranged, as the tranquil and moderately tranquil, who form the great bulk of the patients, may occupy the upper floor.

To describe the numerous minute particulars to be attended to in constructing and furnishing an asylum is unnecessary here; the great rule should be, that every possible amount of safety should be combined with every possible amount of cheerfulness. There should be the strength of a prison without its gloomy character. No part of the building, within or without, should be neglected; and scarcely a day passes without improvements being made in one asylum or other—improvements that are worthy of adoption in any to be hereafter built.

An abundant supply of warm and cold water should be secured; or in some cases it will be found that the cost of supplying this necessary article will neutralize the advantages of an otherwise favourable site.

Baths, water-closets, a store-room, and rooms for washing, are essential in every ward. Warm baths are considered by many authorities to be valuable remedial agents, as well as advantageous to the general bodily health.

The commissioners have expressed an opinion that incurable paupers may be accommodated in asylums apart from the curable at a much less expense, and an arrangement for a separate provision for incurables is required by the new act (s. 27); but they cannot be aware that while the incurables comprise all the most tranquil and intelligent of the patients, whose society is of great value to the curables, they also comprehend patients who display every different form of insanity, and require every variety of treatment. It is certainly much to be wished that provision could be immediately made for all insane paupers; but we cannot consider that the removal of all hope from a large number of them, by immuring them in an 'asylum for incurables,' would be the best mode of attaining this object.

The following is a statement of the cost of building and furnishing twenty-two asylums, including that of the land, which in some cases amounts to a large sum. The mean cost for each patient accommodated is 154*l.* 2*s.* 3*d.*, which is probably more than will be found necessary in most future asylums. The expense of maintaining patients varies from seven to fourteen shillings per week; this must of course depend in some degree upon the prices of provisions in different parts of the kingdom, and be modified by cheap and dear seasons.

Name of Asylum.	No. of Patients.	Cost.			Cost per Patient.			Land.		
		£	*s.*	*d.*	£.	*s.*	*d.*	A.	R	P.
Bedford	180	20,500	0	0	113	17	9	9	0	0
Cheshire	152	28,000	0	0	184	4	2	10	3	0
Cornwall	172	18,780	0	0	109	3	8	presented.		
Dorsetshire	113	14,717	0	0	130	4	9	8	3	0
Gloucester	274	51,360	0	0	187	8	11	24	3	0
Kent	300	64,056	0	0	213	10	5	37	0	0
Lancaster	655	100,695	16	9	153	14	8	45	0	0
Leicester	152	27,630	13	3	181	15	6	8	1	0
Middlesex	1,000	202,000	0	0	202	0	0	77	0	0
Norfolk	220	50,000	0	0	227	5	5	4	2	0
Nottingham	200	36,800	0	0	184	0	0	8	0	0
Suffolk	228	32,000	0	0	140	7	0	30	2	0
Surrey	403	85,366	19	1	211	16	7	97	0	0
Yorkshire, West Riding	420	46,846	0	0	111	10	7	40	0	0
Glasgow	350	46,000	0	0	131	8	6	68 (not included in cost.)	0	0
Armagh	134	20,970	4	5	156	9	10	8	0	23
Carlow	180	22,577	16	4	125	8	8	15	0	39
Clonmel	120	16,677	19	3	138	19	7	11	1	14
Connaught	316	27,130	4	6	85	17	1	22	2	28
Londonderry	212	26,282	8	3	123	19	3	12	5	2
Maryborough	170	24,442	19	0	143	15	7	22	2	17
Waterford	127	16,964	12	1	133	11	7	14	2	12

Statistics.—There are in England and Wales 12 county asylums, 5 county and subscription, 11 partly subscription and partly charitable, 1 military, 1 naval, and 142 licensed houses; 14 of which last receive paupers. The hospital of Bethlem, which is exempt from the rules that affect other asylums, is to be added to this number.

Scotland has eight public asylums; in all of which, we believe, private patients as well as paupers are received; and some are assisted by charitable endowments.

Ireland has twelve public asylums; ten of these are district asylums for the poor; Cork is locally governed, and Swift's Hospital is founded by charter.

Several new asylums are in progress both in England and Ireland.

With a view to present in a few plain statistical tables the results of treatment in each of the existing public asylums, the writer of this article sent blank forms to each superintendent in the kingdom; in almost every case they have been filled up and returned, and their contents are embodied in the following tables. When information could not be obtained in this manner or from reports, the statistical tables published by the Commissioners in Lunacy have been resorted to; but these only extend to the end of the year 1843, and required much correction, as they are not upon one uniform plan. We may instance the tables furnished by Bethlem and St. Luke's as omitting many of the particulars desired by the Commissioners. In several asylums no average number of patients is given, and the per-centages of deaths and cures are calculated upon other numbers; in other asylums which have been opened many years, the early records are so incomplete as to be useless. In several asylums, even in some recently opened, the published returns do not contain any distinction of the sexes.

The First Table shows the whole number of patients admitted into the 49 public asylums of the United Kingdom to the latest date to which we can obtain information; being 38,537 males, 38,328 females, and 8394 of whom the sex is not specified. Thus the admissions of males exceed those of females by 209, or in the proportion of 1 to ·9945; a scarcely appreciable difference. Of the whole number of insane persons in England and Wales on the 1st January, 1844, according to the report of the Commissioners, 9862 were males and 11,031 females; thus the females exceed the males in the proportion of 1 to ·894. The greater mortality among men is the cause of this apparent discrepancy.

The following Table (II.) shows the result in the same asylums as to cures and deaths during the same period. This comparative table is recommended by the Commissioners, in addition to the tables showing the per-centage of cures and deaths on the average number.

The cures are taken as 1.

The term 'Removed' includes all discharged improved or uncured, or escaped.

This table likewise shows the number remaining in the different public asylums at the latest dates to which we have been able to make up the returns, and which appears to be 5163 males, 5044 females, and 236 of whom the sex is not specified.

The greater number of cures and smaller number of deaths among females must be in a great measure ascribed to

TABLE I.

Name of Asylum.	Date of Opening.	Date of Return.	Admissions. Male.	Female.	Total.
ENGLAND.					
Bedford	Aug. 1812	31 Dec. 1843	577	524	1,101
Bethlem*	1547	,, 1844	2,658	3,643	6,301
Bristol, St. Peter's Hospital†	1696	,, ,,	265	316	581
Chatham (Military)	10 May, 1819	,, 1843	586	22	608
Cheshire	20 Aug. 1829	,, ,,	511	386	897
Cornwall	Oct. 1820	,, ,,	429	329	758
Dorsetshire	1 Aug. 1832	,, 1844	202	253	455
Exeter, St. Thomas's Hospital	1 July, 1801	,, 1844	651	746	1,397
Gloucester	21 July, 1823	,, 1844	895	804	1,699
Haslar (Naval)	15 Aug. 1818	,, ,,	807	..	807
Kent	1 Jan. 1833	,, ,,	439	325	764
Lancaster	28 July, 1816	24 June, 1845	2,384	1,912	4,296
Leicester	10 May, 1837	31 Dec. 1844	284	291	575
Lincoln	25 Mar. 1820	,, ,,	577	494	1,071
Liverpool	1792	,, ,,	2,418	1,456	3,874
Middlesex	16 May, 1831	30 Sept. 1845	1,399	1,425	2,824
Norfolk	May, 1814	31 Dec. 1844	716	794	1,510
Northampton	1 Aug. 1838	,, ,,	373	368	741
Norwich, Bethel Hospital ‡	1713	,, ,,	96	105	201
Nottingham	12 Feb. 1812	30 June, 1845	1,045	808	1,853
Oxford §	July, 1826	31 Dec. 1844	..	..	493
St. Luke's	30 July, 1751	,, ,,	7,130	10,410	17,540
Stafford §	1 Oct. 1818	25 Dec. ,,	..	..	3,073
Suffolk	1 Jan. 1829	29 Aug. 1845	627	620	1,247
Surrey	14 June, 1841	27 Aug. ,,	370	343	713
York §	Nov. 1777	1 June, ,,	..	..	4,032
,, Friends' Retreat	June, 1796	24 ,, ,,	336	379	715
Yorkshire, West Riding	23 Nov. 1818	31 Dec. 1843	1,682	1,657	3,339
WALES.					
Pembroke	1824	,, ,,	16	14	30
SCOTLAND.					
Aberdeen	1 Jan. 1821	1 May, 1845	538	614	1,152
Dumfries (Crichton)	1 June, 1839	11 Nov. 1844	176	122	298
Dundee	1 April, 1820	16 June, 1845	586	505	1,091
Edinburgh ‖	..	31 Dec. 1844	83	79	162
Elgin	9 April, 1835	,, ,,	49	24	73
Glasgow	12 Dec. 1814	31 Dec. 1843	1,754	1,421	3,175
Montrose§	May, 1782	,, ,,	..	..	796
Perth	1 June, 1827	1 June, 1845	307	270	577
IRELAND.					
Armagh	14 July, 1825	31 Mar. 1845	800	609	1,409
Belfast	June, 1829	,, ,,	817	776	1,593
Carlow	7 May, 1832	31 Dec. 1844	302	307	609
Clonmel	1 Jan. 1835	31 Mar. 1845	256	223	479
Connaught	16 Nov. 1833	,, ,,	691	472	1,163
Cork	1 Mar. 1826	31 Dec. 1844	1,739	1,749	3,488
Limerick	31 Jan. 1827	28 Aug. 1845	906	840	1,746
Londonderry	June, 1829	31 Dec. 1843	676	638	1,314
Maryborough	14 May, 1833	31 Mar. 1845	296	301	597
Richmond	Dec. 1830	,, ,,	763	626	1,389
Swift's Hospital¶	..	31 Dec. 1844	104	67	171
Waterford	9 July, 1835	,, ,,	221	261	482

* Only for 24 years. † Only for 16 years. ‡ Only for 6 years. § Sexes not distinguished. ‖ Only for 1 year. ¶ Only for 6 years.

their comparative immunity from epilepsy and paralysis, which, when combined with insanity, render recovery very nearly if not quite hopeless. It is said also that women more frequently recover from the acute stage of mania, while men die of exhaustion.

The reverse of this apparent rule is found only in the results of some of the smaller asylums, where the deaths of either sex are few. In those returns where the sexes are not distinguished we have reckoned the proportion as equal.

The tables of per-centage of cures and deaths published by the Commissioners have unfortunately not been compiled upon any fixed plan. All computations, excepting upon the average number of patients in the asylum during the specified year, must be fallacious. The following Tables (III., IV.) have been made upon that principle; the blanks indicate the cases in which correct returns are wanting. Some asylums do not publish their average number of patients; others calculate the per-centage of cures and deaths upon the whole number admitted; but this is an entirely delusive method, as these numbers must be continually increasing, while the proportion of patients remaining decreases.

We have, as far as possible, made an average of all the public asylums for ten years past.

The mean number of cures thus appears to be 21·26 per cent., and of deaths 9·62 per cent.; but many asylums depart very widely from this standard. Bethlem, St. Luke's, and Liverpool receive only recent cases; and in the Liverpool institution their probation is very short. The large asylums at Hanwell, Surrey, and Lancaster are consequently compelled to receive almost entirely incurables, which accounts for their small number of cures. The large number cured in the Irish asylums may be in some measure accounted for by the peculiar character of their patients. The Irish patients in English asylums usually recover rapidly, the form of disorder being frequently pure excitement, which is soon allayed by quiet, by temperance, and the orderly regulations of an asylum.

Many attempts have been made to obtain a uniform system of keeping statistical tables; at present a different plan is adopted in almost every asylum. A great improvement would be effected if every report, in addition to its information for the current year, contained a condensed statement from the opening of the institution as to admissions, cures, and deaths; and there would be little difficulty in adding the ages, forms of disease, the causes of death, and other tables. Much important information as to the most favourable and unfavourable ages, and the results of immediate and delayed admission, would be easily gained, if a reference to the last report of any asylum were sufficient to show the experience of that institution from its opening in a condensed form. No asylum has yet published any such tables; but in the numerous new asylums which will be built in the course of a few years,

TABLE II.

Name of Asylum.	Discharged Cured.		Removed.		Died.		Remain.		Deaths, Cures being 1.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
England.										
Bedford	217	165	170	185	115	110	75	64	·529	·666
Bethlem	1052	1761	1022	1301	220	205	189	197	·209	·116
Bristol	117	133	51	71	61	72	36	40	·521	·541
Chatham	144	4	156	5	218	7	68	6	1·373	1·5
Cheshire	233	197	52	28	138	81	88	80	·592	·411
*Cornwall	240	225	..	..	113	32	74	79	·470	·142
Dorset	87	112	6	13	58	65	51	63	·666	·580
Exeter	389	345	157	344	88	35	17	22	·226	·101
Gloucester	467	457	167	128	121	85	140	134	·259	·186
*Haslar	328	..	..	..	356	..	123	..	1·085	..
Kent	114	72	35	45	159	71	131	137	1·394	·986
Lancaster	933	832	152	116	967	641	332	323	1·036	·770
Leicester	123	135	41	52	45	32	75	72	·365	·237
Lincoln	200	189	196	172	124	86	57	47	·620	.455
Liverpool	1024	548	1083	746	276	144	35	18	·269	·262
Middlesex	339	337	79	56	563	465	418	567	1·667	1·379
Norfolk	308	393	19	21	326	291	63	89	1·058	·740
Northampton	133	153	42	29	74	67	128	123	·556	·437
†Norwich	43	..	62	..	28	..	68	..	1·581	1·581
Nottingham	450	399	321	232	174	77	100	100	·386	·192
†Oxford	246	..	141	..	59	..	47	..	·239	·239
St. Luke's	2575	4624	3503	4879	959	764	93	143	·373	·165
†Stafford	1336	..	875	..	612	..	134	116	·458	·458
Suffolk	245	278	82	67	188	159	112	116	·763	·571
Surrey	57	57	17	9	116	55	181	222	2·071	·964
*†‡York	3179	..	..	..	701	..	80	72	·220	·220
,, Friends' Retreat	145	192	67	48	81	85	43	54	·558	·442
Yorkshire, West Riding	686	771	159	218	622	430	213	238	·906	·557
Wales.										
Pembroke	3	5	..	..	3	3	10	6	1·	·6
Scotland.										
Aberdeen	251	272	85	169	104	87	98	86	·414	·319
†Dumfries	..	..	..	..	..	..	121	..	..	..
Dundee	247	230	129	118	107	64	105	91	·433	·278
Edinburgh	38	52	21	12	11	9	172	175	·289	·173
Elgin	5	7	9	5	3	0	15	11	·6	·000
Glasgow	769	669	556	474	233	130	196	148	·302	·194
†Montrose	324	..	129	..	255	..	47	44	·787	·787
Perth	116	124	60	53	45	29	86	64	·387	·233
Ireland.										
Armagh	348	282	278	171	109	91	65	65	·313	·322
Belfast	424	428	99	69	152	173	142	106	·358	·404
*Carlow	160	190	..	..	49	39	93	78	·306	·205
Clonmel	154	115	30	18	46	25	62	60	·298	·217
Connaught	239	212	59	36	213	89	180	135	·891	·419
Cork	877	980	288	218	351	330	223	221	·400	·336
Limerick	499	468	69	65	175	129	163	178	·350	·275
Londonderry	313	336	105	85	151	143	107	74	·482	·425
Maryborough	121	156	22	22	68	38	85	85	·561	·243
§Richmond	357	324	169	176	193	117	137	150	·540	·361
Swift's Hospital	46	36	31	16	25	23	73	71	·543	·638
Waterford	98	105	49	69	26	23	48	64	·265	·219
								Mean	·624	·458

* Those discharged improved and uncured are included with the cures. † Sexes not distinguished.
‡ Great doubts exist as to the accuracy of the older books at the York Asylum.
§ There is some mistake here; the admissions are made to amount to 1389, and the cures, deaths, and remaining patients to 1623.

nothing could be more easy than to adopt them. The legislature may possibly enforce certain tables; and such a law would be exceedingly desirable, if we could hope that the practical experience of the superintendents of lunatic asylums would be allowed to be of any weight: but if the returns are to be made out according to the fancy of men ignorant of the subject upon which they legislate, the present system, by which every superintendent follows his own discretion, is far preferable.

The following points seem to deserve attention in any plan for uniform registration:—

I. Admissions for the current year:—
 1. Form of disease.
 2. Causes of disease.
 3. Duration of disease.
 4. Age.
 5. Age when first attacked.
 6. Social state.
 7. Station or occupation.

II. Similar returns for the whole number admitted from the opening of the asylum.

III. Cures for the current year:—
 1. Form of disease.
 2. Causes of disease.
 3. Duration of disease.
 4. Age.
 5. Age when first attacked.
 6. Duration of residence.
 7. Per-centage upon average number of patients.

IV. Similar returns for the whole number cured.

V. Deaths for the current year:—
 1. Form of mental disease.
 2. Causes of mental disease.
 3. Duration of mental disease.
 4. Age.
 5. Age when first attacked.
 6. Duration of residence.
 7. Per-centage upon average number of patients.
 8. Causes of deaths.

VI. Similar returns for the whole number who have died.

VII. Number discharged uncured, improved, by request of friends, removed by parishes, or escaped, during the current year, distinguishing the reasons for removal, and the duration of residence.

VIII. Similar returns for the whole number removed or escaped.

IX. Patients remaining in the asylum:—
 1. Form of disease.

TABLE III.

Per-centage of Cures upon the average Number of Patients in the Public Asylums for the Insane in the United Kingdom, for ten Years, ending 1845.

Name of Asylum.	1836.	1837.	1838.	1839.	1840.	1841.	1842.	1843.	1844.	1845.	Mean.
England.											
Bedford	..	..	..	25·66	12·28	9·40	12·60	19·53	..	..	15·88
Bethlem	..	..	..	..	..	..	..	44·14	36·76	..	40·45
Bristol	19·33	25·00	19·33	18·03	30·64	20·31	23·18	10·81	58·90	..	25·05
Chatham	13·00	1·40	2·80	2·80	2·78	2·78	·00	1·49	..	..	3·38
Cheshire	..	..	..	28·90	29·35	36·00	30·26	25·94	..	..	30·09
Cornwall	..	..	..	..	..	16·43	11·56	13·10	..	..	13·36
Dorsetshire	17·40	17·95	17·65	14·25	11·27	17·05	17·41	17·71	21·92	..	17·95
Gloucester	23·88	29·01	32·44	29·44	28·03	33·19	36·03	31·12	29·10	..	30·24
Haslar	..	..	..	..	..	..	10·67	13·00	15·20	..	12·95
Kent	11·18	8·90	9·88	5·84	10·40	6·49	4·32	10·41	7·19	..	8·29
Lancaster	17·98	23·60	21·34	18·81	18·89	13·40	15·64	16·69	20·55	11·16	17·80
Leicester	..	..	..	37·33	53·84	32·65	42·05	19·81	17·73	..	33·90
Lincoln	30·00	16·40	32·80	23·10	9·50	17·40	14·80	23·40	10·09	..	19·79
Liverpool	..	..	..	68·62	53·19	35·29	41·00	96·49	85·93	..	63·42
Middlesex	5·91	4·76	5·67	9·14	8·13	5·65	5·30	5·56	3·55	3·86	5·75
Norfolk	12·27	10·55	12·42	9·14	13·87	7·50	16·00	19·76	16·46	..	13·10
Northampton	..	..	..	37·33	40·19	31·85	22·39	29·31	23·57	..	30·77
Nottingham	23·53	24·61	23·13	18·85	20·54	21·05	24·05	26·58	..	18·32	22·29
Oxford	..	..	..	25·00	22·91	21·73	27·27	16·95	..	..	22·77
St. Luke's	..	..	..	..	..	..	..	..	44·54	..	44·54
Stafford	..	..	..	..	18·77	22·54	25·43	23·93	25·20	..	23·17
Suffolk	..	..	..	22·70	19·17	16·00	11·32	12·20	18·91	..	16·71
Surrey	..	..	..	..	..	2·62	9·46	11·39	7·06	..	7·63
York	10·75	12·19	9·41	8·04	8·02	10·00	6·17	7·05	..	5·92	8·61
„ Friends' Retreat	..	..	..	9·19	7·05	12·08	3·40	11·11	..	8·51	8·55
Yorkshire, West Riding	20·06	19·87	19·65	21·46	18·20	15·34	15·46	16·01	..	..	18·25
Wales.											
Pembroke	..	..	..	11·11	5·00	5·26	0·00	20·00	..	..	8·27
Scotland.											
Aberdeen	..	..	..	..	18·57	17·36	15·17	17·21	16·76	16·39	16·91
Dundee	..	..	..	18·66	24·20	15·34	10·61	13·88	10·69	9·47	14·70
Edinburgh	..	..	..	..	..	..	..	..	30·61	..	30·61
Glasgow	..	..	..	38·99	47·36	61·79	50·00	45·66	..	..	48·76
Perth	13·00	16·37	13·71	11·50	17·77	15·00	12·00	12·00	..	8·90	13·36
Ireland.											
Armagh	42·00	30·50	29·25	29·11	20·47	7·50	15·12	29·50	26·51	29·10	25·91
Belfast	..	26·50	27·50	29·89	23·67	26·12	29·10	36·14	26·87	26·25	28·00
Carlow	24·80	22·22	22·45	21·52	12·84	16·23	9·87	16·66	14·20	15·42	17·62
Clonmel	..	..	..	38·00	20·02	27·00	17·20	20·12	14·03	14·16	21·50
Connaught	24·16	20·26	22·70	21·29	19·67	17·42	16·10	15·19	10·35	10·35	17·74
Cork	27·65	31·90	32·00	34·80	44·17	34·80	35·22	33·80	25·33	27·31	32·69
Limerick	..	..	..	19·41	20·40	19·06	16·19	19·77	7·36	..	17·03
Londonderry	..	..	..	21·25	24·34	26·57	16·58	26·08	18·22	..	22·17
Maryborough	..	..	..	17·33	13·83	14·63	10·11	17·36	12·94	10·00	13·74
Richmond	..	..	..	..	15·51	9·31	15·17	13·10	13·05	12·37	13·08
Swift's Hospital	..	..	..	10·52	12·00	9·32	7·84	8·10	7·24	..	9·17
Waterford	30·23	23·91	50·56	32·00	25·75	32·11	29·56	29·66	24·36	17·94	29·60
										Mean ..	21·26

2. Duration of disease.
3. Duration of residence.
4. Age.
5. Number probably curable.
6. Number probably incurable.

The registers, to contain all this information, might be of very simple form, far less complicated than those at present in use in several asylums. The sexes should be distinguished in every statement.

Registers should likewise be kept of every instance of restraint, its nature and duration, and of the duration of every seclusion; also of employment and of the value of the work done. Many others might be suggested as useful in various ways, though not strictly necessary for statistical purposes.

Abolition of Personal Coercion.—No part of the treatment on insanity has of late years excited so much attention as the system adopted in several asylums of totally abolishing the use of all instruments of coercion, which has gained the name of the *non-restraint system.* We desire to preserve this name, as many asylums, which still continue to use all the antient instruments of restraint, endeavour, by professing to practise the 'humane system,' to lead the readers of their reports to suppose that there is no essential alteration made by the discontinuance of the use of those instruments.

In giving a slight sketch of the progress of this improvement in the mode of treating the insane, we shall consider it as a natural consequence of the progressive amelioration in the management of asylums.

Until the establishment of Bethlem in 1547, we have little or no records of the provision made for the insane; we can only gather that all who were harmless, and many who were dangerous, supported a miserable existence by wandering and begging; those who could not be permitted to be at large were probably chained in prisons, or in the hands of their friends. Some mention is made of an asylum for insane monks established at Jerusalem in the sixth century, where all the rigours of monastic discipline were embodied in the treatment.

Even in Bethlem little attention seems to have been paid to the comfort or cure of the patient; the only consideration was the safety of the sane part of the population. The patients were chiefly naked, and chained to the walls; and were exhibited for money, like wild beasts; and it is even said that the keepers were accustomed to allude to every subject most aggravating to the violent patient, that his rage might increase the amusement of the exhibition; while the propensities of the filthy were encouraged, and the voracious idiot was kept without food, that they might appear as more strikiug objects of wonder to the idle crowd. This shameful practice, by which it appears that an income of 400*l.* per annum was derived by the hospital, was abolished in 1770; but no improvement was made in any other respect in the treatment of the patients.

The benevolent and courageous Pinel was the first to attempt the restoration of the insane to a position among human beings. The scene of his exertions, which were the first great step of the non-restraint system, was the Bicêtre—hospital for insane men, near Paris. In this frightful prison the universal practice was to load patients with heavy chains,

TABLE IV.

Per centage of Deaths upon the average Number of Patients in the Public Asylums for the Insane in the United Kingdom, for ten Years, ending 1845.

Name of Asylum.	1836.	1837.	1838.	1839.	1840.	1841.	1842.	1843.	1844.	1845.	Mean.
ENGLAND.											
Bedford	..	..	..	10·61	7·89	7·69	12·60	13·28	..	..	10·41
Bethlem	..	..	..	..	..	..	..	6·81	7·79	..	7·30
Bristol	9·00	5·20	3·25	9·83	29·17	23·43	20·29	16·21	13·69	..	14·45
Chatham	3·53	15·00	14·00	19·71	7·00	12·50	4·60	4·50	..	..	10·10
Cheshire	..	..	..	18·75	10·48	12·66	11·18	6·96	..	..	12·00
Cornwall	..	..	..	..	..	8·72	9·52	5·51	..	..	7·91
Dorsetshire	11·96	15·84	6·86	9·50	6·57	18·94	12·82	13·05	8·77	..	11·59
Gloucester	5·97	4·76	6·91	6·09	9·34	9·78	14·98	12·03	10·44	..	8·92
Haslar	..	..	..	..	..	..	11·65	14·00	10·40	..	12·01
Kent	9·31	13·29	7·55	10·62	9·32	7·16	8·17	16·66	9·09	..	10·13
Lancaster	18·71	26·76	16·70	12·80	16·25	12·68	12·75	11·50	10·11	11·16	14·94
Leicester	..	..	..	13·33	12·08	13·26	12·84	6·30	2·83	..	10·10
Lincoln	5·20	16·40	10·50	9·34	15·38	15·46	16·83	18·01	12·85	..	13·33
Liverpool	..	..	..	19·60	14·89	14·70	15·38	18·18	17·18	..	16·65
Middlesex	10·84	7·88	11·99	11·53	8·26	9·39	9·65	7·01	6·40	6·81	8·97
Norfolk	18·40	19·25	21·11	20·12	12·71	24·70	12·57	26·35	18·90	..	19·34
Northampton	..	..	..	17·33	8·82	18·51	10·40	15·51	10·56	..	13·52
Nottingham	7·56	9·23	5·22	5·80	6·16	9·86	13·92	9·49	..	7·32	8·28
Oxford	..	..	..	4·54	4·16	13.04	9·09	6·79	..	..	7·52
St. Luke's	..	..	..	..	..	..	..	..	7·86	..	7·86
Stafford	..	..	..	..	13·87	13·51	15·51	10·68	13·67	..	13·44
Suffolk	..	..	..	8·64	10·36	11·00	9·90	13·61	9·45	..	10·49
Surrey	..	..	..	..	..	3·93	11·13	10·82	14·39	..	10·06
York	4·43	9·14	5·88	5·17	8·64	4·37	9·25	6·41	..	6·57	6·65
„ Friends' Retreat	..	..	..	10·34	1·17	4·39	7·95	4·44	..	3·19	5·24
Yorkshire, West Riding	18·12	19·28	10·69	16·30	10·81	15·07	13·21	12·86	..	..	14·54
WALES.											
Pembroke	..	..	..	11·11	10·00	5·26	4·76	0·00	..	..	6·22
SCOTLAND.											
Aberdeen	..	..	..	..	7·14	13·19	6·89	7·28	7·18	3·82	7·58
Dundee	6·20	7·48	5·83	7·33	4·45	4·87	5·58	5·00	6·41	7·37	6·05
Edinburgh	..	..	..	..	..	..	..	..	6·80	..	6·80
Glasgow	..	..	..	9·43	7·01	10·11	12·24	11·32	..	..	10·02
Perth	3·00	5·83	4·33	2·29	2·96	4·25	3·54	6·29	..	3·42	3·99
IRELAND.											
Armagh	8·00	11·00	10·00	9·91	4·80	6·66	5·88	9·01	9·09	10·44	8·47
Belfast	..	18·50	12·50	7·73	11·83	9·79	10·93	7·23	8·30	15·40	11·35
Carlow	3·30	3·16	8·69	3·54	6·42	5·19	7·40	5·35	4·14	4·00	5·11
Clonmel	..	..	..	6·12	10·68	8·57	4·80	6·25	7·89	3·33	6.80
Connaught	15·43	15·68	15·41	15·27	15·98	12·87	10·11	10·95	10·67	10·67	13·30
Cork	12·50	12·33	11·60	11·90	13·83	11·02	11·58	12·35	10·98	11·73	11·98
Limerick	..	..	..	6·17	8·45	4·26	6·56	5·08	5·94	..	6·07
Londonderry	..	..	..	14·49	12·07	12·07	7·72	9·00	10·28	..	10·93
Maryborough	..	..	..	4·00	13·20	4·26	7·78	4·79	4·11	4·11	5·93
Richmond	..	..	..	..	5·51	6·55	5·51	8·27	6·19	6·52	6·42
Swift's Hospital	..	..	..	3·28	8·00	4·02	4·57	6·08	6·52	..	5·41
Waterford	3·48	3·25	3·37	7·00	1·99	4·58	5·21	7·62	8·40	8·54	5·34
										Mean . .	9·62

which remained on for the remainder of their lives, and to immure them in dark, unwarmed, and unventilated cells. Pinel determined on at once releasing a large number of patients. The following account of the experiment is extracted from the 'British and Foreign Medical Review:'—

'Towards the end of 1792, Pinel, after having many times urged the government to allow him to unchain the maniacs of the Bicêtre, but in vain, went himself to the authorities, and with much earnestness and warmth advocated the removal of this monstrous abuse. Couthon, a member of the commune, gave way to M. Pinel's arguments, and agreed to meet him at the Bicêtre. Couthon then interrogated those who were chained, but the abuse he received, and the confused sounds of cries, vociferations, and clanking of chains in the filthy and damp cells, made him recoil from Pinel's proposition. "You may do what you will with them," said he, "but I fear you will become their victim." Pinel instantly commenced his undertaking. There were about fifty whom he considered might without danger to the others be unchained, and he began by releasing twelve, with the sole precaution of having previously prepared the same number of strong waistcoats with long sleeves, which could be tied behind the back if necessary. The first man on whom the experiment was to be tried was an English captain, whose history no one knew, as he had been in chains forty years. He was thought to be one of the most furious among them; his keepers approached him with caution, as he had in a fit of fury killed one of them on the spot with a blow from his manacles. He was chained more rigorously than any of the others. Pinel entered his cell unattended, and calmly said to him, "Captain, I will order your chains to be taken off, and give you liberty to walk in the court, if you will promise me to behave well and injure no one." "Yes, I promise you," said the maniac; "but you are laughing at me; you are all too much afraid of me." "I have six men," answered Pinel, "ready to enforce my commands, if necessary. Believe me then on my word, I will give you your liberty if you will put on this waistcoat." He submitted to this willingly, without a word: his chains were removed, and the keepers retired, leaving the door of the cell open. He raised himself many times from the seat, but fell again on it, for he had been in a sitting posture so long that he had lost the use of his legs; in a quarter of an hour he succeeded in maintaining his balance, and with tottering steps came to the door of his dark cell. His first look was at the sky, and he cried out enthusiastically, "How beautiful!" During the rest of the day he was constantly in motion, walking up and down the staircases, and uttering exclamations of delight. In the evening he returned of his own accord into his cell, where a better bed than he had been accustomed to had been prepared for him, and he slept tranquilly. During the two succeeding years which he spent in the Bicêtre, he had no return of his previous paroxysms, but even rendered himself useful by exercising a kind of authority over the insane patients, whom he ruled in his own fashion.

'The next unfortunate being whom Pinel visited was a soldier of the French Guards, whose only fault was drunkenness: when once he lost self-command by drink he became quarrelsome and violent, and the more dangerous from his great bodily strength. From his frequent excesses, he had been discharged from the corps, and be had speedily dissipated his scanty means. Disgrace and misery so depressed him that he became insane: in his paroxysms he believed himself a general, and fought those who would not acknowledge his rank. After a furious struggle of this sort, he was brought to the Bicêtre in a state of the greatest excitement. He had now been chained for ten years, and with greater care than the others, from his having frequently broken his chains with his hands only. Once when he broke loose, he defied all his keepers to enter his cell until they had each passed under his legs: and he compelled eight men to obey this strange command. Pinel, in his previous visits to him, regarded him as a man of original good-nature, but under excitement incessantly kept up by cruel treatment; and he had promised speedily to ameliorate his condition, which promise alone had made him more calm. Now he announced to him that he should be chained no longer, and to prove that he had confidence in him, and believed him to be a man capable of better things, he called upon him to assist in releasing those others who had not reason like himself; and promised, if he conducted himself well, to take him into his own service. The change was sudden and complete. No sooner was he liberated than he became obliging and attentive, following with his eye every motion of Pinel, and executing his orders with as much address as promptness: he spoke kindly and reasonably to the other patients, and during the rest of his life was entirely devoted to his deliverer. "And I can never hear without emotion (says Pinel's son) the name of this man, who some years after this occurrence shared with me the games of my childhood, and to whom I shall feel always attached."

'In the next cell were three Prussian soldiers, who had been in chains for many years, but on what account no one knew. They were in general calm and inoffensive, becoming animated only when conversing together in their own language, which was unintelligible to others. They were allowed the only consolation of which they appeared sensible, —to live together. The preparations taken to release them alarmed them, as they imagined the keepers were come to inflict new severities; and they opposed them violently when removing their irons. When released they were not willing to leave their prison, and remained in their habitual posture. Either grief or loss of intellect had rendered them indifferent to liberty.

'Near to them was seen an old priest, who was possessed with the idea that he was Christ: his appearance indicated the vanity of his belief; he was grave and solemn; his smile soft, and at the same time severe, repelling all familiarity; his hair was long, and hung on each side of his face, which was pale, intelligent, and resigned. On his being once taunted with a question that "if he was Christ he could break his chains," he solemnly replied, "Frustra tentaris Dominum tuum." His whole life was a romance of religious excitement. He undertook on foot pilgrimages to Cologne and Rome; and made a voyage to America for the purpose of converting the Indians: his dominant idea became changed into actual mania, and on his return to France he announced himself as the Saviour. He was taken by the police before the Archbishop of Paris, by whose orders he was confined in the Bicêtre as either impious or insane. His hands and feet were loaded with heavy chains, and during twelve years he bore with exemplary patience this martyrdom and constant sarcasms. Pinel did not attempt to reason with him, but ordered him to be unchained in silence, directing at the same time that every one should imitate the old man's reserve, and never speak to him. This order was rigorously observed, and produced on the patient a more decided effect than either chains or a dungeon; he became humiliated by this unusual isolation, and after hesitating for a long time, gradually introduced himself to the society of the other patients. From this time his notions became more just and sensible, and in less than a year he acknowledged the absurdity of his previous prepossession, and was dismissed from the Bicêtre.

'In the course of a few days, Pinel released fifty-three maniacs from their chains: among them were men of all conpitions and countries: workmen, merchants, soldiers, lawyers, &c. The result was beyond his hopes. Tranquillity and harmony succeeded to tumult and disorder, and the whole discipline was marked with a regularity and kindness which had the most favourable effect on the insane themselves; rendering even the most furious more tractable.'

If experience did not always prove that improvements of any kind are slow, and invariably met by opposition, we should be at a loss to account for the fact that in England, twenty-three years after the liberation of the lunatics at Bicêtre, a state of things equally bad, if not worse, generally existed. From the evidence given before the parliamentary committees in 1815, we gather facts, supported by the evidence of the attendants themselves, almost too horrible to be credible. Every artifice of cruelty seems to have been employed upon those who were already the most unhappy of mankind. The idea seemed to prevail that all the feelings of humanity were extinguished by tho visitation of insanity. The keepers were, in all the English madhouses, of the lowest and most brutal character, merely distinguished by their success in controlling the violence of their patients by still greater violence, and by possessing the power of punishment. The account of the inquiry into the management of the York Asylum in 1813, written by the late respected Mr. Gray, gives probably a true picture of the state of the condition of the insane in general. This asylum was opened in 1777, and bore a fair character for organization and management. Upon the establishment of the Retreat, at York, in 1796, a more humane system than had hitherto been known in England was introduced into its management; and in the description of it by the founder, Mr. Tuke, published in 1813, a recommendation of the milder mode of treatment was given. This was considered, and with some reason, to be an attack upon the management of the York Asylum; and it was followed up by a series of charges brought by Mr. Godfrey Higgins against this latter institution. The horrors ultimately made known would be beyond belief, were they not amply attested, and were it not certain that in some private asylums things are little mended even now. Though the committee of the York Asylum long refused to listen to the charges brought by Mr. Higgins, they could not entirely conceal the facts; and the extent to which frauds of all kinds were carried by the steward assisted much in developing the general state of the house. A committee of inquiry was appointed; and on the day after their deliberations ceased (28th December, 1813), one wing of the asylum was destroyed by fire. There could be no doubt of this being intentionally done; and that it was done to destroy the part of the house most obnoxious to inquiry. How many patients perished is unknown; but at least four were missing. *The steward barred the gates to prevent the entrance of those who were willing to assist;* and nearly all the officers and attendants were away. The steward entered four patients who were missing as 'died;' but it is far more probable that a larger number were sacrificed. The real number in the house was probably unknown; for either by negligence or design the books had been so irregularly kept that the number of deaths to July, 1813, actually 365, was entered as 221, and 101 of those dead had been calculated among the cures. The committee refused to adopt the only method of ascertaining the number missing by requiring from each keeper an account of the patients under his care, from a pretended delicate objection to the divulging of the names of the inmates.

Mr. Higgins thus sums up the state of the management of the house:—'In the asylum investigations, concealment appears at every step of our progress; 365 have died; the number advertised is 221. A patient disappears, and is never more heard of, and is said to be "removed." A patient is *killed*—his body is hurried away to prevent an inquest. He is *cured*, but it is by some medicine the composition of which is known only to the doctor. The public cry out that a patient has been neglected; there is a levy *en masse* of respectable governors to quell the disturbance, and to certify that the patient has been treated with *all possible care, attention, and humanity*. A committee of investigation desires to be shown the house: certain cells "in an extreme state of filth and neglect" are omitted to be pointed out to them. The governors examine the accounts: there are considerable sums of which neither the receipt nor the application appears. They inspect the physician's report: it only aids the concealment. The steward's books are inquired for: in a moment of irritation he selects for the flames such of them as he thought it not advisable to produce. And yet every circumstance of concealment is imputed by some to mere accident; and every attempt to tear off the mask, and exhibit the asylum in its true character, is stigmatised as a libel or an indelicate disclosure!'

The details which were brought before the committee to exhibit the brutality and profligacy of the keepers need not be repeated; but it is gratifying to find that Mr. Higgins persevered, notwithstanding all the obloquy heaped upon him, until a complete change of the officers and of the system was brought about.

The next asylum of which we shall have occasion to notice the mismanagement is Bethlem, concerning which we find many particulars in the evidence given before the parliamentary committee in 1815.

The severest restraint and the most cruel neglect seem to have been the almost uniform practice; and it must not be forgotten that this royal hospital, favoured with exemption from all visitation and from the effects of acts of parliament, has been, until a very recent period, the most determined in resisting the abolition of restraint, in preserving antient abuses, and in closing its doors against inspection. With such large funds at command, Bethlem ought to be a model where the student of medicine may see every late improvement in the treatment of mental disorder carried into effect, without regard to the economy which has been detrimental to the improvement of many other asylums.

In 1815 Bethlem appeared to have been going back, rather than improving, for half a century. From the time that the indiscriminate visits of the public had been prohibited, the secrets of the institution were known only to a few. The case of Norris, a patient in Bethlem, which was made public by the parliamentary committee, has often been related; but it will not be out of place here. William Norris had been an officer in the navy, and was first confined at Bethlem in 1801. In 1803 he is said to have struck Mr. Haslam, the apothecary; and whether from any real fear of him or as a punishment, a new and most ingenious instrument of torture was invented for his confinement. 'A stout iron ring was riveted round his neck, from which a short chain passed to a ring made to slide upwards or downwards on an upright massive iron bar, more than six feet high, inserted into the wall. Round his body a strong iron bar, about two inches wide, was riveted; on each side the bar was a circular projection, which being fashioned to and inclosing each of his arms, pinioned them close to his sides. The waist bar was secured by two similar bars, which, passing over his shoulders, were riveted to the waist bar both before and behind. The iron ring round his neck was connected to his shoulders by a double link. From each of these bars another chain passed to the ring on the upright iron bar. His right leg was chained to the trough, in which he had remained thus encaged and enchained twelve years. He read books of all kinds, and reasoned quite coherently on the events of the war.' During the whole of this period it was impossible for him, from the nature of the restraint in which he was placed, either to stand quite upright or to lie down at ease. It will be no matter of surprise that he died on the 26th of February, 1815.

From this time a gradual but very slow improvement in the condition of the insane may be observed. Chains were removed, and leathern restraints of much milder kinds substituted; and more care was given to the warming and clothing of the patients. Some of the largest asylums in England were opened between 1815 and 1825. The introduction of employment by Sir William Ellis at Wakefield, and afterwards at Hanwell, was a great advance in the amount of confidence reposed in patients; employment has since been introduced in almost every asylum, and no serious accident, so far as we are aware, has ever occurred from allowing the use of tools. The credit of declaring the total abolition of mechanical instruments of restraint to be desirable and practicable, belongs to Dr. Charlesworth and Mr. Hill, of the Lincoln lunatic asylum. The progress of the alteration was given by Mr. Hill in a lecture delivered by him at the Lincoln Mechanics' Institution, 21st June, 1838, and since published with the addition of extracts from the 'Proceedings' of the asylum, and tables showing the gradual disuse of restraint. A reference to a few of these will illustrate this part of the history of the non-restraint system. The Lincoln asylum was opened on the 26th April, 1820, and was conducted from the first on humane principles, but with all the usual instruments of restraint.

On the 29th February, 1829, it is reported that a patient has died in the night in consequence of being strapped to the bed in a strait-waistcoat; and an order is consequently given that the use of the strait-waistcoat shall be discontinued, except under the special written order of the physician; and also that every case of restraint shall be entered in a journal, with its nature and duration.

On the 4th May, in the same year, the 'heaviest pair of iron hobbles,' which were jointed, and weighed 3 lbs. 8 oz., and the 'heaviest pair of iron handcuffs,' which weighed 1 lb. 6 oz., are ordered to be destroyed; five strait-waistcoats are likewise condemned.

Numerous entries in 1829, 1830, 1831, and 1832 prove the diminished use of coercion. On the 16th July, 1832, is the first order for strong dresses for such patients as tear their clothes. These patients were in all asylums the most subject to continual restraint.

21st July, 1834. All the instruments which would confine the fingers were ordered to be destroyed: but manacles for the wrists and leg-locks were retained. March, 1837, the system of restraint was entirely abolished.

Year.	Total Number of Patients in the House.	Total Number of Patients Restrained.	Total Number of Instances of Restraint.	Total Number of Hours passed under Restraint.
1829*	72	39	1727	20,424
1830	92	54	2364	27,113
1831	70	40	1004	10,830
1832	81	55	1401	15 671
1833	87	44	1109	12,003
1834	109	45	647	6 597
1835	108	28	323	2,874
1836	115	12	39	334
1837	130	2	3	28

Mr. Hill's lecture, which contains much that is exceedingly interesting upon this subject, has the following sentence, which has been the text on which all the controversy on the abolition of restraint has been founded:—'In a properly constructed building, with a sufficient number of suitable attendants, restraint is never necessary, never justifiable, and always injurious, in all cases of lunacy whatever.' This sentence, when published in 1838, was declared even by those most inclined to the new system to be too decided, and likely to produce a bad effect; but fortunately the lapse of eight years has proved its perfect truth, by its adoption as a principle in all the most important asylums in the kingdom. But the upholders of the old system received the announcement of a doctrine so startling as if there were something atrocious in proposing to liberate those who were unfortunate enough to be insane; and for years after restraint had been actually abolished, the non-restraint system was declared 'utopian' and impracticable; then declared to be practicable, but not desirable; and at length, when every other argument has failed, those who have so strenuously opposed it come forward and claim it as their own system, which they have been practising for years, excepting that it is carried a little further.

Too much stress was laid by Mr. Hill on the necessity for tall and powerful attendants; and the management of Lincoln laid the early supporters of the non-restraint system open to the charge of using the coercion of fear and of the hands for that of straps and chains. A form of coercion called 'manual detention,' wherein the attendants held violent patients quiet, was actually at one time used at Lincoln; but it appears to be unknown in the other asylums where restraint is abolished.

The experience of the Lincoln Asylum has proved every advantage arising from the non-restraint system, notwithstanding divisions among the managers, and direct opposition from some of the medical officers, by whom every kind of unfair evidence was brought forward against the system, and the cruelties practised by unfit attendants were considered as part of it.

The next asylum in which restraint was abolished was that of the county of Middlesex at Hanwell. At the time of the appointment of Dr. Conolly to the superintendence of the Hanwell Asylum (June, 1839) it contained eight hundred patients; of these about forty were almost constantly in restraint-chairs, and a number of others wore strait-waistcoats, muffs, leg-locks, &c. In addition to these restraints, which were supposed necessary for the safety of the rest and of the officers and attendants, more than a hundred epileptic patients were fastened by one wrist in bed every night. This was considered a necessary precaution to prevent the patients from falling out of bed or from turning on their faces in a fit, and so becoming smothered, which, it is asserted, has sometimes happened. No such case has however occurred since the disuse of the hand-strap, which took place in July, 1839.

We extract from Dr. Conolly's first report (October, 1839) the following account of the discontinuance of restraint at Hanwell:—

'The article of treatment in which the resident physician

* From March 26th

has thought it expedient to depart the most widely from the previous practice of the asylum has been that which relates to the personal *coercion* or forcible *restraint* of the refractory patients. Without any intention of derogating from the high character acquired by the asylum, it appeared to him that the advantage resulting from the degree of restraint permitted and customary in it at the period of his appointment was in no respect proportionable to the frequency of its application; that the objections to the restraint actually employed were very serious; and that it was in fact creative of many outrages and disorders, to repress which its application was commonly deemed indispensable, and consequently directly opposed to the chief design of all treatment, the cure of the disease.'

* * * *

'By a list of restraints appended to this report, it will be seen that the daily number in restraint was in July so reduced that there were sometimes only four, and never more than fourteen, in restraint at one time; but that since the middle of August there has not been one patient in restraint on the female side of the house, and since the 21st of September not one on either side.' The 51st report of the visiting justices, which accompanies this report, speaks of the new system as requiring an additional number of attendants, and of a superior class to those previously employed.

In their 52nd report (January, 1840) the visiting justices report the satisfactory results of the new system. In the 53rd (April, 1840) they report that 'there has not been a single occurrence to weaken their confidence in the practicable nature of the system;' and also 'that no increased destruction of clothing or other property is occasioned by the personal freedom which the patients enjoy. Indeed, so far as clothing is concerned, the amount of destruction is somewhat lessened, because of the general tranquillity of the patients from the adoption of the new system.'

In the 54th (July, 1840) and 55th (October, 1840) the justices state their increased confidence in the non-restraint system. This last report is accompanied by the second report of Dr. Conolly. During the past year a suicide (by hanging) had taken place, being the only one at Hanwell since the non-restraint system has been introduced. That restraint would not have been very available is proved by the occurrence of the suicide of a female patient in Bethlem, who hung herself in 1840 by the strings of the strait-waistcoat in which she had been confined; and a man has since destroyed himself, also at Bethlem, by working the strait-waistcoat in which he was strapped down in bed so as to produce apoplexy by the pressure of a knot on the neck. The last report of the Lincoln Asylum states that not only have suicides ceased since the system of non-restraint was introduced, but that the tendency to suicide has disappeared. The latest report of Bethlem also contains an admission that restraints increase the tendency to suicide.

The second division of Dr. Conolly's report treats entirely of the management of the patients without restraint, and the substitutes for it. The marked improvement in the condition of the epileptic patients is noticed. Seclusion, the most important of the substitutes for restraint, is minutely described. This very useful remedial agent is styled by the supporters of the old system 'solitary confinement,' which term is also improperly applied by the commissioners in their report. That solitary confinement for days and weeks together *was* the practice in the days of restraint is certain; for then it was a common practice to strap a patient in bed or in a restraint-chair placed in his bed-room. Any abuse of seclusion so great as this can scarcely now take place. Dr. Conolly says, 'All the substitutes for restraint are, like restraint itself, liable to be abused; but none can be made such instruments of cruelty by abuse. All are also liable to great misrepresentation; and none more so than that which is of all the most useful, the most simple, and the most approved of by the highest medical authorities, namely, Seclusion. By seclusion is meant, temporary protection of the maniac from the ordinary stimuli acting upon the senses in the refractory wards of a lunatic asylum.'

In the sixth report (October, 1844) likewise, Dr. Conolly writes: 'It is to be ascribed to want of opportunities of observation that such a simple exclusion of irritations from an irritable mind, an exclusion not found to be necessary in more than four or five instances in any one day in the year among one thousand patients, and seldom prolonged beyond four or five hours in any of those instances, during which time the patient's state is frequently ascertained by means of the inspection-plate in the door of his room, and all his reasonable wants and wishes are attended to, – should ever have been confounded with the idea of Solitary Confinement; the latter in reality comprehending a privation of almost all the stimuli upon which the integrity of intellectual and physical life depends.'

The room should not be dark; the shutter which guards the window should therefore be perforated. Care should always be taken that the perforations of the shutters should not be available, as iron bars always are, as ready means of suicide. In the treatment of the insane nothing is trifling; for upon careful attention to the most minute matters must depend the perfection of the management of any asylum.

The report for 1841 contains many cases which illustrate the benefit of non-restraint. Dr. Conolly also states the result of two years' experience, under sixteen heads, which express that difficulties must be expected in abolishing restraint, from the indolence of attendants accustomed to rely on it, and from the violences at first committed by patients long deprived of freedom of action; but that if steadily persevered in it will be found to produce greater tranquillity, fewer outrages and accidents, more general cheerfulness, and less obstinacy and malice; that good effects will be especially observable in patients newly admitted and treated entirely without restraint; but that complete uniformity of feeling among all the officers, and a sufficient number of humane and vigilant attendants, are indispensable to carry the system to full perfection.

In this year (1841) a man aged 82 died in consequence of a kick given by another patient. The injury was not severe, but the weakness and great age of the patient produced a fatal result. The patient who inflicted the injury was subject to epileptic paroxysms: but was so quiet in the intervals as to be a helper in the wards, and he was actually so engaged at the time of the unfortunate occurrence; this very patient has become tranquil and manageable; and the ward in which the fatal occurrence took place has become, since the abolition of restraints, one of the quietest in the Hanwell Asylum; a ward of which the doors are always open, the windows full of flowers, and the airing-court a beautiful garden.

Dr. Conolly's fourth and fifth Reports (1842 and 1843) contain his confirmed opinion that, 'by the abolition of restraint, the general management of the insane has been freed from many difficulties, and their recovery in various degrees greatly promoted.' The sixth Report (1844) is in a great measure devoted to pointing out the erroneous notions which have been conceived as to the substitutes for restraint, and thus concludes:—

'After five years' experience, I have no hesitation in recording my opinion, that with a well-constituted governing body, animated by philanthropy, directed by intelligence, and acting by means of proper officers, intrusted with a due degree of authority over attendants properly selected and capable of exercising an efficient superintendence over the patients, there is no asylum in the world in which all Mechanical Restraints may not be abolished, not only with safety, but with incalculable advantage.'

Here we may consider the subject of non-restraint concluded so far as its practicability is concerned. If no case requiring restraint has occurred in an asylum containing nearly a thousand patients during six years, in which time eighteen hundred cases have been treated, it is unlikely that any more difficult cases can occur elsewhere. It is nowhere insisted that restraint can never be necessary in ill-constructed asylums, and until houses for private patients are constructed for the purpose for which they are used, some restraint will probably be used in many of them. The system introduced at Lincoln, and followed at Hanwell, was very shortly afterwards adopted at Northampton, Lancaster, Gloucester, Stafford, and Glasgow. The new asylum at Glasgow bears on its foundation-stone, laid on the 1st June, 1842, an inscription stating that one of the principles to be adopted in it is that 'of employing no mechanical personal restraint in the treatment of the patients, which had already been abandoned for a considerable time.' The non-restraint system was also introduced at Haslar Hospital, Portsmouth, in 1842, and we gather from the Irish Reports that it has been adopted at Armagh, Londonderry, and Maryborough, and that very little restraint is used at Clonmel and Waterford; and there appears every reason to hope that it will be one of the standing rules in the Irish District asylums that no coercion shall be employed. Dr. Jacob of Maryborough expresses his full confidence in the system after an experience of eighteen months. In by far the greater number of asylums which have not yet given in their adherence to non-restraint as a principle, the use of restraint forms an exception to the rule. At Dundee, no restraint has been used for two years; this asylum was one which declared most strongly against the principle of the new system, when first introduced. The reports of Nottingham, Dorset, Montrose, Edinburgb, and Dumfries speak of the advantages of restraint, although the writers abstain from availing themselves of it. On the contrary, the authorities of Bethlem, St. Luke's, Kent, Oxford, and the Retreat at York, profess the non-restraint system, while they practise tbe reverse.

The possibility and advantage of the abolition of restraint would seem sufficiently proved by the results reported in all these asylums; but a large number of persons still remain opposed to the new system, from various motives. First we must mention tbe unfair manner in wbich the subject has been noticed by the Commissioners in Lunacy; a body which had been so long paid to attend to the condition of the insane, and yet who had been proved to allow every evil to remain in the houses under their care, when all others were improving, should have been the last to despise the efforts of others. Their examples of the disadvantages of non-restraint are chiefly adduced from Hanwell, and are most ably answered in a pamphlet by Mr. Serjeant Adams. Many of the cases brought forward by them as proving the necessity for restraints, are in fact strong arguments on the other side of the question. The care with wbich the Commissioners have been selected, until lately, exclusively from persons ignorant of insanity, must be their excuse. The absurdities which they have allowed themselves to believe and to record, would almost induce us to think tbat they have been wilfully mystified by some of the medical officera of asylums.

In the Bedford, Chester, Cornwall, Exeter, Leicester, Liverpool, St. Luke's, York, and Pembroke asylums, coercion still appears to remain in force. The private asylums employ it almost without exception; tbese, being most immediately under the auperintendence of the Commissioners, are in every respect the last to improve.

Tbe pbysicians of the Surrey, Wakefield, and Belfast asylums bave been the most consistent opponents, both in principle and practice of the non-restraint system; one assertion in the last Report of the Belfast Asylum (31st March, 1845) deserves to be quoted.

After saying that 'the same system with reference to restraint continues to be pursued in this institution,' it goes on to observe, 'until insanity be blotted out from the "ills which flesh is heir to," or altogether cbanged in its more *striking* effects, physical restraint in some form or other—but still restraint--cannot be dispensed with. Truly the so-called "total abolition" of restraint appears to be only one of the many vulgar delusions and speciously popular *ad captandums* of the present day.' It may be that there is more difficulty in the management of Irish patients without restraint than Englisb ones; althougb many of the other asylums in Ireland are leaving off the use of it; but tbis passage, so utterly inconsistent with well-known facts, proves the writer to be ignorant of the proceedings of other asylums for nearly seven years past. Taking tbis into consideration, we may look with some doubt upon the very curious cases subjoined, wbere patients request the strait-waistcoat and the muffs as favours, and promise to bebave well if they are allowed the indulgence; more especially as such cases do not appear ever to be met with in asylums where restraint is entirely abolisbed. The absurdity of such an idea as that of a patient wishing to be put in restraint, is so monstrous as scarcely to deserve notice. As readily would we believe that negro slaves are in the habit of requesting the luxury of a flogging, or that thieves entreat their gaolers to allow them the agreeable exercise of the tread-mill.

With the results before us of the treatment of many tbousand patients without restraint, and taking into consideration the facts that in no asylum wbere the new system has been introduced it has been found necessary to abandon it, that the reports of all tbese asylums declare their general condition to be improved, that the cures are not decreased, and, whicb we consider of equal importance, that tbe comfort of the incurables is greatly increased, we consider ourselves justified in considering that the strait-waistcoat, the coercion-chair, and every kind of strap and instrument of restraint, will shortly disappear like the 'dark house and a whip,' the chains and straw, the starvation, the wbirling-chair, and every otber means of torture formerly considered a necessary part of the treatment of those who were afflicted with insanity.

('Report of the Metropolitan Commissioners in Lunacy to the Lord Chancellor,' 1844; 'Statistical Tables prepared by tbe Metropolitan Commissioners in Lunacy,' 1844: 'An Act for the Regulation of the Care and Treatment of Lunatics' (8 & 9 Vict. c. 100); 'An Act to amend the laws for the Provision and Regulation of Lunatic Asyluma for Counties and Boroughs, and for the maintenance and care of Pauper Lunatics, in England' (8 & 9 Vict. c. 126); 'Report of the Inspectors-General of District, Local, and Private Lunatic Asylums in Ireland,' 1845; 'Returns from each District Lunatic Asylum in Ireland,' 1845; 'Reports' of all the principal Asylums in England, Scotland, and Ireland, and information privately supplied by many of the superintendents; Farr 'On the Statistics of English Lunatic Asylums;' 'Benevolent Asylum for the Insane of the Middle Classes, Prospectus;' 'History of the York Asylum;' Tuke's 'Description of the Retreat near York;' Hill 'On the Management of Lunatic Asylums;' Browne's 'Lectures delivered before the Managers of the Montrose Lunatic Asylum;' 'Remarks by Mr. Serjeant Adams on the Report of the Metropolitan Commissioners in Lunacy;' Personal knowledge of the Middlesex Lunatic Asylum, Hanwell.)

The custody of the insane in Scotland is, like every other matter wbicb demands both magisterial and executive intervention, connected with tbe system of local courts. The law on the subject is contained in tbree statutes: 55 Geo. III. c. 69; 9 Geo. IV. c. 34; and 4 & 5 Vict. c. 60. By these acts no person can be confined as a lunatic, either in a public or private asylum, witbout a warrant from the sheriff. Any person accessory to a breach of this regulation is liable to a penalty of 200*l.*; and if he be the keeper of the asylum he is liable, instead of the pecuniary penalty, to imprisonment not exceeding three months' duration. The sheriff is not empowered to grant a warrant unless on the report of a qualified physician or surgeon; and the person granting such a certificate is liable to a penalty of 50*l.* if he have omitted carefully to examine the patient. The keeper of every house where two or more insane patients are kept requires a licence for an asylum. Any person acting as keeper to an insane individual, not his immediate relative, must make an annual report to the sheriff, certified by two medical men, of the state of the patient, and must notify the death or removal of the patient. In every licensed asylum a 'mad-house register' must be kept. By the act of 4 & 5 Vict. this record is appointed to be annually transmitted to the sheriff, sealed up, and the seals being broken by him, he reseals the book, and retransmits it. When a patient dies in a licensed asylum, a report must be made to the sheriff within twenty-four hours, accompanied by a certificate from the medical attendant, stating the nature of the disease, the length of time during which it has continued, the time wben his attendance was first required, and the number of visits he has paid. Asylums must be at all times open to the inspection of the sheriff. In the general case, either the sheriff or his substitute may perform the duties of the office regarding lunatics; but it is specially provided that the sheriff principal must make an annual visit to every asylum within his jurisdiction, and either he or his substitute must make a second; in these visits they are accompanied by medical inspectors. Tbe medical bodies in Edinburgh and Glasgow elect inspectors for their respective districts; in other parts of Scotland tbey are chosen by the sheriffs from the qualified medical practitioners.

It is believed that the system of the management of the insane in Scotland has, both in a purely medical and in an administrative point of view, been lately vastly improved. Until a comparatively late period the statute law was nearly inoperative, from a strong natural prejudice against the enforcement of general rules relating to the treatment of the insane, and the consequent toleration for breaches of the statutory regulations. Tbe general rule adopted in practice was, that insane persons were allowed to go at large until they had proved themselves dangerous to the lives of their neighbours, and that when confinement was in any case resorted to, the proceedings were not very rigidly investigated. It is believed that the law is now generally obeyed, and that the utility of treating insane patieuts according to the best scientific advice, is felt by all who are connected with them or concerned in the administration of the law. The Commissioners who in 1844 reported on the state of the poor in Scotland, did much for the removal of tbe remains of the old slovenly system, by exposing the state of some private asylums in the isle of Arran where insane patients were confined in violation of the rules of the statutes.

LURGAN, a market and post town in the parish of Shankill, in the barony of Oneilland East, in the north-east corner of the county of Armagh, in the province of Ulster in Ireland, 17 statute miles north-east of Armagh on the road to Belfast, and 86 miles north of Dublin, by Drogheda, Dundalk, Newry, Banbridge, and Waringstown.

The town consists of one wide street, extending from north-west to south-east along the Armagh and Belfast road. It contained, in 1841, 670 inhabited houses, 52 uninhabited, and 6 building. The population in 1841 comprehended 892 families, being an average of four families to three houses, or 4677 persons. The church is situated near the north-west end of the street. It is a handsome building, erected in 1725, and enlarged in 1832, capable of accommodating 1000 persons: it has a tower and an octagonal spire. There are Presbyterian and Quakers' meeting-houses in the town, and two Roman Catholic chapels in the outskirts. There are meeting-houses for Wesleyan and Primitive Methodists in the parish. There is a court-house, in which the quarter-sessions for the county are held, a Linen Hall, erected by subscription in 1825, and a small area planted with trees, called the Mall. The market-house and weigh-house are in the middle of the street. Of the families 250 were engaged in agriculture, 524 in manufactures or trade, and 118 in other pursuits. The principal manufacture is of linen, especially damasks and diapers (for both which the Lurgan manufacturers are eminent), and cambrics. A weekly market, well supplied with provisions, is held on Friday, and linens to the value of 2500*l.* or 3000*l* are sold on the market-day. There are two yearly fairs. There is a considerable brewery in the town, and a little way from the town is a large distillery. Besides the quarter-sessions, there are petty sessions for the district, held weekly, and a manorial court every three weeks: there is a small gaol or bridewell; and a body of the constabulary are stationed in the town.

Adjacent to the town on the north-east is the richly wooded demesne of Lurgan Castle, the seat of Mr. Brownlow. The house is of modern erection, in the Elizabethan style.

The whole population of the parish, which extends into the barony of Iveagh Lower in the county of Down, was, in 1841, 9350. The town and neighbourhood were, in 1841, rather above the average of the county of Armagh in respect of the diffusion of education, 60 per cent. of the population being able to read, while the average of the county was 56 per cent.; but they were far below the average of the adjacent counties of Antrim and Down. There were in the parish, in 1834, twelve day-schools, with 710 children (411 boys and 299 girls) on the books; and two Sunday-schools. The town is the centre of a poor-law union, and has a workhouse capable of accommodating 800 paupers.

The living of Shankill is a rectory, in the diocese of Dromore and the ecclesiastical province of Armagh: the gross yearly revenue was returned in 1831 (on the average of three years) at £681 16*s.*; the net revenue at £517 14*s.* 4*d.*

Lurgan was built in the reign of James I., on the settlement of Ulster, by William Brownlow, Esq., one of the English settlers; it was burned by the insurgents in 1641, and again destroyed by the army of James II., in the war of the Revolution. A patent for a market and fairs was granted in 1696, and the linen manufacture was established soon afterwards.

(Lewis, *Topographical Dictionary of Ireland; Ordnance Survey of Ireland; Parliamentary Papers.*)

LUTI, BENEDETTO, Cavaliere, a celebrated Italian painter, was born at Florence in 1666. He was the scholar of A. D. Gabbiani, and he went about 1690 to Rome, where he appears to have settled for the remainder of his life: he died in 1724.

Luti has been called by some the last of the Florentine masters. His style is very attractive, but it is more distinguished for agreeable than for great qualities. He painted in fresco and in oil, and executed also many pastel-drawings, a style much practised by the Florentine masters of the seventeenth century. Luti's masterpiece is the large picture of the Vest of San Ranieri, in the cathedral of Pisa, and it is reckoned the best picture in the church. Luti had always a great respect for his master Gabbiani, and after he had finished this picture in 1712, he sent it to Florence to Gabbiani for his correction before it was placed in its final destination. The letter from the scholar soliciting the master's revision is inserted in the second volume of the 'Lettere Pittoriche,' in which there are also ten other letters from Luti to Gabbiani. There are several good engravings from Luti's works.

(Pascoli, *Vite de' Pittori*, &c.; Lanzi, *Storia Pittorica*, &c.)

LÜTZELBURGER, or LEUTZELBURGER, HANS, called also Hans Frank, an early Swiss wood-engraver of Basel, about whom very much has been written, but as yet very little is known. He lived in the early part of the sixteenth century, and is supposed by some to have cut the blocks of the celebrated 'Dance of Death,' attributed to Holbein. This supposition, however, is founded solely on the facts of his being contemporary with Holbein and the circumstance of one of the cuts being marked H. L. This is maintained by some writers and combated by others, and especially by Rumohr in 1836, in a work entitled 'Hans Holbein der Jüngere in seinem Verhältniss zum Deutschen Formschnittwesen' (Hans Holbein the younger, in his relation to German wood-engraving).

There are many other celebrated old cuts, singly and in sets, some from drawings by Holbein, which are attributed to Leutzelburger, and which are described at length in the 'Kunstblatt,' and in the works of Bartsch, Heller, Massmann, and other writers on wood-engraving. The views of all parties are stated with considerable detail in Dr. Nagler's *Neues Allgemeines Künstler-Lexicon.*

LU'ZULA, a genus of plants belonging to the natural order Juncaceæ. It has a 1-celled 3-valved capsule, without dissepiments, with three seeds at the base of the cell. Several species of this genus have been described. *L. sylvatica*, the great Woodrush, is found in shady places in Great Britain. *L. campestris* is common in the pastures of this country, and seven species are natives of the British Islands.

LYCHNIS (from λύχνος, a lamp), a genus of plants belonging to the natural order Caryophylleæ, and to the sub-order Sileneæ. It has a 5-toothed naked calyx; 5 petals, clawed; 10 stamens; 5 styles; the capsules 1-celled, or half 5-celled, opening at the top with five or ten teeth. The species are smooth, hairy, or woolly herbs, with terminal corymbs of flowers, rarely solitary.

L. Chalcedonica, the Scarlet Lychnis, is a smoothish clammy plant, with corymbose flowers in bundles; the calyx cylindrical, clavate, ribbed; the calyx 2-lobed, the carpophore long; the leaves lanceolate, slightly cordate at the base, and clasping the stem. This plant, which produces scarlet, rose-coloured, or white flowers, and is a great favourite in our gardens, is a native of Siberia and Japan. Several varieties of this plant have been named.

L. grandiflora is a glabrous plant, the flowers solitary or ternate, terminal and axillary; the calyx terete, clavate, ribbed; the petals lacerated; carpophore elongated; the leaves ovate, almost sessile. It has large beautiful scarlet flowers, and is a native of China and Japan.

L. Flos Cuculi, Ragged Robin, has deeply 4-cleft petals, with a very short carpophore. It has rose-coloured petals, and is an abundant plant in the moist meadows and pastures of Great Britain, as well as the whole of Europe.

L. vespertina, White Campion, has the petals half-bifid, and the calyx teeth of the fertile flowers linear lanceolate, elongated; the capsule conical; the teeth erect. It is a common plant in the hedge-banks of Europe. This and the following species are frequently regarded as varieties, and then named *L. dioica.*

L. diurna, Red Campion, has the petals half-bifid, the calyx teeth of the fertile flower triangular, the capsule nearly globular, the teeth reflexed.

The other British species of the genus Lychnis are: *L. Githago*, the Corn-cockle, a pretty plant blossoming in corn-fields from June to September; *L. alpina*, found on the mountains of Forfarshire; and *L. Viscaria*, a rare plant.

Many of the foreign species are cultivated in our gardens. They thrive well in a light rich loamy soil, and may be propagated by cuttings or seeds.

(Don, *Gardener's Dictionary;* Babington, *Manual of British Botany.*)

LYCIA. In addition to the general description of the country in the P. C., and the geographical details in the article ANATOLIA in the Supplement to the P. C. (vol. i. p. 112), we give a few particulars respecting the inhabitants and natural productions of this most interesting portion of Asia Minor.

The country is, as it seems, well inhabited, chiefly by Turks, many of whom lead a life half settled and half nomadic; they are distinguished above all other inhabitants of Asia Minor by their excellent character. Most of them are farmers or herdsmen; trade is chiefly carried on by Armenians and Greeks who live in the sea towns, and form the greater portion of the population of the inland town of

Almali, which is the largest in Lycia, the population being about 25,000. Those among the Turks who wander with their herds on the high plateaus, like the Turcomans, show an independence of manners and character not very pleasant to the traveller, but on nearer acquaintance they appear to be a good sort of people. The Turkish population is exceedingly careless about money, and when they have enough to eat and to drink,—and they are moderate in their habits,—they are satisfied and care for nothing more. They are somewhat shy in receiving a stranger, through fear of being treated as they are by Turkish officers and the Sultan's couriers, who take away every thing they please without ever paying for it. Along the coast of Lycia as well as the adjoining provinces of Caria and Pamphylia, there lives a number of Arabs, (*Syrians?*) who are generally seamen, and seem to have settled there many centuries ago. Among the wild animals, the 'káplán' (which term is here applied to the leopard), and the 'arslán' or lion (perhaps the panther), commit great depredations among the herds; great numbers of them are annually killed, and a reward of from 100 to 200 piasters is given by the government for each 'arslán.' They are very frequent in the district of Sidyma, on the coast. The ox is precisely the same as represented on the antient coins and monuments of Lycia; but there is also a species of dwarf ox, of the size of a large dog, though more stoutly built. There are great numbers of buffaloes and camels. The breeding of horses is carried on to a great extent, and herds of many hundreds are often seen grazing together in the valleys. The only kind is that of which such spirited representations are seen in the antient marbles; the head is of Arabic cast, the chest is very large, the feet are remarkably fine and thin, and the ears are small, as in the antique. They are not shod. The rivers and lakes abound with large tortoises, and on their banks the trees swarm with the green climbing frog. No part of Asia Minor contain such splendid valleys as those of the Xanthus and the Dolomon Chái. Myrtle, oleander, and pomegranates cover the banks of the rivers; the plains along the rivers are well cultivated, and in many places the fields are enclosed by fences of myrtle and the small prickly oak, mixed with the orange, the wild olive, the pomegranate, the oleander, the elegant green storax, which are most beautifully matted together by vine, clematis, and many other climbers. Fruit trees are planted in enclosures. The hills are covered with large oaks and planes, which supply excellent timber, of which, however, only small quantities are shipped from the coast towns. The oak, 'quercus ægilops,' is a source of wealth from its acorns, the 'velanea' of the Smyrna merchants, which is used in tanning leather and gives it that agreeable smell which places the Turkish leather even above the Russian 'Jucht.' A sort of horse-radish is used as food, and as a substitute for soap. In proportion as the traveller approaches the high upland plains, the tender fruit-trees, as well as the olive, the aloes, and other Southern plants disappear, and are replaced by the walnut, apple, and pear trees. The high plain round Almali, which is 4000 feet above the sea, is one of the largest and best cultivated corn tracts in Asia Minor; its chief produce is barley, which is the common food for horses. Maize is chiefly raised in the valleys and on the coast.

(Fellows, *An Account of Discoveries in Lycia; a Journal written during an Excursion in Asia Minor.*)

LYCOPERSICON. [SOLANUM, P. C.]

LYCORTAS. [PHILOPŒMEN, P. C.; POLYBIUS, P. C.]

LYGODYSODEA'CEÆ, a natural order of plants closely allied to Cinchonaceæ. It differs from this order in possessing an ovary composed of two confluent carpels, 1-celled, with two ovules, and a single style; the pericarp brittle burst in four directions from the base, not adhering to the seeds, 1-celled; two free placentæ rising up between the pericarp and the back of the seeds; two seeds pendulous from the apex of the placentæ, with the embryo straight, foliaceous, compressed; the radicle short, inferior. The species are twining shrubs, and have single stipules between the petioles.

This little order was constituted by Bartling, but was afterwards examined by De Candolle, who thought there was no reason for separating it from Cinchonaceæ. 'According to De Candolle, what Bartling calls pericarp is calyx, and his seeds are carpels, and consequently all the most remarkable features of the order disappear, with the exception of the absence of the albumen.' (Lindley.) This is a subject that merits further investigation. The only genus of this order is *Lygodysodea*, of which two species, *L. fœtida* and *L. ciliata*, have been described. They are both natives of Peru and Mexico.

LYLY, LILY, or LILLY, JOHN, was a native of the Weald of Kent. His birth has been referred to the year 1554, on the faith of the entry of his matriculation as a student at Oxford in 1571, which asserts him to have then been seventeen years old. He became bachelor of arts in 1573. It appears from one of his prefaces that he was rusticated from Oxford; and, after having (it is said) studied likewise at Cambridge, he went to London, and spent his life in literary labour, as a dramatic and miscellaneous writer. Although his writings must for a considerable time have been fashionable at court, he appears to have shared to the full in the poverty and distresses of authorship. He is supposed to have served Lord Oxford, but to have been deprived of his place; and he was long and unsuccessfully an applicant for the office of master of the revels. In one of his petitions to the queen, which has been preserved, he, with melancholy quaintness, describes the history of his life as 'Lyly *De Tristibus*, wherein shall be seen patience, labours, and misfortunes.' The time of his death is unknown; but he must have survived the beginning of the seventeenth century.

The two most famous of his works bore the following titles: 'Euphues: the Anatomy of Wit, verie pleasant for all gentlemen to read, and most necessary to remember: wherein are contained tho delyghts that Wit followeth in his youth by the pleasantnesse of Love, and the happinesse he reapeth in age by the perfectnesse of Wisedome,' 4to., 1579 or 1580: 'Euphues and his England; containing his voyage and adventures, mixed with sundrie pretie discourses of honest Love, the description of the Countrie, the Court, and the manners of that Isle; delightful to be read, and nothing hurtfull to be regarded; wherein there is small offence by lightnesse given to the wise, and lesse occasion of loosenesse proffered to the wanton,' 4to., 1582. He wrote also a lively satirical tract against Martin Marprelate: 'Pap with a Hatchet; alias, a Fig for my Godson; or Crack me this Nut; or a Country Cuff; that is, a sound Box on the Ear for the Idiot Martin to hold his peace: written by one that dares call a Dog a Dog:' 1593. He was also the author of nine plays still extant: 1. 'Alexander and Campaspe,' 1584, 1591; reprinted in Dodsley's Collection, vol. ii. 2. 'Sapho and Phao,' 1584, 1591. 3. 'Endimion,' 1591; reprinted in Dilke's Old Plays, vol. ii. 4. 'Galathea,' 1592. 5. 'Midas,' 1592; and 6. 'Mother Bombie,' 1594, 1597; both reprinted in Dilke's Collection, vol. i. 7. 'The Woman in the Moon,' 1597. 8. 'The Maid's Metamorphosis,' anonymous, but generally attributed to Lyly, 1600. 9. 'Love's Metamorphosis,' 1601; the authorship of which has been doubted.

The first mentioned works of Lyly gave the name of 'Euphuism' to a fashionable style of language, of which, although he certainly did not invent it, he was the most eminent literary cultivator. The Euphuism of Lyly himself was just an exaggerated form of that strained, pedantic, over-elaborated imagery which was prevalent in refined society as well as in literature about the middle of Elizabeth's reign. In his hands it added to the classical pedantry of the day a pedantry of something like science, consisting in incessant images derived from a half-fabulous system of natural history. Drayton, in ascribing to Sir Philip Sidney (himself no very simple writer) the merit of having brought back the tone of language to nature, speaks of Lyly as

> Talking of stones, stars, plants, of fishes, flies,
> Playing with words and idle similies.

Shakspere's Don Armado has sometimes been considered as 'parleying Euphuism;' but, as Mr. Knight has observed, there is a nearer approach to this jargon in much of the language used by the higher personages in the same play. The absurdities of it are burlesqued by Jonson in his 'Cynthia's Revels.' Sir Piercie Shafton, in 'The Monastery,' is an unsuccessful attempt at representing the characteristics of Euphuism.

Lyly's dramas are almost everywhere deformed by the same false taste; yet they exhibit occasional touches of fine fancy, which however is shown to greater advantage in some of the short lyrical pieces interspersed through them. The wit of the dialogue is in some places lively. To success in portraiture of character these plays can make no claim; and as little can their mythological, pastoral, or classical stories be said to possess dramatic interest, or to be treated with dramatic skill. The author's claim to remembrance as a dramatist rests almost wholly on his position as one of Shakspere's immediate predecessors; and on the fact that his plays present, in strong relief, some of the distinctive characteristics of the literary tastes which prevailed in that interesting age.

LYON KING AT ARMS. [HERALD, P. C.]

LYSIMACHI'A, a genus of plants belonging to the natural order Primulaceæ. It has a 5-parted calyx, a rotate corolla with scarcely any tube, and a 5-parted limb. The stamens are inserted at the base of the corolla, and are 5 in number. The capsules open with 5 valves.

L. thyrsiflora is distinguished by its axillary stalked dense racemes; its leaves are opposite and lanceolate. The corolla is divided almost to the base into narrow petals often separated by a minute tooth, which as well as the calyx is yellow spotted with orange. It is found in marshes in the north of England.

L. vulgaris has an erect stem, with compound terminal and axillary panicles, ovate or ovate-lanceolate leaves nearly sessile or 3 or 4 in a whorl. The petals are entire with glabrous edges; the stamens 5, and combined for half their length. This species is the *L. punctata* of some botanists, and probably the λυσιμάχιον ἄνθος χρυσοειδὲς of Dioscorides, lib. iv. cap. 3.

L. Nummularia, Moneywort, has a prostrate creeping stem, solitary axillary flowers, ovate acute sepals, and glandular filaments connected at the base. The leaves are opposite, roundish, and shortly stalked. The peduncles shorter than the leaves. It is found in damp places in Great Britain.

L. nemorum has linear lanceolate sepals, smooth distinct filaments, and opposite ovate acute leaves. It is found in woods and damp shady places in Great Britain. *L. atropurpurea* is the λυσιμάχιον ἄνθος πυῤῥὸν of Dioscorides, lib. iv. cap. 3.

(Fraas, *Synopsis Plantarum Floræ Classicæ;* Babington, *Manual of British Botany.*)

LYTHRUM (from λύθρον, 'black blood,' from the purple colour of the flowers), a genus of plants belonging to the natural order Lythrariaceæ. It has a tubular cylindrical calyx, with from 8 to 12 teeth; from 4 to 6 of the teeth are broader than the rest and erect, the alternate ones being subulate and opposite to the petals. It has from 4 to 6 petals and a very short style. The capsules are 2-celled and many-seeded.

L. Salicaria, Purple Loosestrife, has lanceolate leaves from a cordate base and whorled. The flowers are in whorled leafy spikes, almost sessile. It is a native of Europe, in ditches and watery places, especially about the margins of ponds and rivers, and is found in Britain very plentifully. The colour of the flowers varies from crimson to purple. The herbage is generally almost smooth, and of a dark green, but in dry situations it becomes hoary and downy, or in some degree hairy, as well as more dwarfy in stature. This species is the *Lysimachia* of Pliny, lib. xxv. cap. 7; lib. xxvi. cap. 12, 14.

L. hyssopifolia has alternate linear-lanceolate blunt leaves. The flowers are axillary and solitary, with two minute subulate bracts. The calyx teeth are all short, and the stamens are usually six in number. The flowers are small and of a light purple colour. The whole plant is glabrous, and is found in damp places in Great Britain.

L. Hunteri, Hunter's Purple Loosestrife, is a native of the East Indies. The leaves are opposite, the calyx tubular and 6-lobed, the stamens 12, and the style subulate. The petals, 6 in number, are of a very beautiful red colour, and are used for dyeing in India. The hardy perennial species of Lythrum are handsome garden-flowers; they grow in any common soil, and are easily propagated by dividing at the root. The seeds of the annual kinds require to be sown in moist situations in the spring.

(Don, *Gardener's Dictionary;* Babington, *Manual of British Botany.*)

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VOLUME II.

M.

M'CRIE, THOMAS, a writer on ecclesiastical history and polemics, was born at Dunse in Berwickshire, in November, 1772. His father was a petty manufacturer and trader, who had by his industry and economy been enabled to purchase a small estate, and spend his old age in quiet independence. 'Dr. M'Crie's parents,' says his biographer, 'being connected with that branch of the secession usually termed Anti-Burghers, he was brought up under the ministry of the Rev. Mr. Whyte, at a period when the primitive strictness of that communion was retained in a measure which is now wholly unknown. In these circumstances he received that thoroughly religious education, of the importance of which he was ever afterwards so strenuous an advocate, and of the success of which he was himself a striking example.' Having received the rudiments of education at the parish school of his native place, he afterwards studied at the university of Edinburgh, which he entered in 1788. Contemporaneously with his academical studies, he occupied himself in teaching younger lads, an employment for which he seems to have been well qualified. In 1791 he commenced his peculiarly theological studies. In 1795 he was licensed as a clergyman by the associate presbytery of Kelso, and he was immediately afterwards chosen pastor of a congregation of the same body in Edinburgh. In the earlier period of his ministry he entered warmly into those discussions naturally prevalent among bodies who have so many points of repulsion from each other as the small Presbyterian sects which had sprung from the church of Scotland. He soon commenced however the important task of studying, for the purpose of some undefined literary projects, the early history of the Presbyterian church in its connection with its most remarkable champions. The body to which he belonged followed a rule of Presbyterian discipline, from the strict tenor of which they maintained that the established church had diverged; and, recurring perpetually to the conduct of the fathers of Presbyterianism, it was likely that any member of this body with sufficient talent would be the most zealous biographer of these primitive worthies. In 1812 he published 'The Life of John Knox.' Scholarship or literary ability were qualities which the clergy of his sect, consisting almost entirely of the humbler members of society, were never expected to display; and this first attempt, which showed both qualities in an eminent degree, accompanied by much patient research, was looked on as a literary phenomenon. In 1813 he received the degree of D.D. from the university of Edinburgh, previous to the appearance of the second edition of his work. It has since passed through several editions, and, while it is very popular with the uneducated classes in Scotland, is highly esteemed by historical students. In 1819 he published a work of still more extensive and curious research, 'The Life of Andrew Melville,' a celebrated champion of Presbyterianism in the reign of James VI. of Scotland. The indefatigable minuteness of the researches connected with this volume is scarcely matched in the English language, and it had the effect of resuscitating from the most obscure materials—records of births, marriages, and deaths, ecclesiastical and proprietary registers, and like sources—the circumstances connected with the lives of some interesting men who in the stir and bustle of their own active age had failed to find commemorators. The partisan zeal with which these works were undertaken is not their least remarkable feature. and obtained from Mr. Hallam the apt designation of 'Presbyterian Hildebrandism.' There is no doubt of the accuracy with which Dr. M'Crie stated facts and cited authorities, and that he was thoroughly honest; but from the beginning to the end each work is a piece of industrious and acute special pleading, and the reader whose position enables him to take an impartial view of the characters discussed in them sees plainly that he knows what portions may be favourably dwelt on, and what should be hastily passed over, if not omitted. His palliations and vindications are singularly ingenious; and amid all the rude morality and savage acts of the turbulent periods of which he gives the history, he vindicates his own heroes from all follies as well as from all vices; even the destruction of the Scottish ecclesiastical buildings has its meed of praise. Written in such a spirit, and being works of genuine learning and research, they are very popular with the ultra-Presbyterian party in Scotland. Their author led a blameless simple life, on a small salary, which, with the free use of the valuable public libraries in Edinburgh, contented his unmercenary disposition. He died on the 5th August, 1835, deeply lamented by the members of his congregation and a wide circle of private friends.

(*Life of Thomas M'Crie, D.D.*, by his son, the Rev. Thomas M'Crie, 1840.)

MAC CULLOCH, DR. JOHN, was born in Guernsey, on the 6th of October, 1773. He was descended from an antient Scottish family, the MacCullochs of Nether Ardwall, in Kirkcudbrightshire, a younger branch of the MacCullochs of Myretown, a family which at one time possessed considerable property in Galloway. He was the third son of James MacCulloch, Esq., and Elizabeth, daughter of Thomas De Lisle, Esq., one of the jurats of the royal court of Guernsey.

In his childhood Dr. MacCulloch was very thoughtful, and fond of being alone. He taught himself to write, and wrote Latin exercises at an age when many children have barely acquired a knowledge of the alphabet. He seldom played with other children, but when the hours of study were over was in the habit of going into a room which his father, who was a man of scientific and literary attainments and a good mechanic, allowed him to call his own, and the door of which he contrived to fasten with a large bent needle in such a manner as to prevent his brothers entering. Here he amused himself with drawing, carving various articles in wood and cocoa-nut shell, and, at a very early period, in attempts to make gunpowder, and, after he had effected that, in manufacturing fireworks. His family was at this time residing in Cornwall, and the first school he was sent to was the grammar-school at Plympton. He was afterwards removed to one at Penzance; and thence, in 1787, to the grammar-school at Lostwithiel, where he remained three years, and where his talents seem to have been appreciated by the master, Mr. M'Gilvray, of whom Dr. MacCulloch always spoke with the greatest respect and love.

In 1790 he went to prosecute his medical studies at Edinburgh, where he obtained his diploma of physician, at the age of eighteen. He subsequently entered the artillery as assistant-surgeon, and on the 5th of April, 1803, accepted the situation of chemist to the Board of Ordnance. In 1807 he resided at Blackheath, where he practised as a physician. His application while pursuing his studies at Edinburgh was intense, and probably received an additional stimulus from the circumstance that his father, who was settled as a merchant in Bretagne, was arrested at the beginning of the French revolution, and with his family imprisoned during the whole of the Reign of Terror, a state of things which naturally put a stop to the lucrative business in which he was at that time embarked. During Dr. MacCulloch's occasional visits to Penzance, whither his father, on the fall of Robespierre, retired, he became acquainted with Sir Humphry Davy, who was indebted to him for some of his earliest instruction in chemistry.

About the year 1811 he was engaged by government to make various surveys in Scotland. He in consequence gave up his practice, which he never regularly resumed, although he was frequently consulted. The first business on which he was employed in Scotland, was in a search for stones adapted to the use of the government powder-mills. The second was an examination of the principal mountains, with a view to the repetition of the experiments which had been made at Schehallian on the density of the earth. The third had for its object the correction of the deviations of the plumb-line on the meridian of the trigonometrical survey. Whilst he was making these surveys, he also employed himself in geological observations, and in collecting materials for a mineralogical map, as well for his own amusement and instruction as with the hope that they would be useful to the country. In 1826 he was desired by government to complete the work which he had begun; and this was the commencement of the last great public work in which he was employed - the mineralogical and geological survey of Scotland, which was continued every summer from 1826 to 1832, when he completed it. The winters of these years were spent in the laborious task of putting in order the observations made in the summer, in drawing sections, and preparing the map. This great work, precise and exact as it is, the labour of one individual, begun, carried on, and completed by himself alone, extending over a country richer in its variety of rocks than any country of equal extent in the world, abounding in geological difficulties, has never been surpassed, or even equalled, by any undertaking of a similar nature. In making this survey Dr. MacCulloch had to contend with many hardships, for great part of the time was spent upon a boisterous sea or a miserably poor comfortless land. It was his lot to do all the different works provided for in all other surveys by half a dozen men and as many salaries. As a proof of the aptitude which he possessed for doing anything that he willed, we may mention that he steered his own boat through the dangerous channels of the Scottish islands.

Some of the fruits of these separate surveys are published. The first publication was 'A Description of the Western Islands of Scotland, including the Isle of Man, &c.,' 2 vols. 8vo., with 1 vol. 4to. of plates, London and Edinburgh, 1819. Next, 'A Geological Classification of Rocks, with Descriptive Synopses, comprising the Elements of Practical Geology,' London, 1821, 1 vol. 8vo. Thirdly, 'The Highlands and Western Isles of Scotland, in a series of Letters to Sir Walter Scott,' London, 1824, 4 vols. 8vo. This work, in addition to a most graphic description of the country, contains many learned dissertations on the history, antiquities, language, music, and economy of the Highlands. Fourthly, A System of Geology, with a Theory of the Earth, and an Explanation of its Connection with the Sacred Records,' London, 1831, 2 vols. 8vo. In 1821 he published a Treatise on the Art of making Wines, which reached a fourth edition in 1829; and in 1823 he published anonymously an account of Blair and Dunkeld, forming a guide-book to those localities. He contributed many papers both to the Encyclopædia Britannica and to Brande's Journal, on various subjects connected with Scotland generally, or its rocks and minerals; besides others on different topics. One of these is a description of twenty-two species of Medusa found about Shetland and Orkney; so attentive was he to everything that surrounded him. He published many articles in the 'Transactions' of the Geological Society, and wrote frequently in the Edinburgh, Westminster, and Quarterly Reviews, and in the London and New Monthly Magazines.

Although unable to follow up the practice of his profession, Dr. MacCulloch never lost sight of it, the proofs of which we have in two elaborate works which appeared in 1827 and 1828. The first is entitled 'Malaria, an Essay on the Production and Propagation of this Poison, and on the Nature and Localities of the Places by which it is produced,' &c., 1 vol. 8vo., London. The second is 'An Essay on the Remittent and Intermittent Diseases, including generally Marsh Fever and Neuralgia,' &c., in 2 vols. 8vo., London. He appears to be the first who referred a large list of disorders, hitherto deemed anomalous, and which appear to have nothing in common with one another, to their true source—the poison of the malaria.

Dr. MacCulloch's writings contain internal evidence that they must have resulted from deep thought, based on an intimate knowledge of the subjects he treated of. The acquisition of this knowledge was gained by intense study, aided by a wonderfully retentive memory. The variety of his acquirements was not less remarkable than their extent. Allusion has been already made to his knowledge of medicine, geology, mineralogy, chemistry, and mathematics. He was also well acquainted with theology, astronomy, zoology, botany, physics, and the mechanical arts. He was skilled in architecture. He drew well, and has left an immense number of drawings. He was a good musician, and his musical compositions show that he was conversant with the theory as well as the practice of the science. His accomplishments, as they are called, were cultivated at times which many persons pass without employment. His drawings were done while others were employed in walking or riding. His flowers and herbs were examined, dried, and painted before breakfast in the long summer mornings. When he used to practise music, he did so during the twilight hours. In short, no portion of his time was unoccupied. And the magnitude of his labours appears still more remarkable from the fact, that for many years he was afflicted most severely by the effects of malaria.

He completed in 1830 a work entitled 'Proofs and Illustrations of the Attributes of God, from the Facts and Laws of the Physical Universe; being the Foundation of Natural and Revealed Religion.' It was intended for publication in the following year; but its appearance was delayed by the announcement of the Bridgewater Treatises. In obedience to his last will, it was published in 1837, in 3 vols. 8vo. Many papers on various subjects remain unpublished, and among them a corrected copy, with numerous additions, of his work on the Highlands.

Dr. MacCulloch was fellow of the Royal, Linnean, and Geological Societies, and at one time vice-president of the last. In 1820 he was appointed physician in ordinary to Prince Leopold of Saxe-Coburg. For some years, and till his death, he filled the situation of lecturer on chemistry and geology at the East India Company's Military Establishment at Addiscombe.

He married, in the summer of 1835, Miss White. He was with her in Cornwall, on a visit to an old friend, when the accident occurred which led to his death on the 21st of August, 1835. He was thrown out of a pony phaeton, by which, in addition to other injuries, his right leg was so shattered that amputation became necessary. He only survived the operation a few hours. He was buried in the churchyard of Gulval, a village near Penzance, in which his family had at one time resided.

Dr. MacCulloch was steady in his attachments, zealous to promote the interests of his friends, and ever ready to aid those who needed his assistance. He possessed very strong affections and acute sensibility, which the sufferings of many years seemed rather to have increased than diminished. His manners were courteous; his conversation was rich, varied, apparently exhaustless, though never urged so far as to exclude others, and remarkable for its unaffected simplicity. He was as willing to impart information as he was eager to acquire it.

(Principally from the *Annual Biography and Obituary* for 1836.)

MACDONALD, ANDREW, an unfortunate man of letters, furnishes the theme for one of the most affecting passages in D'Israeli's 'Calamities of Authors.' He was born about 1755, and was the son of a gardener in Leith. After having been educated in the University of Edinburgh, he took orders in the Scottish episcopal church, and in 1777 became pastor of a congregation in Glasgow. In 1782 he published 'Velina, a Poetical Fragment,' in Spenser's stanza. This volume was succeeded by a novel called 'The Independent;' and afterwards a tragedy of his, called 'Vimonda,' was played with success in the theatre of Edinburgh, with a prologue written by Henry Mackenzie. Becoming tired of a charge very ill remunerated, and being encouraged by the reception of his play, he resigned his place, and came to Edinburgh; first however marrying the servant-maid of the house he had lodged in, and then living for a short time very extravagantly. He next removed to London, where, in 1787, his tragedy was brought on the stage by Colman with much pomp and very considerable approbation. But the author was starving; and in 1788 he died in London, leaving his wife and child in beggary. A volume of his sermons was published in 1790; and a volume of poems, including 'Vimonda' and three other plays, appeared in 1791. His dramatic genius cannot be rated high; but he possessed no inconsiderable power both of poetic fancy and of expression. There is a good deal of vigour in some of his light poems, written in London, in the manner of Peter Pindar.

MACDONALD, ETIENNE JACQUES JOSEPH ALEXANDRE, Duke of Tarentum and Marshal of France, was born on the 17th Sept., 1765, at Sancerre in the department of Cher, though some authorities make Sedan the place of his birth. He was descended from a Scotch family, which, on account of its participation in the rebellion of 1745, was compelled to take refuge in France. In 1784 he entered the army as a lieutenant in the legion of Maillebois, and afterwards joined the regiment of Dillon, chiefly composed of Scotch and Irish, in the French service. He was induced, it is said, to remain in France at the breaking out of the Revolution, on account of his attachment to the daughter of Mons. Jacob, who warmly espoused the republican cause. His military talents procured him a place at the commencement of hostilities on the staff of General Dumouriez, and he rose to the rank of Captain after the battle of Jemappe; some biographers however state that his valour on that occasion was rewarded with the rank of Colonel. He served in the campaign of the Low Countries under General Pichegru, and distinguished himself by the passage of the Waal on the ice, under a severe fire from the batteries of Nimeguen, by which exploit the Dutch fleet was captured. Having risen to the rank of General of Division, he commanded in 1796 at Düsseldorf and Cologne. He then joined the army of the Rhine, and afterwards that of Italy; and when in 1798 the French became masters of Rome, Macdonald was appointed governor of that city. His behaviour in this new capacity appears to have been marked by some severities, but his position was one of extreme difficulty. On the approach of General Mack he was obliged to abandon Rome, and his army was attacked by the enemy at Otricoli; the Austrians however were defeated, and he was enabled to regain possession of Rome. He was afterwards sent by the French government in their enterprise against the kingdom of Naples, and when compelled to retire before the superior force of Suwarrow, he saved his army, and reconducted it to France by a retreat in which he displayed considerable skill. [SUVAROV, P. C.]

Macdonald had command at Versailles during the period of the revolution of the 18th Brumaire. [BONAPARTE, P. C.] In 1800 he was appointed commander-in-chief of the army of reserve in Switzerland. His celebrated passage of the Splugen, the dangers and difficulties which he surmounted, the persevering ability which he displayed, have rendered his name greatly celebrated in the annals of warfare. There are indeed but two events recorded in history to which this memorable exploit can be compared—the passage of Hannibal over the Alps, and that of Napoleon over the Great St. Bernard. Alison, in an elaborate comparison which he makes between the latter and that of Macdonald, considers that this general had greater difficulties than Napoleon to surmount, while he had less means at his command to surmount them. (Alison, *Hist. of Europe*, c. xxxii.)

In March, 1802, he was appointed French ambassador at the court of Copenhagen; and on his return to Paris he was created Grand Officer of the Legion of Honour. He afterwards remained some years without employment, on account of the free expression of his sentiments with respect to the conduct of the First Consul towards General Moreau. [BONAPARTE, P.C.; MOREAU, P. C.] It was not until the year 1809 that he was recalled to military service, when the command of a division of the army of Italy under Eugene Beauharnois was given to him by the Emperor. Macdonald on this occasion made a noble use of the opportunity of renewing his military reputation. The troops under his orders entered Styria; he compelled the Austrian general Meerfeldt to capitulate at Laybach (May 22, 1809); and he shared the glories of the victory of Raab. He was present on the 6th July at the famous battle of Wagram; the important duty of forcing the enemy's centre, which was defended by two hundred pieces of cannon, was committed to him, and he executed this critical movement with the most consummate skill and bravery, but with immense loss. On the morning after this great and sanguinary engagement, Napoleon, as he passed by Macdonald, stopped, and, holding out his hand as a pledge of their reconciliation, paid him a just tribute of praise for his share in the victory, and as an earnest of his admiration presented him with the marshal's staff. On this field of battle two other marshals were created for their distinguished services, Marmont and Oudinot, who afterwards obtained the respective titles of dukes of Ragusa and Reggio. It is also added that Macdonald with affectionate gratitude for the honour conferred, and especially for the manner in which it was conferred, pledged himself to abide by the destinies of Napoleon for life or death.

He was afterwards appointed governor of Gratz, where by the strict discipline he maintained among his troops he so conciliated the esteem of the inhabitants, that on his leaving the town they begged his acceptance of a most valuable gift of jewels, intended as a present to one of his daughters who was about to be married. This gift however he nobly refused, and added that the best proof of their gratitude towards him would be shown by their care of three hundred sick soldiers whom he was obliged to leave behind him.

In April, 1810, Macdonald returned to Paris, and was created Duke of Tarentum, and appointed to the command in Catalonia of the corps of Marshal Augereau, who was recalled. [AUGEREAU, P. C.] His conduct in Spain did not add to his military reputation. On one occasion indeed he was engaged in an enterprise which has tarnished the glory of his previous exploits. After the fall of Tortosa (March 29, 1811) this marshal was proceeding from Lerida to Barcelona by the circuitous route of Manresa. He was attacked on his march by the Spanish general Sarsfeld, and his troops met with a determined opposition on the bridge of Manresa; this obstacle overcome, the French, or rather the Italians in the French service, forced their way through the town, whose inhabitants offered them no resistance, and they wreaked their vengeance upon it by setting fire to its buildings. Seven hundred houses and two large hospitals were thus destroyed, and it is to be regretted that Macdonald, who witnessed the conflagration, made no efforts to put a stop to it, and offered no assistance to the sufferers. This unnecessary cruelty was condignly visited by universal indignation, and rekindled in all its vigour that guerilla warfare which proved so harassing in its effects and so important in its ultimate results.

In 1812 Macdonald accompanied Napoleon in the expedition to Russia, with the tenth corps of the army under his command. In the Saxon campaign of 1813 he distinguished himself at the battles of Bautzen and Lützen. In that of Katzbach (August 29, 1813) he met with a severe reverse. In direct violation of Napoleon's orders, he imprudently advanced against Marshal Blücher, who was at the head of an army very superior in numbers to his own, which was imprudently scattered over a space of thirty miles from Liegnitz to Schoenen; so that when attacked on his centre and his left by the concentrated masses of the Prussians, he had no adequate force at hand to arrest the onset of the enemy. The result of this engagement was the loss of one of his divisions, that commanded by Puthod, one hundred officers, including Puthod himself and all his staff. Three thousand soldiers became prisoners; twelve pieces of artillery also fell into the hands of the enemy. At the great and disastrous battle of Leipzig, more fortunate than the illustrious Poniatowsky, he was enabled in the retreat to swim safely across the Elster. [PONIATOWSKY, P. C.]

In 1814 Marshal Macdonald faithfully redeemed the pledge he had given to Napoleon on the field of Wagram, and constantly adhered to his declining fortune; he also warmly exerted himself with the allies to obtain favourable terms for the emperor and his family. He was with him at Fontainebleau [BONAPARTE, P. C.], where Napoleon expressed to him his regret at not having before appreciated his value, and presented him with a splendid Turkish sabre, the gift of Ibrahim Bey.

On the first restoration of the Bourbons, he was called to the chamber of peers, where he proposed several measures of justice towards the returned emigrants and the veterans of Napoleon's army. These just and expedient proposals were however rejected.

When his former chief returned from Elba, this marshal was solicited to accept a command which his loyalty refused. He proceeded to Lyon to join the Count d'Artois, afterwards Charles X., and endeavoured, though fruitlessly, to induce the troops to remain faithful to the Bourbon cause. On his failure he returned to Paris, and when Napoleon approached that city he accompanied to the frontier the fugitive king (March 20, 1815). It is however stated by some that he came back to Paris, and there performed duty as a simple soldier in the national guard.

On the second restoration of the Bourbons he was named chancellor of the Legion of Honour [LEGION OF HONOUR, P. C. S.], which office he retained till 1831. He likewise received the appointment of governor of the twenty-first military division, and that of major-general of the Royal Guard. The rest of Macdonald's life appears to have been chiefly passed in tranquil occupations on his estates. He visited Scotland, where he showed much kindness to some relatives whom he found in the Highlands in humble circumstances. He died at Paris on 24th September, 1840.

Marshal Macdonald, though not the most distinguished of Napoleon's generals for his military service, has not been surpassed by any of them in pure integrity of character, in disinterestedness, and in the maintenance of honourable principles. His highest praise is perhaps to be found in the brief but expressive remark made concerning him by Napoleon at St. Helena—'Macdonald was a man of great loyalty.'

(Alison, *Hist. of Europe*, vols. ii. iv. and ix.; *Court and Camp of Napoleon*; Las Cases, *Mémorial de St. Hélène*; *Dict. Hist. des Batailles*; *Biographie Moderne*, Paris, 1815; Napier, *Hist of the Peninsular War*.)

MACER, AEMI'LIUS, a Roman jurist, who lived under the Emperor Alexander Severus, or shortly after his time. He was either a contemporary of Ulpianus, or wrote after Ulpianus, for he cites him several times. There are 275 excerpts from Macer in the Digest. His works mentioned in the Florentine Index are two books on Military matters, two on Publica or Publica Judicia, two on the Officium Praesidis, two on the εἰκοστή or Vicesimae haereditatum, and two on Appellationes. According to Priscian be also wrote Annales.

MACHINERY. It is proposed to consider in this article the influence which is exercised by machinery upon the general interests of mankind, and especially upon the well-being of different classes of society. There is no subject in the present age which is more deserving of attention; and none perhaps in which all classes are so much concerned. Whatever theoretical opinions may be entertained by speculative men, the use of machinery in aid of human labour, or, as some contend, instead of it, is rapidly increasing and cannot be restrained; it is right therefore for all men to endeavour to judge for themselves in what manner it is valuable to society, and whether the injuries attributed to it be real or imaginary. By some, every new machine is viewed as an addition to the wealth and resources of a country; by others it is regarded as a hateful rival of human industry—as iron contending with straining sinews—as steam struggling against the life and blood of man. The one view is full of hope and promise; the other is fraught with gloom and sadness. One would present society advancing in wealth and comfort: the other would show it descending faster and faster into wretchedness. But even those who believe that the inventive faculties of men have been engaged in devising for themselves a curse, would gladly be convinced that cheerful anticipations of good are consistent with sound philosophy.

The influence of machinery is of two kinds: 1st, as it affects the production and consumption of commodities; and 2ndly, as it affects the employment of labour.

As regards production, the effects of machinery have been well described to be the same 'as if every man among us had become suddenly much stronger and more industrious.' (*Results of Machinery*, 7th edit. p. 36.) If, by the aid of machinery, ten men can perform the work of twenty, and perform it better and more quickly, the products of their labour are as much increased as if they had really 'become suddenly much stronger and more industrious,' and, it may be added, more skilful. Thus production, which is the object of all labour, is more abundant, and society enjoys the results of industry at a less cost. Who can doubt that this is a great benefit, unless it be attended with evils which are not at first perceptible? No man labours more than is necessary to effect his object, and his constant desire is to contrive modes of saving his own physical exertions. A rich soil and a fine climate are universally esteemed as blessings because the people enjoy abundance with comparatively little labour. A poor soil and bad climate are evils, because the husbandman must labour much though the produce of his industry be small.

Labour without adequate results is always regarded as a curse, and almost every human invention, from the earliest times, has had for its objects the saving of labour and the increase of production. Horses and other beasts of burden were made to work for man; to bear loads which otherwise they must have borne themselves; to draw the plough which otherwise their own strength must have forced through the soil. To the same object all nature has been made subservient. The stream turns the mill, and does the work of man; the wind performs the same office. A boat is built to save men the labour of carrying their goods to a distance, and it is less labour to row the boat than to carry its cargo: but rowing is laborious, and sails were invented that the wind should do the work of man. In all other matters it has been the same. Man is weak in body, and ill endowed by nature with the means of self-preservation and subsistence. Many animals are stronger and most animals are more active than himself: they can pursue their prey with more certainty, they are armed with weapons of offence and defence, and they need no shelter from the weather but that which nature has provided; their own powers and their own instinct suffice for their preservation. But man was created naked and defenceless. To live he must invent, and reason was given to him that he might force all nature into his service. His teeth and nails were powerless against the fangs and claws of the wild beast; but his hands were formed with wondrous aptitude for executing the tasks which reason set them. He invented tools and implements and weapons, and all nature became his slave. He was now able to make his own strength effect as much as if he had become stronger and more industrious. He produced more for his own comfort and subsistence, with little labour, than the greatest exertions could otherwise have obtained for him. Every successive invention has made him more powerful, has increased his strength, and multiplied the productions of his industry; and at length the giant power of steam has peopled the world with inanimate slaves who do his work faster and better than he did it himself with the greatest labour and the most ingenious tools.

The flint and fish-bone of the savage, the tool of the workman, and the steam-engine of the manufacturer, have but one common object—to save the labour of man and to render it more productive: but that is the most perfect invention which attains this object the most effectually. Can any one doubt the advantage of abundant production? It needs but a few words to point out its benefit. Whether it be for evil or for good, we are not satisfied with the enjoyment of the common necessaries of life; we all desire comforts, luxuries, and ornament: and in proportion as we desire them do we become civilized. There are many who sneer at civilization, and unhappily it has its vices, its follies, and its absurdities; but it seems the law of our nature to advance to that state, and with the increase of artificial wants our intellects become more active and enlightened, refinement of manners succeeds to barbarism, and all those moral qualities for which man is distinguished, become developed. We may conceive some Utopia in which all the noble parts of man's nature are cultivated, while his wants remain simple and easily satisfied, but the world we live in presents another picture. We might wish it were otherwise; but it is in vain to deny that refinement is the accompaniment and, in some degree, the consequence of riches, and brutality the condition of those people who have not been elevated by the increase of wealth. It follows therefore that to multiply the objects of comfort and enjoyment which human industry can produce, is to improve the condition of mankind, to raise them in the scale of moral and intellectual being, and to minister to their enjoyment of life. It is quite consistent to deprecate the vices and follies which are ever associated with our craving for new possessions, while we observe the benefits resulting from it. Throughout the world good and evil are found side by side; but the good, as we would fain believe, preponderates.

When once it is admitted that men are to be decently housed and clothed, and are to surround themselves with such comforts as they can obtain, it is clear that the more easily they can obtain them, and the more generally such possessions are enjoyed, the more completely are the objects of civilized life secured. If all men could obtain them easily, there would be no poverty, and infinitely less vice. Machinery, by diminishing the amount of labour required for the production of commodities, lowers their price and renders them more universally accessible to all classes of society. Working-men no longer toil for the rich alone, but they participate in the results of their own industry. If they desire such luxuries, 'purple and fine linen' are not beyond their reach; and their dwellings are more commodious and often more elegant than were the houses of the rich three centuries ago. If this increased facility of acquiring the comforts of life had been accompanied by greater prudence and frugality, we believe that the beneficial results of machinery would have been conspicuously shown by the improved condition of all the working classes of this country; but more money has been squandered by them in poisonous spirits, within the last fifty years, than would have sufficed to place themselves and their children beyond the reach of want.* Cheap production is more beneficial to the poor than to the rich. The rich man is certain of gratifying most of his wants, but the poor man is constantly obliged to forego one enjoyment in order to obtain another. If his shoes or his coat be worn out, his dinners must be stinted perhaps until he can pay for a fresh supply; and thus, unless his wages be reduced in consequence of the cheapness of such articles, it is beyond all question that cheapness is an extraordinary benefit to him, the money which he saves in the purchase of one cheap article is laid out upon another, and without privation or suffering he satisfies the wants which custom has made imperative. In short, he is no longer poor.

These facts are undeniable; but it is alleged that machinery not only makes articles abundant and cheap, but multiplies them beyond the wants of the world, and by causing gluts brings ruin and misery upon the working classes. For reasons explained elsewhere [DEMAND AND SUPPLY, P. C. S.] a universal glut of all commodities is impossible: the more men produce, the more they have to offer in exchange, and their

* The amount spent annually upon spirits is equal to the interest of the national debt; and the amount spent within the last fifty years may be estimated at considerably more than the entire capital of the funded debt. Six millions a year are now sufficient to support all the poor of the country; and thus some idea may be formed of the prosperity of the labouring classes of the present day, if they had accumulated a fund producing an income of thirty millions beyond the wages of their labour.

wants are only limited by their means of purchasing. But particular commodities are frequently produced in excess, and a glut of the market ensues. In causing such gluts machinery is a powerful agent, but only in the same manner as all labour would be, if applied in excess. The results would be precisely the same if too many men were employed in any department of industry; they would produce more than there was a demand for, and their goods would fall in value or be unsaleable. Commodities produced by machinery are subject to the same laws as govern all other commodities. If the supply of them exceed the demand, they are depreciated in value; but the power of producing with facility does not necessarily occasion an excess of production: it must be applied with caution, and its use be properly learned by experience. Suppose that the soil of any isolated country were extraordinarily fertile and the population very small; but that without considering these circumstances the people were to cultivate the whole of their land and bestow upon it all their skill and labour. An excess of food would be the result—more than could be eaten within the year; much would be wasted or sold without profit, and much laid up in store for another season. The husbandmen would be disappointed at the unfortunate results of their industry, but would they complain of the fertility of the soil? It would not be the soil that had caused the glut, but their own misapplied exertions; and so it is with machinery, which like a fertile soil gives forth abundance: its capabilities are known and its advantages ought to be appreciated; but if its productiveness be brought into excessive activity, it causes the evils of a glut.

The influence of machinery upon the production and consumption of commodities need not be followed any further. It increases the common stock of wealth in the world and is capable of multiplying indefinitely the sources of human enjoyment. But these benefits will be neutralized if, while it cheapens production, it has a tendency to diminish the means of employment for the people and the wages of labour;—and this leads us to the second part of our inquiry.

The invention of a machine which should immediately do the work of many men employed in a particular trade would certainly, in the first instance, diminish employment in that trade. Several men would be turned off to seek employment in other trades, and much individual suffering would be occasioned. There have been frequent instances of such a result, and so far as the immediate interests of the particular sufferers are concerned, it is an evil which cannot be too much lamented. In their case machinery is like a rival bidding against their labour, and is as injurious to them as if a fresh set of workmen had supplanted them in the service of their employer. But great as this evil is (and we would not underrate it) it is of comparatively rare occurrence and of short duration. If the invention of the machine caused no more production than the labour of the workmen had previously accomplished, the labour of a certain number of men would be permanently displaced: but as an equal quantity of goods is produced at a less cost of labour, their price is reduced and their consumption consequently encouraged. An increased supply is thus called for and more workmen are again required in the trade. In this manner the demand for increased production corrects the tendency which machinery would otherwise have to displace labour permanently. Even the temporary displacement which frequently occurs is less extensive than might be supposed. Machines are rarely invented which at once dispense with many workmen. They are at first imperfect, and of limited power: they make the labour of the workmen more efficient; but do not become substitutes for labour. Thus, even if the demand for commodities were not increased, the displacement of labour would be very limited and deferred to a distant period: but as an increased demand almost invariably follows every successive improvement in machinery, it will be found, practically, that more operatives are employed in every branch of manufacture, after the introduction of improved machinery than before.

Of this fact we shall offer some examples presently; but here it may be necessary to allude to the case of the hand-loom weavers, which is constantly adduced in proof of the supposed evils of machinery. Their unhappy condition can scarcely be overstated, nor can it be denied that it has been caused by machinery: but it must be recollected that while they have vainly contended against machinery—like pigmies against a giant—hundreds of thousands of other classes, unaccustomed to the labour of operatives, have gained a profitable employment by working *with* it, in the same trade as themselves. No one can suppose that the labour of the hands could compete with the power of steam, and the real cause of their distress is, that instead of adapting the form of their industry to the altered circumstances of their trade, they have continued to work, like an Indian caste, with the same rude implements which their fathers used before them. Their case is the same as that of a miller who should persist in grinding corn by hand, while his neighbours were building mills upon a rapid stream which ran beside his garden. His own ignorance or obstinacy, and not the stream, would be the cause of the failure of his trade.

If the case of the hand-loom weavers be adduced as an example of the permanent displacement of labour by machinery, and if it be contended that it is the natural result of machinery to diminish employment in other trades in the same manner, we must necessarily infer that wherever machinery has been largely introduced into any trade, the number of persons supported by it must have been diminished. We should infer that the agricultural population of this country must have been rapidly increasing, while the population engaged in those branches of manufacture in which steam-power is used must have been falling off or increasing less rapidly. The correctness of such an inference may be estimated from the following facts:—

In no trades has machinery been so extensively introduced as in the manufacture of cotton, wool, and silk, and nowhere has the population increased so rapidly as in the principal seats of these manufactures. Between 1801 and 1841, Manchester increased in population from 90,399 to 296,183, or 227·5 per cent.: Liverpool (whose prosperity has been caused by the cotton trade) increased, in the same period, from 79,722 to 264,298, or 231·5 per cent.; Leeds, from 53,162 to 151,874, or 185·6 per cent.; Bradford (York), from 6393 to 34,560, or 440·5 per cent.; Bolton, from 17,416 to 49,763, or 185·7 per cent.; Huddersfield, from 7268 to 25,068, or 244·3 per cent.; Macclesfield, from 8743 to 24,137, or 176 per cent.; and Dukinfield from 1737 to 22,394, or 1189 per cent. In Scotland the same results have followed from the use of machinery. Between 1801 and 1841 Glasgow increased from 77,385 to 274,533, or 254 per cent.; Paisley, from 31,179 to 60,487, or 94 per cent.; and Greenock, from 17,458 to 36,936, or 111·5 per cent.

Thus far of the manufactures of cotton, wool, and silk. The seats of the iron and hardware trades exhibit similar results. In the same period of forty years Birmingham increased from 73,670 to 190,542, or 158 per cent.; Sheffield, from 31,314 to 68,186, or 117·6 per cent.; Wolverhampton, from 12,565 to 36,382, or 189 per cent.; Merthyr Tydvil, from 7705 to 34,947, or 353 per cent.; and West Bromwich from 5687 to 26,121, or 359 per cent.

In this extraordinary ratio has the population increased in the seats of our staple manufactures, which by the aid of machinery have supplied the whole world with articles wrought by the industry of our people. Let us now compare these places with those agricultural counties in which machinery has exercised the least influence, and let us see if the absence of machinery has been equally favourable to the support of a growing population. In the same period, from 1801 to 1841, Devon increased 55·3 per cent.; Somerset, 59 per cent.; Norfolk, 50·9; Lincoln, 73·5; Essex, 52, and Suffolk, 49·5 per cent. The average increase of these six agricultural counties did not exceed 50 per cent. in forty years; while, setting aside the extraordinary increase exhibited in the particular towns already enumerated, the population of six manufacturing counties, viz. Lancaster, Middlesex, York, W. R., Stafford, Chester, and Durham, including all the agriculturists, increased 112·5.

These facts prove conclusively that machinery, so far from diminishing the aggregate employment of labour in those trades in which it is used, increases it in an extraordinary degree. And not only does it give employment to larger numbers of persons, but their wages are considerably higher. We will not stop to compare the income of an agricultural labourer with that of operatives engaged in the infinite variety of trades carried on in manufacturing towns, in connexion with machinery: but it is sufficient to ask, whence has come the manufacturing population? Its natural growth would have been comparatively insignificant if thousands had not been attracted to the towns from other places. And what could have induced them to leave their homes and engage in new trades but the encouragement offered by more certain employment and higher wages?

It has been shown that machinery has had a beneficial influence upon the employment of labour in the particular trades in which it has been used, and it now remains to consider its effects upon the employment of labour in other trades. In the first place, a few of its obvious results may be noticed. For example, the manufacture and repair of machinery alone gives employment, directly and indirectly, to vast numbers of persons who are unconnected with the particular trades in which the machinery itself is used. Again, the production of all commodities is increased by machinery; and thus the producers of the raw materials of manufactures, the carriers of goods by land and sea, the merchants, the retail-dealers, their clerks, porters, and others, must find more employment. It is clear also, that while the manufacturing and commercial population are thus increased by the use of machinery, the cultivators of the soil must receive more employment in supplying them with food.

In this and other ways the general employment of labour is directly extended by machinery. At the same time the application of machinery to existing branches of industry creates new trades and distributes capital into other enterprises which afford employment for new descriptions of labour. A hundred examples of this fact might be cited; of which railways and steam navigation are amongst the most remarkable; but such examples will be superfluous if it can be shown that it is the necessary result of the use of machinery to apply capital to new enterprises. It has been said that machinery cheapens production by reducing the amount of labour expended upon it: it follows that a less amount of capital with the aid of machinery will produce as much as a larger capital without such aid. A portion of capital is thus disengaged, either for increased production in the same trade, or for application to new speculations. In some way it must be employed, or it will yield no profit, and in some form or other it must be ultimately expended in labour. As long as a person can extend the accustomed operations of his own trade with a profit, he is disposed to do so; but as soon as he finds them less profitable than other investments, he changes the direction of his capital, and seeks new modes of increasing his profits.

There is no truth more certain than that the employment of labour is small or great according to the proportion which capital bears to the number of labourers. Capital is the fund which supports labour, and which must employ it or be unproductive; and thus, if in any country capital be increasing more rapidly than the population, employment will be abundant and wages high; if less rapidly, employment will be scarce and wages low. In the one case, capitalists will be bidding high for labour; in the other, labourers will be bidding against each other for employment. Accumulation of capital is therefore highly conducive to the interests of the labouring population generally, and the use of machinery is especially favourable to accumulation, as may be shown by a simple example. Suppose a man to have a capital of 10,000*l.*, which he is expending annually upon labour in a particular trade, and that his profits are ten per cent., or 1000*l.* a-year. Each year his whole capital is expended, and his means of accumulation are thus restricted to a portion of his annual profits only. But let him invent a machine to facilitate his business, and his position is immediately changed. If this machine should cost 5000*l.*, and the other 5000*l.* be still expended in labour, he may be said to have saved one half of his entire capital in a single year; for instead of spending the whole of it as before, in labour, he is possessed of a durable property which, at a small annual cost, will last for ten or probably twenty years. Nor can it be said that this saving is effected at the expense of labour; for the owner of the machine is placed in a new position in respect to his profits, which prevents him from securing to himself the difference between the amount paid now and that previously paid for labour. To gain a profit of ten per cent. it had been necessary for him, before the invention of the machine, to realize 11,000*l.* annually, being his whole capital and the profits upon it: but now, in order to obtain the same profit, it is sufficient if he realize 6500*l.* only: viz., 500*l.* profit upon his fixed capital of 5000*l.*; 500*l.* for repairs, and wear and tear, calculated at ten per cent.; and 5500*l.* to replace the sum spent upon labour with a profit of ten per cent. He would realize the whole 11,000*l.* as before, if he were able; but he is restrained by competition, which levels the profits of trade. For some time he will most probably obtain more than ten per cent. profit, and so long as he is able to do this, his means of accumulating fresh capital in addition to his machine will be increased, which capital will be expended upon additional labour. But when his profits had been reduced to their former level by competition, society has gained in the price of his goods 4500*l.* a-year, being the difference between 11,000*l.* formerly realized by him, and 6500*l.* his present return. But is this amount thus gained by society lost to the labourer? Unquestionably not. As a consumer, he participates in the advantage of low prices, while the amount saved by the community in the purchase of one commodity must be expended upon others which can only be produced by labour. It cannot be too often repeated, that all capital is ultimately expended upon labour; and whether it be accumulated by individuals in large sums, or distributed in small portions throughout the community, directly or indirectly it passes through the hands of those who labour. If a manufacturer accumulates by means of higher profits, he employs more labour; if the community save by low prices, they employ more labour in other forms. So long as the capital is in existence, it is certain to have an influence upon the general market for labour.

We are now speaking not of the interests of particular workmen to whose temporary sufferings caused by the use of machinery we have already adverted, but of the general and permanent interests of the working population of a country. As regards these, the statistics of British industry amply confirm all reasoning from principles, and prove beyond a doubt that machinery has had a beneficial influence upon the employment and wages of labour. Any one who will reflect upon the facts which have been noticed above, as disclosed by the Census [Census, P. C. S.], can scarcely fail to arrive at the conclusion that without machinery England could not have supported her present population, or could only have supported them in poverty and wretchedness. Nor must the degradation of a part of the manufacturing population be thoughtlessly attributed to machinery, instead of to moral and social causes, which are independent of it. Into these causes it would be out of place, at present, to inquire; but enough has been said to show, 1st, that machinery by increasing production multiplies the sources of enjoyment, and places them within the reach of a greater number of persons; and 2ndly, that by giving increased employment to labour it enables more persons to enjoy those comforts which it has itself created. These are the elements of social prosperity, and if evils have sprung up with it, like tares with wheat, it is not machinery which has caused them. Wherever the influence of machinery has been felt, wealth has advanced with rapid strides; and though in too many cases religion, virtue, and enlightenment may have lagged behind, the tardiness of their progress is to be ascribed, not to machinery, but to the faulty institutions of men.

MACKENZIE, HENRY, was born at Edinburgh in August, 1745. He was the son of Dr. Joshua Mackenzie, a physician in extensive practice and of literary habits. His mother belonged to an ancient family in the county of Nairn. He was educated at the high school and university of his native city; and afterwards he became one of the attorneys in the Scottish Court of Exchequer, a department of law-business which is now all but extinct, and which even then was extremely limited, and conducted by a very few practitioners specially appointed for the purpose. His professional duties, while he held this place, must have left him abundant leisure for indulging his literary tastes. While in London in 1765, studying the English practice in Exchequer, he had begun to write his earliest and best novel, 'The Man of Feeling,' which was published anonymously in 1771, and for some years was not acknowledged by the author. In 1783 he published his second novel, 'The Man of the World;' and next came 'Julia de Roubigné,' his last considerable work of this class. Meantime he had edited two well-known periodicals in the manner of the Spectator: 'The Mirror,' which continued to appear for seventeen months from January, 1779; and 'The Lounger,' which, begun in February, 1785, came to a close about two years afterwards. To the former Mr. Mackenzie contributed forty-two papers; to the latter fifty-seven. Among these are his small novels, such as 'The Story of La Roche,' and a kindly criticism on the poems, then new, of Robert Burns. The Transactions of the Royal Society of Edinburgh received from him several papers; and one of these, a memoir on German tragedy, was followed in 1791 by a volume of dramatic translations, which was one of the earliest causes that drew the attention of Walter Scott to German literature. The Highland Society likewise published in their Transactions papers of Mr. Mackenzie, one of which was his account of the Ossianic Controversy. In 1793 he wrote, for an edition of the works of the blind poet Blacklock, a memoir of the author; and a Life of John Home, the author of 'Douglas,' which he read to the Royal Society of Edinburgh in 1812, was afterwards prefixed to an edition of Home's works, and also published separately. Mr. Mackenzie himself wrote several plays, which are more remarkable for refinement of feeling, imagery, and language, than for dramatic force or effectiveness. The collected edition of his works contains three of these: 'The White Hypocrite,' a comedy, which was once performed at Covent Garden: 'The Spanish Father,' a tragedy, which Garrick had declined to bring on the stage on account of the harrowing nature of the catastrophe; and 'The Prince of Tunis,' which had been acted at Edinburgh with much applause in 1773, and printed separately the same year.

He was likewise a political writer in the Tory interest. His most elaborate work of this sort was 'An Account of the Proceedings of the Parliament of 1784,' which was revised and corrected by Mr. Pitt's own hand; and he published some anti-jacobin tracts at the time of the French Revolution. The merit of these services to the government, set forth by his friends Lord Melville and Mr. George Rose, procured for him in 1804 the place of comptroller of taxes for Scotland, an office of large emolument, but considerable labour and responsibility, which he held thenceforth till his death.

In 1808 he edited a complete collection of his literary works, in eight octavo volumes; and this was almost his last contribution to literature. 'The old stump,' as he himself was once heard to say, 'would still sometimes send forth a few green shoots;' but his official duties occupied much of his time; and the romantic fervour of sentiment, which had prompted his early literary efforts, had given way to practical habits of thinking and feeling, such as a man of business may unite with literary tastes and with a fondness for literary amusement. Indeed that tendency to sickly refinement, which characterised his exquisite novels, indicated a want of the vigour of mind essential to success in the highest walks of literary invention; and his is not the only case in which genius of this cast has put forth all its strength in youth, and been overborne in mature years by the realities of life.

Accordingly, for many years, Mr. Mackenzie's leisure was spent either in the society of literary and other friends, or in shooting and fishing, sports to which he was particularly attached, and which he pursued as long as his strength permitted. His old age was healthy, cheerful, and happy: a slight deafness alone indicated the decay of nature. He, who had in youth breakfasted with Dr. Johnson, and who had enjoyed the friendship of Blair and Robertson and Adam Smith, lived to see one generation after another, and revolution after revolution in the phenomena of literature.

He had married the daughter of Sir Lodovick Grant of Grant: and by this lady he had eleven children, one of whom has long been a judge in the Supreme Court of Scotland. Henry Mackenzie died in Edinburgh on the 14th of January, 1831, being in the eighty-sixth year of his age.

MACROCHE'ILUS, a genus of fossil Gasteropoda, proposed by Professor Phillips (*Palæozoic Fossils of Devon*) to include several species which occur in the Devonian and carboniferous strata

MACRO'POMA, a genus of fossil fishes, proposed by Agassiz: the species belong to the cretaceous strata.

MACROSE'MIUS, a genus of fossil fishes proposed by Agassiz. From the oolite.

MADNESS. [INSANITY, P. C.; LUNACY and LUNATIC ASYLUMS, P. C. S.]

MAECIA'NUS, LUCIUS VOLUSIUS, a Roman jurist, who lived in the time of Antoninus Pius and Marcus Aurelius. He was one of the legal advisers of Antoninus (Capitolinus, *Anton. Pius*, 12), and one of the instructors of Aurelius in law (Capitolinus, *Ant. Philosoph.* 3). He was held in high estimation by Aurelius, as appears from a Rescript of the Divi Fratres, in which he is styled their friend and a most careful student of the Civil Law (*Dig.* 37, tit. 14, s. 17). He was also a friend of the jurist Julianus (*Dig.* 35, tit. 2, s. 30, § 7). It is conjectured that he was made governor of Alexandria by Aurelius, for Vulcatius Gallicanus, in his Life of Avidius Cassius (c. 7), mentions a Maecianus who was put to death there by the army for joining in the rebellion of Avidius Cassius. The writings of Maecianus which are mentioned in the Florentine Index are sixteen books on Fideicommissa, and fourteen on Judicia Publica. There are 44 excerpts from Maecianus in the Digest. His Libri Quaestionum are also mentioned in the Digest (29, tit. 2, s. 86); and a commentary, or something of the kind, on the Lex Rhodia de Jactu (*Dig.* 14, tit. 2, s. 9). Maecianus is cited by Papinianus, Ulpianus, and Paulus.

An extant treatise, De Asse et Ponderibus, is supposed by some writers to belong to another author of the same name.

MAGIC LANTERN is a species of lucernal microscope, its object being to obtain an enlarged representation of figures, on a screen in a darkened room, by means of the pencils of light issuing from a lamp or candle and passing through a convex lens.

The instrument consists of a lantern, generally of tin, and of a cubical form, in the interior of which is the light; and at a perforation in one of the sides is applied a tube projecting horizontally from it. Immediately before the aperture, and within the tube, is a glass lens, often nearly a hemisphere and three or four inches in diameter, serving to condense the light which proceeds from the lamp both directly and by reflexion from a concave mirror attached to the side of the lantern which is directly opposite the aperture: this tube carries within it another, which is also provided with a convex lens, and is capable of a small movement for the purpose of adjustment.

A groove in front of the lantern and parallel to that front receives a rectangular frame containing the glass plates on which are painted, with transparent colours, the objects of which an enlarged view is to be obtained; and, as the amusement of young persons is chiefly intended by the exhibition, grotesque figures are usually those which are represented. Instead of a single convex lens, the sliding tube is sometimes provided with two such lenses; these are placed at a little distance from one another, and have between them a perforated plate of tin, crossing the interior of the tube: the lens, or pair of lenses, is of such a focal length that the rays in each of the pencils which proceed from the object may unite on the screen and thus produce the enlarged representation of the figure.

Several figures are usually drawn on the same plate of glass, and the plate is capable of being moved by hand in the groove so that the different figures may be brought successively before the spectator: there may thus be exhibited various scenes relating to one subject, which is generally some absurd fiction.

Persons who make it their occupation to exhibit the magic lantern frequently give, with the representations, descriptions of the objects on the screen; and these being expressed in a peculiar jargon, add in a certain degree to the amusement of the company: they frequently also, for the purpose of heightening the effect, give, by a simple wheel-work, motions to the figures which are painted on the plates of glass.

This ingenious toy, as it may be considered, is said to have been invented by Kircher, in the seventeenth century, and it is described by him in his 'Ars Magna Lucis et Umbræ.' The celebrated Euler proposed to substitute for the lens in the side of the lantern a concave mirror, perforated in the middle like that of a Gregorian telescope: this was to be placed in the interior of the lantern with its polished surface towards the light and its convexity towards the object. The light was to be so disposed that none of it should pass directly through the aperture in front of the lantern so as to fall on the screen; and that which was reflected from the concave mirror, after falling upon one with a plane surface, was from thence to be reflected in a contrary direction upon the object. The rays in the pencils proceeding from the object were to pass through a lens in the tube, as in the former construction; and, by converging with greater accuracy to points on the screen, they would have produced a more correct image than that which results from refracted light alone.

A remarkable improvement in the manner of employing the magic lantern was first exhibited in London in the year 1802. The lantern itself is similar to but larger than that which serves for more general purposes; and the sliding tube which carries the farthest lens has a greater range of motion. The objects to be exhibited are painted upon a glass plate, which is inserted in a groove as before stated; and the machine is placed upon a stage which is capable of being moved on wheels in a direction perpendicular to the screen on which the objects are represented.

The screen is a curtain made of fine muslin or gauze, and covered with varnish so as to be quite transparent: it is stretched in a vertical position across the theatre or apartment; and this being made quite dark, the spectators occupy the space in front of the screen, while the apparatus is disposed on the opposite side.

In any magic lantern when the tube carrying the lens which is farthest from the lamp is drawn out as much as possible, the magnitude of the image represented on a screen is the smallest; that image increases in magnitude in proportion as the tubes are diminished in length, or as the lens is brought nearer to the body of the lantern. It increases also in proportion as the whole machine is made to recede from the screen; and the variations of the length of the tubes must, by the exhibitor, be combined with the different distances of the lantern from the screen, in order that by the just convergence of the rays in each pencil, on the screen, the proper degree of distinctness of vision may be obtained under all the variations in the magnitude of the image.

Care is taken that during the exhibition all light shall be excluded both before and behind the screen, except that which, in proceeding from the lantern, produces the image to be observed; and the screen being itself invisible, the spectators can scarcely divest themselves of the idea that they are looking into a dark cavern, in which the objects, at first dimly visible as specks in its deepest recesses, appear to be gradually advancing towards them, increasing in magnitude as they seem to approach: after the objects have been some time apparently in the immediate presence of the company, perhaps surrounded by a blaze of light, they seem as gradually to retire, and at length they vanish, leaving the place in profound darkness. The effect of the exhibition is, moreover, heightened by the accompaniment of mournful or inspiring sounds, according to the character of the object, from musical instruments disposed for the purpose.

Spectres are frequently exhibited in this manner; but occasionally the heads, or the entire figures, of celebrated personages are shown; and the illusions produced have caused the name of *Phantasmagoria* to be applied to the apparatus.

MAGISTRATE, a word derived from the Latin *magistratus*, which contains the same element as *magnus* and *magister*, and signifies both a person and an office. A Roman magistratus is defined to be one who presides in a court and declares the law, that is, a judge. The kings of Rome were probably the sole Magistratus originally, and on their expulsion the two consuls were the Magistratus. In course of time other offices, as those of Praetor and Aedile, were created; and those who filled these offices were elected in the forms prescribed by the constitution, and they had jurisdictio. [JURISDICTION.] The original notion of a magistratus, then, is one who is elected to an office, and has jurisdiction

In England the term magistrate is usually applied to justices of the peace in the country, and to those called police magistrates, such as there are in London. It has also been applied in other ways; for instance, people have sometimes said that the king is the chief magistrate in the state. But these applications of the term do not agree with its proper sense. A Roman magistratus was elected, and so far he differed from a justice of the peace; he also exercised delegated power in his jurisdiction, in which respect, as well as being elected, he differed from the king of England, who is not elected, and does not exercise delegated jurisdiction, but delegates jurisdiction to others.

MAGNETISM, ANIMAL. [ANIMAL MAGNETISM, P. C. and P. C. S.]

MAGNETO'METER is the name given to a magnetized bar of steel, of considerable dimensions compared with the needle of an ordinary compass, which is employed to determine either the absolute amount of magnetic declination (commonly called the *variation* of the needle) or the resolved intensities of terrestrial magnetism in horizontal or vertical directions. It has the names of *declination magnetometer*, and *vertical* or *horizontal force magnetometer*, according to the purpose to which it is applied.

The declination magnetometer is of various sizes; for general purposes it is from 12 to 15 inches long, 1 inch broad, and ¼ inch thick; but that which is mounted in the Greenwich Observatory is 2 feet long, 1½ inch broad, and ¼ inch thick: the bar is placed so as to rest at the middle of its length, within a sort of stirrup made of gun-metal, and this, at its upper part, has a triangular aperture through which passes a metal cylinder. A skein or a number of fibres of untwisted silk, from 3 feet to 8 or 9 feet long, attached to the middle part of the cylinder, passes over a pulley at the top of the stand or near the ceiling of the apartment, and, afterwards descending, is connected with a small windlass, in order that the bar may be raised or lowered: thus the bar is suspended in a horizontal position, with freedom to turn on a vertical axis till it rests in the plane of the magnetic meridian. The whole apparatus is contained in a box of wood, in order to protect it from the agitations of the air, glazed apertures being provided for the purpose of allowing the observations to be made.

In some constructions, near each extremity of the magnetized bar is a sliding frame of gun-metal: one of these frames carries a small glass plate on which is a graduated scale, and the other carries an achromatic lens, the focus of which coincides with the scale. By means of a telescope placed at a certain distance in the direction of the magnetometer the graduations on the scale may be observed through the lens, so that the instrument becomes a sort of collimator; and by the number of the graduation which coincides with the wire in the eye-piece of the telescope, the absolute position of the axis of the bar and any variations in its position may be observed.

The stand which carries the suspending fibres of silk generally consists of two pillars of copper, firmly supported on a stone base; and at the upper extremity the apparatus to which the silk fibres are attached is connected with a horizontal circle, graduated, for the purpose of determining the value of any torsion which may exist in the fibres.

Previously to placing the magnetometer in the stirrup, a bar of gun-metal, called a *detorsion bar*, equal in weight to the magnetometer, and, like it, furnished with a graduated scale and lens, is suspended by the silk fibres: this is allowed to vibrate till it comes to a state of rest; the angle which its axis makes with the plane of the magnetic meridian is then observed, and the torsion circle, carrying the fibres depending from it, is turned round on its vertical axis till the detorsion bar is brought to that plane. Thus the torsion of the fibres is nearly obviated.

In order to find the point on the graduated scale which corresponds to the magnetic axis of the magnetometer, the latter is placed in the stirrup; and, looking through the telescope, the observer remarks the graduation of the scale which coincides with the vertical wire in the field of view: the like observation is made with the magnetometer in a reversed position; and then half the sum of the numbers on the scale is that which coincides with the axis; half the difference of the readings converted into angular space (the distance of the telescope from the scale being the radius) is the deviation of the optical axis of the telescope from the magnetic meridian. The telescope having a movement in azimuth, it must then be turned through an angle equal to the deviation, and thus brought into the plane of that meridian. The apparatus would then be ready for use if it were not that some remains of torsion may exist in the fibres; and this must be corrected by means of the detorsion apparatus as before.

When it is required to determine the absolute declination, the point which indicates on the scale the direction of the magnetic axis of the bar being in coincidence with the wire in the telescope, and a correction made for any existing error of collimation, the telescope is turned horizontally to some terrestrial object whose azimuth from the astronomical meridian is known. Then the difference between this azimuth and the angle through which the telescope was turned will evidently be the required declination, or the angle between the planes of the astronomical and magnetic meridians.

After the actual position of the magnetic meridian has been determined as above, any deviations of the axis of the magnetometer from it, indicated by a different division of the scale coinciding with the vertical wire of the telescope, will denote a variation of the declination; but it is evident that such deviation will be affected by the torsion induced in the silk fibres in consequence of the angular movement of the magnet. The correction due to this cause of error is to be found from an experimental determination of the relation between the force of terrestrial magnetism and the force of torsion: thus, a magnetized bar being already in the plane of the magnetic meridian, let the torsion circle be turned on its axis till a radius of it has described any angle (called the angle of torsion), and let the position of the magnetometer be observed when it rests between the force of torsion thus created, by which it is made to deviate from the meridian, and the horizontal force of magnetism, by which it is drawn towards the meridian. Then, by mechanics, the force (M) of magnetism is to the force (T) of torsion as the difference between the angle of torsion and the angular distance of the bar from the meridian is to the latter distance; or, by proportion, T+M is to M as the given angle of torsion is to the difference between that angle and the distance of the needle from the meridian. The last ratio being obtained from an experiment, holds good for any corresponding observation; consequently the observed changes of declination must be increased in the ratio of M to T+M, or be multiplied by $\frac{T+M}{M}$, in order to have the correct changes.

When it is required to determine the absolute horizontal intensity of terrestrial magnetism with an apparatus like that which has been described, a magnetic bar of the same dimensions as that which is suspended is used with the latter: this is called a deflecting bar. It is placed in the direction of a horizontal line passing through the centre of the suspended magnet, perpendicular to the magnetic meridian, at two different distances, R and R′, from that centre; and the angular deflexions produced by its actions on the suspended bar are observed; first, when the north end of the deflecting bar, at each distance, is towards the east, and again when it is towards the west. Half the difference between the observed deflexions at the two distances is taken as a mean deflexion. A second mean deflexion is obtained from observations made in like manner with the deflecting bar on the opposite side of the suspended bar: let these mean angular deflexions be represented by θ and θ'; then the formula

$$\frac{R'^5 \tan.\ \theta' - R^5 \tan.\ \theta}{2\,(R'^2 - R^2)} \cdot \frac{T+M}{M},$$

investigated by M. Gauss, will give the ratio of the force m of magnetism in the bar to the horizontal force F of the earth's magnetism, or the value of $\frac{m}{F}$. The second factor is the correction on account of the force of torsion in the suspending lines of silk.

The value of mF, or the momentum of the horizontal force of the earth's magnetism on the suspended bar, may be computed. For, representing the momentum of the bar's inertia with respect to a vertical axis passing through its centre of gravity by N ($N = \frac{1}{12}\mu(a^2+b^2)$ in which a is the length, b the breadth, and μ the mass of the bar, whose form is rectangular), $\frac{mF}{N}$ denotes the angular velocity of the bar. But, by mechanics, the angular velocity of a suspended body is expressed by $\frac{g}{l}$ (g being the force of gravity, and l the distance from the centre of suspension to that of oscillation in the magnetometer), or by its equivalent $\frac{\pi^2}{T^2}$ ($\pi = 3{\cdot}1416$, and T the observed time in which the magnet makes one vibration); therefore, applying also the correction for torsion,

$$mF.\ \frac{T+M}{M} = \frac{\pi^2 N}{T^2}.$$

From the values of $\frac{m}{F}$ and mF, the value of F, the required intensity of magnetism in the horizontal direction, may be found.

The bifilar magnetometer, invented by M. Gauss for determining both the absolute amount of the horizontal intensity of magnetism and its variations, has been noticed under Terrestrial Magnetism, P. C. The horizontal force magnetometer at the Greenwich Observatory is bifilar, and of the same dimensions as the declination magnetometer. Below it, and under the centre of motion, is fixed a mirror in a vertical plane, but oblique to one passing through the magnetic axis of the bar: this reflects to the eye of the observer a scale which is applied to the opposite side of the apartment; and, the telescope being directed to the mirror, in proportion as the magnet declines more or less from the meridian, the numbers which on the scale appear in coincidence with a wire in the telescope increase or diminish. Thus the variations of the horizontal intensity are obtained.

The instrument is held nearly perpendicularly to the magnetic meridian by the force of torsion in the two halves of the skein of silk by which it is suspended: these parts are each about 8 feet long. An oblong ring of copper, which entirely surrounds the magnet in a vertical plane, serves to diminish the extent to which the bar would vibrate; and both ring and bar are contained in a double rectangular box, one side of which is of plate glass: the box is covered with gilt paper, in order to obviate the effects of electricity in the apparatus.

The suspended bar being in equilibrio between the force of torsion and the horizontal force of magnetism, it is evident that if the former force be computed, the latter will be obtained. In order to determine the variations of the horizontal force by the observed deviations of the bar from its mean place the following formula is employed:

$$\frac{dF}{F} = -\text{cotan.}\ v\ du,$$

in which F is the absolute horizontal force, dF its variation, v the angle between a vertical plane passing through a line connecting the upper extremities, and one passing through a line connecting the lower extremities of the two parts of the suspending line; du is the observed deviation of the axis of the needle from its mean place, and is expressed by the length of an arc in terms of the radius. $\frac{dF}{F}$ evidently gives the variation of the horizontal intensity in parts of its absolute value.

The vertical force magnetometer is a magnetized bar which is crossed in the middle by a short axle perpendicular to its length, and has its lower part, on each side, reduced to an edge. This *knife-edge*, as it is called, passes nearly through the centre of gravity of the bar, and rests, on each side of the bar, on an agate plane; the whole is supported on a short copper pedestal, which rests on the base of the instrument. For the purposes of adjustment the bar is furnished on each arm with a screw, which acts as a weight: that which is attached to one arm is parallel to the magnetic axis of the bar, and by moving it backwards or forwards the bar is made to assume a horizontal position: the other is in a vertical position, or at right angles to the magnetic axis; and by moving it upwards or downwards the centre of gravity is made to coincide with the knife-edge. The whole apparatus is capable of being turned on a vertical axis, so that the bar may be placed in any azimuth with respect to the magnetic meridian.

In some constructions of the instrument there is attached to each extremity of the bar a ring of copper carrying two wires at right angles to one another; a line joining the intersections of the pairs of wires should be parallel to the magnetic axis of the bar, and the deviation, if any there be, is determined by observing the intersections on a scale in a microscope, which is fixed on a support near each extremity of the bar; the latter, while at right angles to the magnetic meridian, being for this purpose placed successively in a direct and a reversed position. Half the difference between the readings on the scale is the value of the error.

In order to put the magnetized bar in any required position, a brass bar of the same dimensions as the other, and like it provided with knife-edges, is made to rest on the agate planes, and is brought to the magnetic meridian by means of a magnetized needle which turns on a pivot at the top of the bar. A theodolite is placed on the base of the instrument, and its telescope is turned till the crossing of wires in the field of view bisects a distant object; the telescope is then turned horizontally through an angle equal to the required azimuth in which the magnetized bar is to be placed, but in a contrary direction, and lastly the stand carrying the whole apparatus is turned round horizontally till the telescope wires again bisect the object. The bar will then be situated in the required azimuth.

When the variations of the vertical intensity of terrestrial magnetism are to be observed, the interval between a fixed wire in the microscope and the apparent place of the intersection of wires on the bar is measured by means of the moveable wire in the former; the deviation is read on a scale provided for the purpose, and is expressed by a circular arc in terms of the radius. The formula for determining the ratio between the absolute vertical force of magnetism and its variation is

$$\frac{dF'}{F'} = \frac{t'^2}{t^2}\ \text{cotan.}\ \theta\ d\eta,$$

in which F′ represents the vertical intensity, dF′ its variation, t and t' are the times in which the needle would perform a vibration in a vertical and in a horizontal plane respectively, θ is the inclination (commonly called the dip), and $d\eta$ is the observed deviation of the bar from a horizontal position.

At the Greenwich Observatory the vertical force magnetometer is provided with a mirror, which stands over its centre of motion with its plane oblique to the magnetic axis of the bar. A scale is affixed to the opposite wall of the apartment, and the mirror reflects it to the eye of the observer, who, looking through a telescope, reads the division of the scale which appears in coincidence with the wire in the field.

The building containing the magnetic instruments at Greenwich is in the form of a cross on the plan; two of the walls are parallel, and the two others perpendicular to the magnetic meridian. The declination magnetometer is in the south arm, the horizontal force magnetometer in the east, and the vertical force magnetometer in the west arm of the building: both of these bars are perpendicular to the magnetic meridian. Three telescopes are placed in such situations that the observer, seated near all of them, can readily turn from one to another, and thus make his observations on the three magnetometers nearly at the same time.

MAGNO'LIA, a genus of plants named in honour of Pierre Magnol, who was professor of medicine and prefect of the botanic garden of Montpellier. He was born in 1638, and died 1715. He gave an account of the plants growing wild about Montpellier, in a work entitled 'Botanicum Monspeliense; seu Plantarum circa Monspelium nascentium Index,' 8vo., 1686. This work was illustrated with plates, as well as one published in 1689 with the title 'Prodromus Historiæ generalis Plantarum in quo Plantæ per Familias disponuntur,' was arranged according to a natural system of his own. In another work embracing the plants growing in the Montpellier garden, entitled 'Hortus Regius Monspeliensis,' he has arranged the plants according to the system of Tournefourt.

The genus Magnolia is the type of the natural order Magnoliaceæ. It has a calyx of 3 deciduous sepals that resemble petals; the corolla is composed of 6 to 9 petals; the stamens and pistils numerous; the carpels are disposed compactly in spikes, opening by the external angle, 1-2-seeded, permanent; the seeds baccate, somewhat cordate, pendulous, hanging out beyond the carpels by a very long umbilical white thread. The species of Magnolia are trees or shrubs, with alternate, stipulate, deciduous, or evergreen simple leaves, and large terminal solitary odoriferous flowers. They are all natives of North America and Asia.

M. grandiflora, Great-flowered Magnolia, or Laurel Bay, is an evergreen tree, reaching sometimes a height of 70 feet. It has oval-oblong coriaceous leaves with the upper surface shining and the under surface rusty; the flowers erect, with from 9 to 12 petals expanding. This plant is one of the tallest and handsomest trees of North America. It has large pale-green shining leaves nearly 10 inches long, with large white flowers. It has been cultivated in England for the last century, and in this country attains a height of from 20 to 30 feet. Several varieties of this species have been named and described. Amongst the most constant and best known varieties are, 1, *M. g. obovata*; 2, *M. g. Exoniensis*; 3, *M. g. angustifolia*; and 4, *M. g. præcox*. The first is known in the Carolinas by the name of the Big Laurel; the second is the Exmouth Magnolia; the third and fourth are varieties which have been produced in France.

In the cultivation of this species a deep sandy loam, dry at bottom, and supplied with vegetable mould, suits all the varieties. In planting it against a wall, almost any aspect may be chosen except a north-east. This plant may be propagated by stools, which should be laid down in autumn, and require two years before they are fitted for separation. They are then potted, and kept in pits or under glass during the winter. It may be also propagated by seeds from America.

M. glauca, deciduous Swamp Magnolia, is an almost deciduous plant, with obtuse elliptical leaves, glaucous on the under surface; the flowers from 9-12 petalled, contracted; the petals ovate, concave. This species is a tree rising from 15 to 20 feet in height. It is a native of North America, in low moist swampy ground at a little distance from the sea, from Massachusetts to Florida and Louisiana. This plant is also cultivated, and a number of varieties have been described. The bark has a bitter and aromatic odour resembling sassafras. On this account it has been used in America as a substitute for other aromatic bitter barks as Cascarilla, Canella, &c., and, it is said, with great success. Although not much used in Europe, very favourable reports of its efficacy in chronic rheumatism, ague, and remittent fever have been given. All the species of Magnolia possess more or less the properties which are most evident in *M. glauca*. When used, a tincture made from the bark, seeds, or cones, is equally efficacious. It is said that when the tincture is made from the leaves and cones whilst green, it is more efficacious. In America this tree is known by the names White Laurel, Swamp Laurel, Swamp Sassafras, Sweet Bay, and Beaver-tree. The last name is given to it on account of the fondness of the beaver for it. The flowers are of a cream colour and have a sweet scent, which Kalm says may be smelt at a distance of three miles. The flowers are followed by red berries, which give the tree a handsome appearance. The berries are steeped in brandy and used as a domestic medicine for various complaints.

M. umbrella is a deciduous tree with lanceolate spreading leaves, the adult ones smooth, the younger ones pubescent underneath; the petals 9-12, exterior ones pendant. It is a native of North America, in the Carolinas, Georgia, Virginia, and New York. The leaves are 1 to 2 feet long, placed at the ends of the branches in a circular manner, somewhat in the form of an umbrella, from which circumstance it has been called the Umbrella-tree. The wood is soft and spongy, and on the mountains of Virginia is called Elmwood.

M. acuminata, a deciduous tree with oval acuminate leaves, the under surface pubescent, the flowers with from 6 to 9 petals. It is a native of North America, from Pennsylvania to the Carolinas. The flowers are large, 3 or 4 inches in diameter, of a yellowish colour, mixed with faint blue or pea-green, but not remarkable for their beauty. The fruit is about three inches long, and resembles a small cucumber, whence in America it is called Cucumber-tree. A tincture is made of the fruit, and is used in cases of rheumatism. Several varieties of this plant have been described. It is often used in the London nurseries as a stock on which to engraft the other species.

There are several other species of this magnificent genus found in the forests of North America, all of which are valued in Great Britain for ornamental culture. The best known of these are *M. cordata*, the heart-leaved Cucumber-tree, with yellow flowers streaked with red, and having a disagreeable odour; and *M. auriculata*, Indian Physic, or long-leaved Cucumber-tree, having white flowers and a bitter bark, which is used as a medicine by the Indians.

M. Yulan, or *conspicua*, a deciduous tree with obovate abruptly acuminated leaves, the younger ones pubescent, expanding after the flowers, the flowers erect, 6-9 petalled; the styles erect. This plant attains a height of 30 or 40 feet in its native country, but reaches only 8 or 10 feet in our gardens. It grows in China, where it has been cultivated since the year 627. Its native name is Yulan. It is a very showy tree, having white flowers sometimes suffused with purple, which give out a most delicious perfume. It blossoms in this country from February to April, and is distinguished from the other species by the flowers appearing before the leaves. It is not quite so hardy as the American species; still, unless the weather is unpropitious, it will put forth an abundance of blossoms during the dreary months of February and March.

M. purpurea, the purple-flowered Magnolia, is a deciduous shrub, with obovate acute reticulately-veined leaves, almost smooth; the flowers erect, of 3 sepals and 6 obovate petals; the styles very short. This plant is a native of Japan, and seldom attains a greater height than 10 feet. The bark when bruised has an aromatic odour. The flowers are more or less purple without, and always white within. It is a very ornamental species and worthy of cultivation. The best situation for it is against a wall, when its branches will reach from 15 to 20 feet.

In their cultivation the hardy kinds may be treated in the same way as M. grandiflora. The Chinese kinds are often inarched or budded on *M. obovata*. When the plants are replanted after layering or propagation by seed, neither the roots nor leaves ought to be cut off, otherwise they will not succeed so well.

(Don, *Gardener's Dictionary*; Loudon, *Encyclopædia of Trees and Shrubs*.)

MAHADE'VA. [SIVA, P. C.]

MAHMUD II., Sultan of Turkey, the younger son of Sultan Abdu-l-Hamid, or Ahmed IV., was born on the 14th of Ramazán, A.H. 1199 (the 20th of July, A.D. 1785), and succeeded his elder brother, Sultan Mustafa IV., on the 28th of July, 1808. It has been shown [TURKEY, P. C.] how Sultan Selím, the uncle of Mahmud, was deposed and imprisoned in 1807 on account of his civil and military reforms, and that Mustafa had no sooner succeeded him than he abolished the new institutions of Selím, especially the Nizam Jedíd, or the body of troops who were disciplined on European principles. Mustafa Bairaktar, pasha of Rusjuk, an old friend of the deposed Selím, strongly objected to the policy of Sultan Mustafa, and no notice being taken of his remonstrances, put himself at the head of his troops, marched upon Constantinople, occupied the town, and proclaimed Selím sultan. But while Selím's name was shouted by the victors in the streets of Constantinople, he had ceased to live; he was assassinated by order of Mustafa, who thought that by removing the object of the revolution, he could also crush it. He was mistaken. Mustafa Baïraktar occupied the seraglio, after a bloody struggle, and after having confined Sultan Mustafa in the same prison in which Selím was murdered, he proclaimed Mahmud, who was found in a room hid under carpets and books, and more ready to believe that he was going to be murdered than to be placed on the throne of Osman. Hitherto Mahmud had spent his days in the quiet confinement of the seraglio, chiefly occupied with Turkish and Persian literature, and enjoying, during the last twelve months previous to his accession, the instruction of the captive Selím, who, it is said, foretold his nephew's future elevation, and initiated him in those principles of reform through which he had endeavoured, though in vain, to reorganise Turkey. Mahmud was also imbued with that deep hatred of the Janissaries which was one of the leading principles of his future actions.

Mahmud ascended the throne when Turkey was in a violent political and social crisis. In consequence of the enlightened but weak government of Selím the prejudices of the people were roused without meeting with a power sufficient to keep them in check; the sultan's authority was disregarded by the pashas of Europe, Asia, and Africa; and the Janissaries, who were exasperated through Selím's attempts upon their privileges, were ready instruments in the hands of those agitators who, under the pretext of either avenging the murder of Selím, or the deposition of Mustafa, were, at first secretly, then openly, sowing the seeds of discord. In spite of this threatening state of the empire, Sultan Mahmud boldly proclaimed that he would carry out the reforms of Selím, and by choosing Mustafa Baïraktar his grand vizír, he proved that he was not using idle words. Several pashas who were severely punished for disobedience were the first to perceive that Turkey was now governed by a reformer more energetic than Selím. When the turn of the Janissaries came, they broke out in open rebellion, and besieged Mustafa Baïraktar, whom they believed to the originator of the reforms, in his fortified palace. Unable to hold out longer, and receiving no relief from the sultan, who was himself assailed by the rebels, the gallant vizír blew himself up. Mustafa was proclaimed sultan, and the rebels cried out for the head of Mahmud. In this critical position Mahmud did a deed at which humanity shudders, but which was one of the boldest political strokes ever attempted by a Turkish sultan: he ordered his captive brother to be strangled together with his infant son; and those of Mustafa's women and concubines who were pregnant, four in number, were sewn up in leathern sacks, and drowned in the Bosporus. By these murders Mahmud became the only male descendant of Osman.

His life was in the utmost danger. Yet he had no higher thought than the glory of Turkey, and he made its existence depend upon his own, for with the death of the last of the house of Osman, the empire of Osman would have become a prey to anarchy. The very fact, however, of his being the only descendant of Osman, was a sort of guarantee for his life, for although the people had massacred more than one sultan, and the sultans themselves had shed the blood of more than a hundred royal princes, these crimes were committed against individuals and not against the reigning family, the popular belief being that Turkey would last no longer than the family by whose great ancestor the empire was founded. Mahmud was fully aware of this when he sacrificed his brother and his brother's children, and we may fairly presume that his object was to make himself the only representative of the founder's family.

Mahmud succeeded in crushing this bloody rebellion after a struggle of two days, and having conciliated the Janissaries by abolishing the Nizam Jedíd and establishing his authority at home, he turned his attention to his relations with the European powers. The war with Russia had just broken out. The Turks were defeated; Constantinople was in danger; the principal pashas in Asia, Africa, and Europe threatened a revolt or had revolted; and Czerni George raised the standard of independence in Servia. Mahmud, although pressed to make peace, persisted in continuing war, and he was encouraged to do so by French diplomacy, for a war between France and Russia was imminent. That war broke out in 1812, and Constantinople became the centre of European intrigue, Russia and Great Britain being active in making peace acceptable to the sultan, while Napoleon made the greatest efforts to rouse him to further resistance. Although the Russians had conquered Northern Turkey as far as the Danube, Mahmud could fairly hope that the Russian army would soon be compelled to evacuate the Turkish territory, and he would perhaps have continued the struggle, but for the strong remonstrances of England, which were backed by a large fleet in the Mediterranean. Under these circumstances he made peace with Russia at Bukarest, on the 28th of May, 1812, on conditions more favourable to him than the unfortunate turn of the war allowed him to expect. He lost only that part of Moldavia which lies east of the Pruth, which now became the frontier of the two empires, and a few districts in the Caucasus; while the Servians, abandoned by Russia, were obliged to submit once more to the Turkish yoke. Mahmud would perhaps never have waged war with Russia, but for the certainty that Napoleon had abandoned him, by a secret article of the treaty of Tilsit, to the Emperor Alexander, and the exorbitant demands which Russia made upon him in consequence of the Czar's friendship with Napoleon. The Russian army thus disengaged immediately set out to cut off the retreat of Napoleon from Moscow, who was outrageous at the news of the peace of Bukarest, for he had been outwitted by a prince whom he used to call an ignorant barbarian.

Mahmud availed himself of the peace to continue the work of reform, in which he was ably assisted by his personal friends Berber Bashi and Khalet Efendi. He succeeded in keeping down the rebellious spirit of the pashas of Baghdad, Damascus, Widdin, and Silistria; and he received good news from Mehemed 'Ali, the pasha of Egypt, who had retaken Mecca from the Wahábis who had seized it. His attention was chiefly directed to 'Ali Pasha of Janina, whom he watched with great suspicion, being convinced that sooner or later that great feudatory would kindle a rebellion all over Greece. His conduct towards 'Ali Pasha was signalized by that mixture of craft and frankness which is so striking in the character of eastern nations; and while he deprived the sons and grandsons of 'Ali of their offices, or drew them over to his side by bribes, he still professed to be a friend of 'Ali himself, till the moment came for ensnaring and crushing him. The downfall and death of 'Ali Pasha, in 1822, seemed to promise a harvest of future success to the sultan. But Turkey's enemies were like the hydra; the more heads fell the more foes rose; and no sooner was 'Ali's head exposed on the gate of the seraglio, than Mahmud had to prepare for a contest with Russia, a deadly struggle with Mehmed 'Ali of Egypt, and an open rebellion of the Greeks.

The Greek rebellion came first. The attempts of Alexander Ypsilanti in Wallachia, and of the Greeks of Constantinople, who had formed a plan to get possession of the Turkish fleet, were easily frustrated; but the insurrection in Greece compelled the sultan to make the greatest efforts. Unable to quell the revolution with the forces under his immediate command, Mahmud persuaded Mehmed 'Ali to join him, on the promise that he should be invested with Candia as soon as the object of the campaign was attained. An Egyptian fleet, with an army of 12,000 men, commanded by Mehmed Ali's son, Ibráhim, the conqueror of the Wahábis, sailed for the Peloponnesus, and the combined Turkish and Egyptian forces committed those atrocities which roused a cry of indignation throughout Europe, and induced Great Britain, France, and Russia to interfere on behalf of the unfortunate Greeks. Mahmud, bent upon crushing all rebellion within his dominions, and making himself equally respected by both his Turkish and Christian subjects, declined any interference, and the three powers entered into an alliance by the convention of the 7th of July, 1827. They proposed that Greece should be a vassal state of Turkey, and should acknowledge the sultan's suzerainty by paying an annual tribute. . The Greeks promised to submit on that condition, but the sultan rejected the proposition with disdain. Upon this the combined British, French, and Russian fleets attacked the Turko-Egyptian fleet in the bay of Navarino (20th of October, 1827), and the pride of the sultan, his splendid ships of war, which had cost him so dear, were destroyed after a gallant resistance. A French army now landed in the Peloponnesus, Ibráhim Pasha evacuated the country, and Greece, without being independent, was freed from her invaders. None of these defeats dispirited the sultan, and proud of having humbled the most dangerous of Turkey's internal foes, he boldly proclaimed 'a holy war' against Russia, well-knowing that the insurrection in Greece was in a great measure the work of the Czar. Before, however, we proceed to the Russian war, it is necessary to speak of the destruction of the Janissaries.

Mahmud accomplished this the greatest of his measures at a time when the whole of his attention seemed to be absorbed by the interference of the three powers in the Greek insurrection. At this time he proceeded so openly with his reforms as to leave no doubt of his firm intention to overthrow the antient institutions of Turkey, and to form an entirely new state of things. He had musical and theatrical entertainments performed in the seraglio; he dressed after the fashion of Europe, and abandoned the sacred turban for the fez; and, to the deep indignation of the Janissaries, gave orders to form another Nizam Jedíd, or Azásiri Mahammediyeh, as he now chose to call these troops. When he signed that order he had likewise resolved to destroy the Janissaries, who did not allow him to wait for an occasion to begin the contest. On the 15th of June, 1826, the sultan and the grand vizír being then in the country, a strong body of Janissaries, reinforced by a crowd of the worst characters, met at their great barrack, the Et-Meídán, and thence marched in battle array to the palace of the grand vizír, which they took and burnt after a feeble resistance on the part of the domestics, who were cut to pieces. The vizír's women escaped by hiding themselves in some subterraneous vaults in the garden. The grand vizír hastened to Constantinople as soon as he had heard of the riots, informed the absent sultan of the event, assembled the diván, and concentrated round the seraglio all the troops that he could dispose of. The shouts of 'Down with the Nizám Jedíd! we will have the heads of all those who advised the sultan to introduce new institutions!' soon reached the ears of the ministers, who were then assembled in the 'Arslán Khánéh,' or the menagerie of the seraglio. Thither crowded the 'ulemás and the students, the marines, the sappers, and the officers of the artillery with their guns, all ready to shed their blood for the sultan and his reforms. Encouraged by the presence of so many adherents, the grand vizír sent an answer to the rioters, that he would not satisfy their demands, but would repel force by force. The Janissaries were preparing for an attack upon the seraglio, when Mahmud arrived in a small boat from his country-seat at Beshik Tásh, on the Asiatic side of the Bosporus. Fully aware of the danger of his position, he harangued his troops, and declared that he would put himself at their head and attack the rebels, but having been dissuaded from this resolution he sent the grand vizír with a body of troops to the mosque of Sultan Ahmed, which was to be the chief meeting-place of the sultan's party, and contented himself with encouraging his men from a kiosk on one of the outer walls of the seraglio. On his order the mufti unfolded the 'sánják sherif,' or the standard of the prophet, and hundreds of 'cháush,' or criers, dispersed themselves through the capital, summoning all faithful Mohammedans to rally round the holy standard, and to defend the throne and their religion against a mob of impious rebels. An immense crowd soon gathered round the seraglio, and marched off to the mosque of Sultan Ahmed, cutting to pieces the detachments which the Janissaries had placed in all the streets leading to that mosque, for the purpose of isolating the grand vizír. At the sight of the holy standard the Janissaries concentrated their forces in the square, round the Et-Meídán, and threw up entrenchments. Huseín Pasha, Ibráhim Pasha, and Mohammed Pasha, who summoned them by order of the sultan, to lay down their arms, were received with a terrible yell and narrowly escaped assassination. 'They were strong enough, they said, to defend themselves till the evening, and the coming night would bring destruction over the reformers. Two thousand houses in flames would throw light upon their path!' The mufti now read with a loud voice the first chapter of the Korán, the 'Al-Fátihat,' the shortest chapter of the Korán, which is held in as much veneration by the Mohammedans as the Lord's Prayer by the Christians, and is considered to contain the quintessence of the whole Korán. The words run thus:—'Praise be to God, the Lord of all creatures; the most merciful, the king of the day of judgment. Thee do we worship, and of thee do we beg assistance. Direct us in the right way, in the way of those to whom thou hast been gracious; not of those against whom thou art incensed, nor of those who go astray.'—While the mufti was reading this prayer every man was prostrate on the ground, and at the close of the prayer the signal of attack was given. The entrenchments were soon levelled by the ordnance, and the Janissaries retired within their fortified barrack, whence they kept up a murderous fire upon the assailants. But their resistance only delayed their fate for a few hours; the massive walls crumbled under the fire of a heavy and well-directed artillery; fusees were thrown upon the roof; and the whole building was soon in a blaze. Thousands of the rebels were burnt under the falling ruins; others who tried to escape were received with grapeshot; and only two hundred succeeded in reaching the streets, where they were massacred and their bodies thrown round that majestic plane-tree which is said to have cast its shadow over the centre of the hippodrome for more than two thousand years. Six thousand Janissaries perished in the course of one day; several hundreds who had not taken part in the action, but were known as rebels, were massacred in the streets or in their houses, and 15,000, who had kept quiet, were exiled to different places in Asia Minor. On the following day, the 16th of June, a hatti sherif pronounced the abolition of the military corporation of the Janissaries, after it had been the bulwark of Turkey during five centuries from the time of its foundation by 'Alá-ed-dín, the vizír of Sultan Urkhan. Thus Mahmud crushed his most dreaded enemy at home, only four years after he had been compelled to sacrifice to the fury of the Janissaries his favourites Berber Bashi, the mufti, and his favourite wife.

Although Mahmud was sufficiently provoked by the Emperor Nicholas to take up arms against him, his declaration of war, in 1828, was a rash act. Mahmud thought that his army, being now organised after the European system, would behave as well as European armies, but he was greatly mistaken, and paid dearly for learning that it is easier to create a name than a thing. We shall not dwell upon the particulars of the Russian campaign. After an indifferent struggle in 1828, the Russians, commanded by Diebitsch and Paskiewicz, made astonishing progress in 1829, in Europe as well as in Asia; and after the victory obtained by Diebitsch over the grand vizír Jusuf Pasha at Shumla, in the eastern Balkan, and the capture of Erz-Rúm by Paskiewicz, Constantinople would have been lost, and the Turkish empire would have fallen a prey to the Russians, but for the interference of the great European powers, headed by England, through whose mediation the war was concluded by the peace of Adrianople, on the 14th of September, 1829. This was the most disastrous war that was ever undertaken by the Turks, although their loss of territory was comparatively trifling, and far less than the loss of Hungary and Servia after the peaces of Karlowicz and Passarowicz with Austria. Mahmud's direct loss was only a small tract on the Caucasian frontier. But Greece was now definitively separated from Turkey; the suzerainty of the Sultan over Moldavia and Wallachia was reduced to a shadow, and the Russian emperor acquired that sovereignty over the two principalities which was formerly possessed by the Sultans; Servia was acknowledged as an independent state, though tributary to Turkey; Russia obtained a free navigation from the Black Sea to the Mediterranean, and an effective protectorship over the Greek church throughout all Turkey; and the sultan at last was required to pay the expenses of the war, a sum so heavy that a few years afterwards he was compelled to solicit the remittance of about one-third of it. The circumstance most humbling for the pride of the sultan was that he obtained that peace through the mediation of the European powers.

During the years subsequent to the peace of Adrianople Mahmud, with unabated perseverance, was active in creating a new army and navy, and in improving his ruined finances. He wanted both men and money to check the increasing power of Mehmed 'Ali, whom he watched with hate and suspicion. A conspiracy detected at Constantinople to depose the sultan, was attributed to the intrigues of the Pasha of Egypt, and increased Mahmud's hatred: to reward those who had proved most loyal under such trying circumstances he founded a new order, the Nisheán Istíkhar. In 1831 hostilities commenced with Mehmed 'Ali, Ibráhim Pasha having made war against the Pasha of Damascus and conquered Syria; but there was not open war till 1832, on Mehmed 'Ali's refusal to withdraw his troops from Syria. The declaration of war took place on the 15th of April, 1832; on the 7th of July Ibráhim defeated the Turks at Hems; and on the 21st of December he obtained the splendid victory of Koniah, in consequence of which the Turkish army was disbanded, and the Egyptians advanced upon Constantinople. The mediation of the European powers effected a truce; but in spite of it Ibráhim pushed on and occupied Brúsa. The ruin of the sultan seemed to be inevitable. He was saved by his greatest enemy: a Russian fleet appeared off the Bosporus, and opposite Constantinople landed a strong body of Russians, commanded by General Lazaref, whose arrival stopped the progress of Ibráhim. On the 4th of May peace was concluded at Koniah, and Mehmed 'Ali obtained the object of his armament, the investiture of Syria and Adána, but he remained a tributary vassal of the Porte. So much was Turkey weakened through this war, that Mahmud, despairing of further independence, threw himself into the arms of Russia, and on the 8th of July signed the treaty of Unkiar Skelesi, by which Russia bound herself to assist Turkey with an army whenever she should want it, in acknowledgment of which Mahmnd promised that no armed ship of foreign nations should be allowed to pass the Dardanelles without the permission of Russia. Mahmud was more fortunate in an expedition against Tripoli, which was brought back under the sultan's immediate authority, and at Tunis also he succeeded in obtaining obedience to his orders.

Mahmnd's hatred of Mehmed 'Ali became now the principal motive of his actions. As early as 1834 things were so bad, that Mahmud not only resolved upon a fresh war, but put himself at the head of his troops in order to conduct it in person. But in crossing the Bosporus he dropped the sacred sword of Soliman II., which fell into the sea and was lost for ever, and this bad omen induced him to give up his plan and to return to Constantinople. War was prevented by the mediation of England, France, and Russia, but the sultan nevertheless continued preparing for a contest which he wished, and which could be postponed, but not prevented. The care which he bestowed upon his military preparations was surprising. Yet the result did not answer his expectations. He thought that because he had a system of order on paper, the administration would go as well as in Europe; and he forgot that the execution of his orders was to be intrusted to persons who themselves had first to learn obedience and impartiality. In his first war with Mehmed 'Ali he was the victim of the knavery and rapacity of some of his ministers, especially the old Khosrew Pasha, without ever suspecting how unfairly he had been dealt with. Sufficient money was intrusted to Khosrew to defray the expenses of the war, and the strictest orders were given to provide military stores in abundance; but Husein Pasha, who commanded part of the army, received only a scanty supply of ammunition, most of the ammunition waggons which were sent to his camp being found empty at their arrival. Mahmud also gave 4000 purses to Khosrew, directing him to send them to Husein, who had received orders to pay for the provisions and horses, which he should be obliged to take from the peasants; the money, however, remained in the hands of Khosrew, and when, after the end of the campaign, Husein returned to Constantinople, he did not dare to complain of the peculation of the powerful minister. Reshid Pasha, another commander, received the most solemn protestations that there was provision for three years for the army, in the different towns of that part of Asia Minor where he was to command, but when he came to Ak-Shehr, his men found that the best chance of getting a dinner was in the camp of Ibráhim Pasha.

The second war with Mehmed 'Ali would perhaps not have broken out so soon (1840), but for the pasha's manifest design to subject all Arabia to his authority; and it is said that the sultan was urged by Russia, and especially by Great Britain, to open the campaign in that year, although he knew that his army was not yet able to take the field with any chance of success.

On the 25th of June, the Turkish army under Hafiz Pasha was entirely defeated by Ibráhim Pasha, near Nisibis; and there being no other army to oppose his victorious career, it was evident that Turkey was lost if the European powers did not interfere. Mahmud was fortunately not destined to hear of the disgrace of his arms. He died on the 1st of July, 1840, a few days before the news of the battle of Nisibis threw the seraglio and the capital into consternation. It was after the passage of the Balkan by Diebitsch, in 1829, that for the first time in his life Mahmud evinced symptoms of despair. From that time care and disappointment produced a visible effect upon him; after his defeats in the first Egyptian war he looked careworn and dispirited, and his violent hatred of Mehmed 'Ali impaired both his body and mind. At the beginning of 1840, his health was so bad as to indicate a speedy dissolution, and he increased his weakness by excess in wine. Two German physicians, under whose care he was, declared his ailment to be tubercular phthisis; shortly before his death they were dismissed, and, as the younger Michaud in the 'Biographie Universelle' says, were superseded by an English quack, through whose efforts the sultan died two months before his death could have been expected to take place according to the nature of his disease. Mahmud was succeeded by his eldest son 'Abdu-l-Mejid, the present sultan.

Sultan Mahmud II. was a handsome man of majestic appearance. He was always active, and at no period of his life did he abandon himself to those sensual pleasures of which so many of his predecessors made themselves the slaves. He rose before daybreak to be ready to say his prayers the moment the sun was above the horizon; after prayer he used to work six hours or more, according to the state of business; he would then ride out, review the troops, and visit the arsenals, the docks, or the barracks. He always tasted the soldiers' dinner, rewarded the cooks when it was good, and punished them when it was bad. The soldiers he called his children, and many of them loved him as a father. For a Turk Mahmud possessed considerable knowledge: his handwriting was beautiful, an accomplishment which contributed much to his popularity among the learned, for the sultan is expected to surpass his subjects in penmanship. He was an excellent father, and loved his wives tenderly: on his death-bed he ordered his son 'Abdu-l-Mejid to come to his side, and he entreated him never to abandon the path of reform. Yet he was only half civilized, and, as Pouqueville observes, he combined the barbarity of a Turk with all the artfulness of modern diplomacy. His knavish tricks against 'Ali Pasha of Janina and Prince Milosh of Servia are well known. He could be cruel in cold blood: he assisted at the execution of the Greek Prince Constantine Morali, at the murder of the patriarch Gregory, and the violent death of many others who had incurred his hatred. For the details of his reforms we refer the reader to TURKEY, P. C., pp. 393, & 404, 405. Mahmud II. was decidedly one of the most remarkable men of his age, and one of the greatest sultans of Turkey. He may be compared with Peter the Great, and like him he was idolized by one portion of his subjects and hated by another. The adherents of the old school called him a heretic (ghiaur), and accused him of attempting to destroy the religion of Mohammed and to introduce the Christian faith, a calumny which grieved him very much, for he was a sincere Mohammedan, except as regards the prohibition of wine. If Mahmud was less successful than Peter the Great, it must partly be attributed to the circumstance that the Russian Czar ruled over one nation professing one religion, his Mohammedan subjects being proportionally too few in number to offer any serious resistance; Mahmud ruled over seven nations, Turks, Wallachians, Albanians, Greeks, Slavonians, Armenians, and Arabs, some of them Mohammedans, others Christians of various creeds, and all of them detesting each other. Among these the ruling nation, the Turks, form the great minority in European Turkey, and in Asia Minor are less numerous than the Greeks and Armenians together, while in Syria, Arabia, and Egypt the population is almost exclusively Arab. We conclude this sketch by an extract from the Turkish historiographer Asá Efendi, quoted by Michaud in the source mentioned above, who gives the following portrait of Sultan Mahmud:—

'Mahmud is terrible like Alexander. The slightest menacing cast of his countenance would check 100,000 rebels; and his awful frowning crushes the impious followers of Shedda who dare to take up arms against him. Such is his power, and such the soundness of his genius, that he silences the most subtle metaphysicians and rhetoricians, strikes them with astonishment, and compels them to lower their heads before his superiority. There is not his equal among the wisest of the kings, for, as the poet says, "He pleases equally the warriors, the learned, and the charitable, by his exploits, his speech, and his liberality." To quote only one of his merits, his handwriting is of extraordinary beauty; the points (diacritical) are like so many fixed stars; and it is worthy to be hung up under the vault of heaven near the girdle of the Gemini. The style of Mir-Feredún, so much praised, is flat in comparison with his. His generosity is so great that the waters of the ocean would be only a spoonful of his liberalities, and the mines of the earth a handful of his gifts.—To comment in a fit manner on the folio volume of his merits would be a task too high, not only for my poor pen and me who am only a parasite at the banquet of literature, but even for the most accomplished writer. I am not so presumptuous to undertake it. I shall only express my good wishes for His Highness. May Allah preserve this great monarch, the love of his people, the ornament of the throne; may he extend the shadow of his bounty over the East and the West; and may he grant no other limits to our sultan's success and years than those of numbers, namely infinity.'

(*Sultan Mahmud and Mehmed 'Ali Pasha*, by the author of 'France, Russia, and Turkey,' 3rd edition, London, 1835; Von Hammer, *Des Osmanischen Reiches Staats-Verfassung und Staats-Verwaltung*; Pouqueville, *Histoire de la Régénération de la Grèce; Mémoire sur la Vie et la Puissance d'Ali Pacha, Vizir de Janina:* two valuable sources for the Life of Mahmud.)

MAIA'NO, BENEDETTO DA, a celebrated Italian sculptor and architect, was born at Florence, in 1444. He first distinguished himself as a carver and inlayer of wood, and in both of these arts he was the first artist of his time. He executed some very extraordinary inlaid-work for cabinets for the kings of Naples and Hungary, and an accident which happened to two which he made for the latter king caused Maiano to give up the art of inlaying in disgust. These two chests or cabinets suffered so much in the transport from Florence to Hungary by undue care or the change of climate, that when they were uncovered by Benedetto before the king, a great part of the inlaid-work, owing to the effect of the moisture on the glue, fell to pieces, to the great dismay of the king and the horror of the artist, and had to be remade. Benedetto felt that an art in which the works were subject to destruction by so slight a cause, was unworthy the attention of superior abilities, and he thenceforth applied himself exclusively to sculpture in marble and to architecture.

Benedetto's marble works however were also of an ornamental or decorative class, consisting of fonts, pulpits, and tombs. His fonts and pulpits were of a most elaborate character, being loaded with beautifully executed small figures, besides other decorations. One of his master-pieces is the marble pulpit of Santa Croce, which is still in good preservation: the sculptures represent the life of San Francesco, and the establishment of his order, in five compartments; with the figures also of Faith, Hope, Charity, Fortitude, and Justice. The whole has been beautifully engraved by Gio. Paolo Lasinio, and was published with letter-press description in 1823—'Il Pergamo scolpito in marmo da Bened. da Majano nella Chiesa di Santa Croce in Firenze.' Benedetto made also the crucifix over the altar of the cathedral of Florence; and he finished the Magdalen in Santa Trinità, which was left imperfect by Desiderio da Satignano. In architecture he did very little: he built the portico of the church of the Madonna delle Grazie near Arezzo; a chapel for himself on his own estate near Prato; and he is said to have designed the Palazzo Strozzi. He died rich in 1498, aged only fifty-four, and was buried in San Lorenzo at Florence. He left the reversion of his property to the brotherhood of the Bigallo.

GIULIANO DI NARDO DA MAIANO, the uncle of Benedetto, was likewise a distinguished artist, and in similar works as Benedetto. He was intrusted with several important charges in Florence, in Pisa, in Loreto, in Naples, and in Rome. He succeeded Brunelleschi as the architect of the cathedral of Florence in 1446. At Naples he built the palace of Poggio Reale, and executed the sculptures of the Porta Capuana, also the triumphal arch, and the reliefs of the Castello Nuovo (now the Arsenal). At Rome he built of Travertine stone the loggie of one of the courts of the Vatican; and the church and palace of San Marco for Pope Paul II. in the same material; and a report was long in circulation that part of the Colosseum was pulled down for the stones, but more charitable persons have presumed that the pope used only such stones as had already fallen. Giuliano commenced also, in 1464, a new nave to the church of the Madonna at Loreto, which was completed by his nephew Benedetto. Giuliano was still living in Florence in 1471, a fact clearly ascertained by Rumohr; Vasari's account therefore that he died at Naples, in the reign of Alfonso I. (1435-1458), is erroneous; this statement is also evidently incorrect from the fact of Giuliano being employed by Paul II., who was pope from 1464 to 1471.

(Vasari, *Vite de' Pittori*, &c., and the Notes to the German translation by Schorn; Cicognara, *Storia della Scultura;* Rumohr, *Italienische Forschungen.*)

MAINTENANCE, SEPARATE. [SETTLEMENT, P. C.]

MALATESTA, MALATESTI, Lords of Rimini, an historical family of Italy during the middle ages. Like many other great feudatories of Italy, the Malatesti are said to have originally come from Germany. One of the name is mentioned in some chronicles as 'Vicarius,' or Imperial Lieutenant of Rimini, under Otho III., A.D. 1002. It is not, however, until the second half of the thirteenth century that we find authentic records of this family as being at the head of the Guelph party in Rimini. Giovanni Malatesta, called 'il Zoppo,' or 'the lame,' married Francesca, daughter of Guido di Polenta, Lord of Ravenna. Paolo, brother of Giovanni, seduced his wife, and being caught in adultery with her, they were both killed by the outraged husband. This tragical event forms the subject of one of the most beautiful episodes of Dante's 'Inferno.' After many vicissitudes, owing to the factions of those times, we find Galeotto Malatesta, in the early part of the fourteenth century, acknowledged by the Pope as Lord of Rimini, Pesaro, Fano, and other places in fief of the Papal See. His descendants continued in possession of Rimini, with various interruptions, till the time of Clement VIII., in 1528, when Sigismondo Malatesta was deprived of his dominion by the Pope, and retired to Venice, after which several of the same family figured in the service of that republic. One Carlo Malatesta had already distinguished himself in the wars of the fifteenth century, between the Duke of Milan and the Venetians.

(Sansovino, *Famiglie Illustri d'Italia.*)

MA'LAXIS, a genus of plants belonging to the natural order Orchidaceæ, and to the tribe Malaxideæ. It has a patent perianth, the lip posterior, erect, entire, similar to the petals and smaller than the sepals; the spur absent; the stigma rhomboidal; the rostellum short, entire, acute; the anthers terminal, continuous with the short column, out of the apex of which it appears as if it were excavated with two imperfect cells; the pollen-masses connected at their apex; the germen upon a twisted stalk.

Of this genus there is one British representative, *M. paludosa*. It is a small plant, with a stem from one to four inches in height. The leaves are remarkable for being fringed at the end with bulbous gemmæ or leaf-buds. It is a native of spongy bogs, where it grows upon the moss, in the character of an epiphyte, and not amongst it as other bog-plants.

MALINGERING. [FEIGNED DISEASES, P. C. S.]

MALLOW. [MALVACEÆ, P. C.; MALVA, P. C. S.]

MALMESBURY, JAMES HARRIS, FIRST EARL OF, was the only son of James Harris, the learned author of 'Hermes,' and other well known works. His mother was Elizabeth, daughter of John Clarke, of Sandford, in the county of Somerset, Esq.; and he was born at Salisbury on the 21st of April, 1746, the day of the battle of Culloden.

The Harrises had been seated on their estate of Orcheston St. George, in Wiltshire, since about the middle of the sixteenth century. The father of the subject of the present notice was the first of them who was ever in parliament or employed in any political capacity; but they may be considered as having belonged to the first class of the gentry in their county. The father of the author of 'Hermes' married a daughter of the second Earl of Shaftesbury.

After having been put in the first instance to the grammar-school of his native town, the subject of this notice was sent to Winchester, where he remained till September, 1762. His father, who was by this time in office, now kept him with him in London for above six months, and then sent him to Merton College, Oxford. In a letter written in his advanced years he expresses himself as unable to decide whether his father did right or wrong in introducing him to society before he was sent to the university. 'I believe,' he says, 'the seeing many of the leading men in administration, hearing them converse on public business, contributed to form my mind to think on public affairs, and to give me an interest in them which, probably, otherwise I might never have acquired; but the mixing at that age (seventeen), and raw from school, in all the gaiety and dissipation of London, filled my mind at the same time with false objects of admiration, false notions of excellence, and gave me, in my own conceit, a knowledge of the world so much greater than I supposed my fellow-collegians could possibly possess, that I apprehend I carried to the university a considerable share of self-sufficiency, and no great propensity to attend lectures and conform to college rules.' But although he professes to look back upon the years he passed at Merton as the most unprofitably spent of his life, he appears to have by no means altogether neglected study amid the then prevailing idleness and dissipation of the place. Even in his own disparaging account he admits that, although he never saw his tutor at any other time, he did receive his instruction for one fortnight, when he took it into his head to be taught trigonometry.

On leaving Oxford in 1765 he was sent for a year to study at Leyden; and here at least he seems to have made excellent use of his time, spending many hours daily among his books, while he also mixed much in society. He then, after being eight months at home, set out in 1767 on a short continental tour, in the course of which he visited Holland, Prussia, Poland, and Paris; and in the autumn of the same year he was, through the patronage of Lord Shelburne, his father's colleague and friend, appointed secretary of embassy at Madrid, and thus entered public life at the age of one-and-twenty.

Three years after the affair of the Falkland Islands occurred, when he chanced to have been left at Madrid as chargé d'affaires, and, acting upon his own responsibility, he had the good fortune very quickly to bring the Spanish government to concede the object in dispute. The Falkland Islands, the acknowledgment of our right to which was thus obtained from Spain, were given up by England four years after; but the temper and firmness, as well as talent, with which Harris had managed his successful negotiation, gave so much satisfaction to his government, that he was the following year appointed to the post of minister at the court of Berlin. He retained this mission for four years, and then returning to England in 1776, married Harriet Mary, second daughter of Sir George Amyand Cornewall. In 1777 he was sent as ambassador to St. Petersburg, and, having in the mean time received the Order of the Bath in 1780, he remained in Russia till his health compelled him to return home in 1784. He had ever since 1770, notwithstanding his being abroad, held a seat in the House of Commons as member for Christchurch, and had, like most of Lord Shelburne's friends and connexions, attached himself to the party of Mr. Fox. When Fox, however, was now superseded in the direction of affairs by Pitt, the latter at once offered Sir James Harris the post of minister at the Hague, to which it had been intended that he should have been appointed if the Fox and North administration had remained in power; and he accepted it with the full approbation of Mr. Fox. While at the Hague he succeeded in negotiating, in April, 1788, the treaties of alliance with Holland and with Prussia, by which the power of the Stadtholder was at that time preserved from being overthrown by the democratic party, and Holland in all probability rescued from the grasp of France. For this great service, as it was considered, Sir James was, in September of the same year, raised to the peerage as Baron Malmesbury.

He now, after a short visit to Switzerland, returned to England. He continued to act with the Whig party in parliament till 1793, when he formed one of the large body of the friends of Mr. Fox who went over to ministers with Burke and the Duke of Portland. Lord Malmesbury was now sent over by Mr. Pitt on a mission to Berlin, where he prevailed upon the new King of Prussia to enter into a second alliance with England and Holland, which however did not last for quite two years. In 1794 he was employed to negotiate the marriage between the Prince of Wales and Caroline, the daughter of the Duke of Brunswick; and, after having gone through the ceremony of marrying her Royal Highness by proxy, he accompanied her to England. His published Diary relates many curious particulars respecting this affair, the issue of which was hardly more unhappy than he had anticipated that in all probability it would be; but his directions left him no discretionary power whatever. It is stated, however, that he was never forgiven for the part he acted by the Prince, 'with whom until then he had been on terms of great intimacy and confidence.'

His last missions were those on which he was sent in 1796 and 1797 to Paris and Lisle, to negotiate a peace with the French Republic, and which were attended with no result. He was then attacked by a deafness which, in his own opinion, unfitted him for being again employed on any foreign service of importance. In 1800 he was created Earl of Malmesbury and Viscount Fitzharris. He died at his house in Hill Street, London, Nov. 20, 1820, leaving a son, who succeeded him in the title, and three daughters.

Lord Malmesbury was without doubt one of the very ablest diplomatists of his time, and a man of great general talent. Talleyrand said of him, in a phrase the point of which cannot be preserved in a translation, 'Si on lui laissait le dernier mot, il avait toujours raison.' And he was equally noted for readiness and spirit in his ordinary conversation as when acting in his diplomatic capacity.

A very favourable impression, also, of his good sense and general right-mindedness is made by his 'Diaries and Correspondence,' which have been edited by his grandson, the present earl, in 4 vols. 8vo., Lond. 1844; and which, besides throw much valuable illustration upon many of the events and transactions o the important period in which it was his fortune to livo and act. The materials of the present article have been mostly abstracted from the Memoir prefixed to that publication.

MALTHUS, REV. THOMAS ROBERT, was born in 1766, at the Rookery, a small but beautiful estate in the county of Surrey, in the neighbourhood of Guildford and Dorking. His father, Daniel Malthus, was a gentleman of good family and independent fortune, attached to a country life, of retired habits, and devoted to literary and philosophic pursuits. He was the author of several works, published anonymously, which met with considerable success. Thomas Robert Malthus, who was his second son, was never sent to any public school except to the academy at Warrington, and that for a very short time. Besides the instruction which he received from his father, he was for some time under the private tuition of Robert Graves, author of the 'Spiritual Quixote,' whose house, however, he left when young, and was afterwards instructed by Gilbert Wakefield, with whom he remained till 1784, when he was admitted of Jesus College, Cambridge. He took the degree of B.A. in 1788, and that of M.A. in 1797, when he was made a Fellow of his college. Having taken orders about the same time, he undertook the care of a small parish in Surrey, near his father's house, but he occasionally resided at Cambridge, in order to pursue his favourite course of study with more advantage.

Mr. Malthus, about the year 1797, wrote a pamphlet called 'The Crisis,' which however, at the request of his father, he did not publish. It was directed against the government of Mr. Pitt in general as well as against certain specific measures connected with the poor laws. In 1798 he published 'An Essay on the Principle of Population, as it affects the future Improvement of Society, with Remarks on the Speculations of Mr. Godwin, M. Condorcet, and other Writers.' The book excited considerable attention; but finding that his facts and illustrations were imperfect, in 1799 he went abroad in search of materials to establish his theory more completely. He sailed for Hamburg in company with three other members of his college, Dr. Edward Clarke, Mr. Cripps, and Mr. Otter. In Sweden the party separated, when Dr. Clarke and Mr. Cripps preceded to the north, and Mr. Malthus and Mr. Otter journeyed leisurely through Sweden, Norway, Finland, and part of Russia, and then returned to England. During the short peace of 1802 Mr. Malthus travelled through France and Switzerland with some of his relations, observing whatever was curious in nature or art, but especially examining into the state of the people, and collecting materials for the improvement of his work. In 1803, he published a new edition of his 'Essay on the Principle of Population,' with the omission of the controversial parts, but much enlarged in what related to the general subject.

In 1805 Mr. Malthus married Harriet, eldest daughter of Mr. Eckersall, and was soon afterwards appointed Professor of Modern History and Political Economy at the East India College at Haileybury, in Hertfordshire, which situation he held till his death. He attended to his professional duties, preached regularly in his turn in the college chapel, and enjoyed the society of his family and friends. He was taken ill suddenly, when apparently in strong health, while on a visit to his father-in-law Mr. Eckersall, at Bath, where he died December 29, 1834. He left a widow and a son and daughter.

The attention of Mr. Malthus had from an early age been directed to political economy, in which he was much stimulated by his conversations with his father. The two most important of his works are, the 'Essay on the Principle of Population,' of which an analysis is given in the article POPULATION, P. C., and the 'Inquiry into the Nature and Progress of Rent,' the leading principles of which are stated in the article RENT, P. C.

When a boy, and while at Cambridge, Malthus displayed a great love of fighting for fighting's sake, a keen perception of the ludicrous, much relish for wit and humour, and considerable comic power of imitation; but his character gradually changed: he retained indeed his cheerfulness and playfulness, but he became placid, temperate, patient, and forbearing under the obloquy which was heaped upon him. His manners were kind and gentle, his conversation mild but earnest and impressive, his deportment gentlemanly. In politics he was a Whig and a decided advocate of all salutary reforms, but strongly attached to the institutions of his country, and fearful of all imperfectly considered changes and innovations.

The following is a list of his works in the order in which they were published:—

1. 'An Essay on the Principle of Population, as it affects the future Improvement of Society; with Remarks on the Speculations of Mr. Godwin, M. Condorcet, and other Writers.' Anonymous, London, 8vo. 1798.

2. 'An Investigation of the Cause of the present high Price of Provisions, containing an Illustration of the Nature and Limits of Fair Price in Time of Scarcity, and its Application to the particular State of this Country.' 8vo. 1800.

3. 'An Essay on the Principle of Population; or a View of its past and present Effects on human Happiness; with an Inquiry into our Prospects respecting the future Removal or Mitigation of the Evils which it occasions.' New edition, London, 4to. 1803.

4. 'A Letter to Samuel Whitbread, on his proposed Bill for the Amendment of the Poor Laws.' London, 8vo. 1807.

5. 'A Letter to Lord Grenville, occasioned by some Observations of his Lordship on the East India Company's Establishment for the Education of their Civil Servants.' London, 8vo. 1813.

6. 'Observations on the Effects of the Corn Laws, and of a Rise or Fall in the Price of Corn on the Agriculture and general Wealth of the Country.' London, 8vo. 1814.

7. 'The Grounds of an Opinion on the Policy of restricting the Importation of Foreign Corn;' intended as an appendix to the 'Observations on the Corn Laws.' London, 8vo. 1815.

8. 'An Inquiry into the Nature and Progress of Rent, and the Principles by which it is regulated.' London, 8vo. 1815.

9. 'Statements respecting the East India College, with an Appeal to Facts in Refutation of the Charges lately brought against it in the Court of Proprietors.' London, 8vo. 1817.

10. 'Principles of Political Economy, considered with a View to their Practical Application.' London, 8vo. 1820.

11. 'The Measure of Value stated and illustrated; with an Application of it to the Alteration of the Value of the English Currency since 1790.' London, 8vo. 1823.

12. 'Definitions in Political Economy, preceded by an Inquiry into the Rules which ought to guide Political Economists in the Definition and Use of their Terms.' London, 8vo. 1827.

13. 'A Summary View of the Principle of Population.' 1830. (From the 'Supplement to the Encyclopædia Britannica.')

(*Memoir of Malthus*, prefixed to the 'Principles of Political Economy.' 2nd edition, Pickering, London.)

MALUS, ÉTIENNE LOUIS, a distinguished philosopher and military engineer, was born at Paris, June 23rd, 1775. He received his first lessons under the eyes of his father, Anne Louis Malus of Mitry; and, in early youth, his time appears to have been nearly equally divided between classical and mathematical studies. This judicious combination of the two great branches of education had the happiest effect in expanding the mind of the pupil, and laying the foundation of those developments of genius by which his name will descend to the remotest posterity. His memory was very retentive, and it is said that, even near the close of his life, he could repeat several passages of the 'Iliad' of considerable length. His taste for classical literature is shown by the fact that, when seventeen years of age, he had written a tragedy entitled 'The Death of Cato;' but subsequently his studies were almost exclusively of a scientific character.

At the time that the tragedy is said to have been written, young Malus was, after a strict examination, in which he acquitted himself to the satisfaction of the persons in authority, admitted as a pupil in the Ecole du Génie Militaire, it being the intention of his father that he should enter into that branch of the public service; and he is said to have immediately distinguished himself by his diligence and his scientific talents. From some cause, however, which is not explained, but probably because his father, who held the post of Treasurer of France, had become suspected by the government (the great revolution having commenced), he was dismissed from the Institution; and, either from choice or compulsion, he entered the army as a private soldier. He was for a short time employed in that capacity, with the battalion to which he was attached, in repairing the fortifications of Dunkirk. But on the termination of the reign of terror, the government having decided upon the formation of the Ecole Polytechnique, inquiry was made for a certain number of young men who, having completed the usual course of education, might be the first to receive instruction in the higher branches of science; and it is recorded to the honour of M. Le Père, the commandant of the engineers at Dunkirk, that, knowing the great talents of the young soldier, he withdrew him immediately from the ranks and sent him to Paris with a recommendation to the celebrated Monge. Malus was immediately admitted, and was joined, in a class, with about twenty other persons, to attend a course of instruction in mathematics, physics, and engineering.

During three years he prosecuted his studies with extraordinary ardour, and distinguished himself by his applications of analysis to the solutions of some intricate propositions; he is said also to have occasionally delivered lectures on mathematical subjects. It is added that he then commenced those researches concerning the properties of light, which prepared the way for his subsequent discoveries in optics; and his first step in this brilliant career consisted in investigating the path of a ray of light after being reflected from or refracted into a medium having a surface of any form.

On quitting the Ecole Polytechnique, Malus was for a time employed as a professor of mathematics in the military school at Metz; but the small fortune which he possessed, his family having suffered great losses during the Revolution, and perhaps an inclination in favour of a more active life, induced him to abandon the project which he at one time entertained of devoting himself entirely to the sciences. He therefore entered the corps of engineera with the rank of captain; and, in 1797, he was sent to join the Army of the Sambre and Meuse. He accompanied that army across the Rhine, and was present at the actions of Ukratz and Altenkirk.

At the termination of the campaign Malus went to Paris, and, in the following year, he embarked with the expedition to Egypt under Bonaparte. He was engaged in the battle of the Pyramids and in the affair of Chebrces: he was also employed as an engineer at the sieges of El Arish and Jaffa; and, after the taking of the latter place, he was appointed to superintend the repair of its fortifications. While performing this duty he fell ill of the plague, and lay for some time in the military hospital which he had assisted to form: he recovered, however, with little aid from medicine, and he was almost immediately sent to fortify Damietta. He was afterwards engaged in the action with the Turkish forces which landed at Aboukir; he was also at the battle of Heliopolis, at the affair of Coraim, and at the surrender of Cairo.

When the Institute was founded in that city, he was appointed one of its members; and in the first volume of the 'Décade Egypticnne' there is an account of an excursion which he made far into the country, with his discovery of a branch of the Nile which had not before been noticed. Malus continued in Egypt till the remains of the French army capitulated, when, in 1801, he returned to his native country in an English vessel. Exhausted by the arduous services in which he had been engaged, and with his health nearly ruined, he yet performed the duties of an officer of engineers, having, in 1804, been appointed by the government to superintend the construction of the works which were being added to the fortifications of Antwerp. He had then the title of sub-director of fortifications, and he was made a member of the Legion of Honour. Five years afterwards he was appointed superintendent of barracks in the department of the Seine; and in the following year, 1810, he was made a member of the Committee of Fortifications and Lieutenant-Colonel of Engineers.

Almost immediately on his return to France, Malus married a daughter of Koch, the Chancellor of the University of Giessen, to whom he became attached before his departure for Egypt; and, during the rest of his life, all the time he could spare from his professional avocations was spent in the cultivation of the sciences, particularly in the continuation of those optical investigations which he had commenced at the Ecole Polytechnique. His first published work was entitled 'Traité d' Optique,' in which he treated the phenomena of the reflexion and refraction of light as they were then known; and he particularly distinguished himself by his experiments and researches concerning the reflexion of light in transparent media. It was known that when a pencil of light has entered into glass at a considerable angle of incidence, the internal reflexion takes place either before it arrives at the posterior surface, or at a certain distance from that surface on the exterior; but it had been found impossible to determine, though an inequality in the angles of reflexion in the two cases was manifest, to which of the cases either of the observed reflexions should be referred. Malus overcame this difficulty by applying successively to the surface an opaque medium, which, by preventing the reflexion of the emergent rays, proved that the observed reflexion had taken place within the glass, and a transparent medium which, by permitting the rays to pass quite through the glass, afforded a reflexion from the exterior of the latter.

The subject of double refraction in crystals was very imperfectly known, when, in 1808, the Institute of France offered a premium for the best Mémoire on the subject; and Malus immediately entered with ardour into this field of research. It was while prosecuting his experiments that there occurred to him one of those fortunate accidents which only men of genius have the power of rendering available as steps to great discoveries. He then resided at Paris, and, happening one day to direct a prism of crystal which he held in his hand to one of the windows of the Luxembourg palace, on which there was a brilliant light produced by the reflected rays of the setting sun, he was surprised to find that, while turning the crystal round, one of the images produced by the double refraction in it varied in intensity, and alternately appeared and disappeared. As such phenomena had not been observed when the prism was directed to any other bright object, as the flame of a candle, Malus was for a time at a loss to divine the cause; but after making several observations on the light from the same windows, he ascertained that the effect was produced only when it fell on them at a particular angle of incidence, which he determined from the known position of the sun with respect to the surface of the building.

In the prosecution of the researches to which this interesting discovery gave rise, Malus found that when a pencil of light is reflected from unquicksilvered glass, at an angle of incidence equal to 54° 35′, or from the surface of water at an angle of incidence equal to 52° 45′, the reflected light possessed the same properties as were exhibited by one of the pencils produced by double refraction in a crystal. He observed also that when the pencil reflected from a transparent medium, at a certain angle of incidence, is made to fall on another such medium at an equal incidence; if the plane of the second reflexion is coincident with the plane of the first, the light is reflected as usual; but if the planes are at right angles to one another, no reflexion takes place at the second surface, the pencils of light being wholly refracted.

To the effect produced on light so reflected, Malus gave the name of polarization; conceiving that the particles of light have poles or axes, and that, on entering the doubly refracting crystal, those which form one of the pencils may arrange themselves so as to be capable of being transmitted through it, while those which should have formed the other ray may have such dispositions as prevent the passage, in certain directions, from being effected.

These phenomena may be said to have laid the foundation of a new branch of physical optics; and an account of them is given in the 'Mémoires de la Société d'Arcueil,' as well as in the 'Mémoires' of the French Institute. Of this learned body Malus was immediately elected a member; and in 1811, though, on account of the war, there was scarcely any intercourse between Great Britain and France, the Royal Society of London awarded him the Rumford medal; thus performing a noble act of homage to scientific merit in the person of a foreigner, and one who carried arms among the enemies of the country.

In 1810 Malus published at Paris his 'Théorie de la Double Refraction de la Lumière dans les Substances cristallisées;' and in the following year he presented two papers to the Institute on some remarkable phænomena of polarized light. In the first of these it is shown that when a pencil, after being polarized by reflexion, falls on glass, part of it is reflected and part transmitted; the reflected part is wholly polarized in one direction, while the transmitted part consists of two portions, in one of which the particles preserve the character of direct light, and in the other the light is polarized in a direction contrary to that of the reflected pencil: it is added that the portion which has the character of direct light diminishes gradually by transmission through several plates of glass successively; and at length the whole of the transmitted ray becomes polarized in a direction contrary to that of the reflected pencil. In the second paper it is shown that all polished bodies, opaque and transparent, polarize light by reflexion; and that, in different bodies, the polarization takes place with different angles of incidence. Polished metals, however, resisted for a time the efforts of Malus to produce the phænomena of polarized light; but, at length, by a particular disposition of the reflecting surface, he succeeded in exhibiting them: he discovered that the pencils reflected from polished metals are polarized in opposite directions, while those which are reflected from transparent bodies are polarized in one direction only. He observed the modifications which parts of organized bodies, whether animal or vegetable, produce on light when they are thin enough to transmit the polarized pencil through them; and he noticed the coloured and multiplied images which are sometimes seen in Iceland spar. He ascribed these images to the effects of fissures parallel to the longer diagonal of the crystal rhomboid; but Sir David Brewster has since ascertained that they arise from veins which act upon the transmitted light at both of their surfaces.

During the short remainder of his life, Malus continued his scientific researches amidst all the duties which his post as a member of the Committee of Fortifications required. He was chosen Examiner in Physics and Descriptive Geometry at the Ecole Polytechnique; and though his health was fast declining, he neglected no occasion of performing the functions of that office. He was on the point of being made Director of the Studies in that Institution when he was removed by death from the scene of his useful labours.

He died in Paris, February 23rd, 1812, in the thirty-seventh year of his age; and his wife who, ever since their union, had alleviated his labours by her attentions, and watched him in his last days with affectionate solicitude, survived him but two years.

Malus enjoyed the esteem of the public for the qualities of his mind, and was beloved by all who knew him for the benevolence of his character.

(*Eloge de Malus*, by Delambre; *Biographie Universelle.*)

MALVA (the Latin Malva), a genus of plants belonging to the natural order Malvaceæ. It has numerous styles, a double calyx, the outer one three-leaved, the inner one five-leaved. The capsules are orbicular and many-celled; the cells one-seeded and circularly arranged.

M. Moschata, the Musk Mallow, has an erect stem, kidney-shaped leaves, with five or seven deep pinnatifid lobes, the lower leaves inciso-crenate, the stipules lanceolate-acute, the fruit-stalks erect, and the fruit hairy. The flowers are large and rose-coloured, on axillary single-flowered peduncles, crowded at the extremity of the stem and branches. It is native in many parts of Europe, and is found in Britain in grassy borders of fields and by waysides.

M. sylvestris, Common Mallow, has an erect stem, and is distinguished by its kidney-shaped leaves with seven deep crenate lobes; the fruit is glabrous, reticulate-rugose. The flowers are large and of a purple colour, much longer than the calyx, which is hairy. It grows on waste places and road sides in Britain, and is native in most parts of Europe. The whole plant, but especially the root, yields when boiled a plentiful tasteless mucilage, which is used in some cases of internal irritation. Decoctions of the leaves are employed in dysentery and in general for removing supposed acrimonious humours, but their chief utility is in clysters, fomentations, and poultices. This species is the Malva of Pliny, lib. 20, cap. 21; also, in Columella, lib. 10, cap. 247: it is the *μαλάχη* of Theophrastus, lib. 9, cap. 17, and the *κηπευτὴ μαλάχη* of Dioscorides, lib. 2, cap. 144.

M. rotundifolia, Dwarf Mallow, has a decumbent stem, roundish heart-shaped leaves with five shallow acutely crenate lobes, the outer sepals linear lanceolate shorter than the ovate acuminate stellately hairy inner ones. The flowers are small and purple, and two or three times longer than the calyx. It is common in waste places in most parts of Europe, and is native of Britain. It is the *M. vulgaris* of Fries, the *ἀγρία μαλάχη* of Dioscorides, loc. cit., and the Malache sylvestris of Pliny, loc. cit.

M. borealis has its outer sepals linear, as long as the ovate acute glabrous but strongly ciliated inner ones, the petals as long as the calyx, the fruit pubescent, margined, reticulate-rugose. It is the *M. pusilla* of Smith, the M. rotundifolia of Fries. It is found in Britain, near Hythe in Kent. There are many other species of Mallow.

Those mentioned are the only natives of Britain, and the others are of little importance excepting as ornamental plants. Those best worth cultivation for this purpose are *M. Moschata*, *Morenii*, *alcea*, *Muroana*, and *purpurata*. The stove species will succeed in any kind of rich soil, and cuttings of them will strike root freely if planted in light soil underneath a handglass. The greenhouse species may be propagated in the same manner. The hardy perennial kinds should be planted in the open border, and may be propagated either by seed or by dividing the roots.

(Don, *Gardener's Dictionary*; Babington, *Manual of British Botany*.)

MANDATE, as one of the contracts of the Roman law, was constituted where one by special agreement, or by tacit assent, had undertaken to perform some act gratuitously for another. The obligations incumbent on the mandatary, and enforced against him by law, arose, not from his receiving a consideration for what he had undertaken to do, but from his leading the mandant to believe that he would perform it, and thus causing damage if he should neglect it. It is distinguished from Negotiorum Gestio, where the person performing the service undertakes it without authority from the person for whose behoof it is undertaken; and from Locatio-Conductio, where the service is remunerated. The characteristics of Mandatum are briefly stated in Heineccius, *Ad Inst.*, tit. 27, and by Gaius, iii. 155, &c. In England mandate in this simple sense is a department of the law of Bailment. [Bailment, P. C.] In Scotland there is a wide departure from the old Roman meaning of the word, and almost every instance where one person acts for another is said to be under the contract of mandate; thus the commercial agent buying and selling, and the solicitor conducting a litigation, are said to be 'Mandatories.' The case in which, by the practice of the law of Scotland, the word mandate in its old sense is best exemplified, is in trusts, which, instead of being subject to the complex legal peculiarities which characterise the system in England, are merely treated as simple mandates. The acceptor of a bill is held to be a mandatary of the drawer.

MANDRA'GORA. [Atropa, P. C.]

MANGANESE—*Medical Properties of.* During the prevalence of pneumatic medicine, preparations of manganese, particularly the binoxide, on account of the large quantity of oxygen it can yield, were much employed; but since the views of Beddoes and others, who recommended them, have become obsolete, the articles suggested to be used have fallen into oblivion. A rational ground for reviving some of them is to be found in the facts that oxide of manganese exists as a constituent of the bones, and may in some cases be deficient in these structures, and also that carbonate of manganese exists in some of the mineral springs of Carlsbad and Marienbad, and hydrochlorate of manganese exists in the waters of Kreutznach. The presence of these salts in waters much celebrated for their utility in various chronic diseases has suggested their employment in some of the complaints which are frequently benefited by them. But even if their curative properties are insufficient to establish them as valuable medicines, the deleterious effects of some forms of manganese justify a notice of them in this place. The extensive employment of black oxide of manganese in the preparation of bleaching-powder produces in some of the workmen a form of paralysis which should be early noticed, inasmuch as after it is thoroughly established it seems altogether incurable; and the only chance of escape is the complete abandoning of the occupation. It is limited to paralysis of the lower extremities, affecting the motor nerves only, for the sensibility is unimpaired. A staggering gait is the first symptom of its commencement. This is often perceived sooner by others than by the sufferer. No cholic, nor constipation, such as attends the use of lead, is manifested. (See Dr. Couper's paper in 'British Annals of Medicine.' i. p. 41.)

Binoxide of manganese has been used internally in pills, and also as a gargle; externally as an ointment in some obstinate cutaneous affections. It does not appear entitled to much attention. Hydrochlorate, and still more sulphate of manganese, deserve attention as chologogue cathartics, or promoters of the secretion of bile. The latter salt has a cooling and bitter taste, resembling that of Glauber salt. Dissolved in a considerable quantity of water, and taken in the morning, it produces several liquid stools. Its purgative action may be increased by giving it with infusion of senna or with rhubarb. Alkalies and their carbonates are incompatible with it, as decomposition occurs. Its power of augmenting the secretion of bile renders it a valuable agent along with mercury, or as a substitute for it where mercury cannot be borne. It is useful in gout.

MANGLE. [Calendering, P. C. S.]

MANGOSTA'NA. [Garcinia, P. C.]

MANIA. [Insanity, P. C.; Lunacy, P. C. S.]

MANNYNG, ROBERT, is more usually called Robert de Brunne. He owes this name to his having been a Gilbertine canon in the monastery of Brunne or Bourne in Lincolnshire. He lived in the reigns of Edward I. and his successor, and was the writer of one of the earliest of the Metrical Chronicles whose language can be called English. His work however is merely a translation from the French. It is in two parts: the first, translated from the 'Brut d'Angleterre' and 'Roman le Rou' of Wace and Gaimar, begins with Æneas and ends with Cadwallader; the second, from Cadwallader to Edward I., is translated from the Chronicle of Peter Langtoft. [Langtoft, P. C.] Robert's version was published by Hearne in 1725. The measure of it is octosyllabic in the first part, and Alexandrine in the second. Its poetical merit is very small; but it is interesting as an early monument of the language, and valuable for its information, both historical and literary. Robert made in English rhymes a translation, which has never been printed, of Saint Buonaventura's treatise 'De Cœna et Passione Domini.' He translated also, freely, into octosyllabic verse, the 'Manuel Peche,' or 'Manual of Sins,' which used to be attributed to Bishop Grosthead on insufficient grounds. Of this unprinted translation specimens are given in Warton's work and elsewhere. Hearne has supposed, with little reason, that Robert de Brunne was the author of the old English metrical romance called 'Rycharde Cuer-de-Lyon.'

MANTUA'NO, the common name of a family of artists of Mantua, of the sixteenth century. The proper name appears to have been Ghisi, but few particulars regarding the lives of its members are known.

Giovanni Battista, called Giovanni Mantuano, and also Bertano, was painter, sculptor, engraver, and architect, and author of a commentary on Vitruvius—'Gli oscuri e difficili Passi dell' Opera di Vitruvio,' fol., Mantua, 1558. He was the pupil of Giulio Romano, executed many designs, some engravings, and a few paintings; but his chief business was architecture, and he built the church of Santa Barbara at Mantua. It is not known what relationship he bore to the following artists.

Giorgio Ghisi, called Giorgio Mantuano, was born at Mantua about 1520. He was painter and engraver, and was still living in 1578. Bartsch describes seventy-one of his engravings, many of which are after the most celebrated works of the sixteenth century; they are well drawn and executed with great mastery, much in the style of Marcantonio. Among the most valuable are the Last Judgment, and the Prophets and Sibyls, by Michelangelo, in the Sistine Chapel; and the Dispute on the Sacrament and the School of Athens, after the frescoes by Raphael in the Vatican.

Bartsch describes 129 prints by Adamo Ghisi, called also Mantuano; and 46 by Diana Ghisi, called Mantuana. Those of the former are dated from 1566 to 1576, and those of Diana from 1575 to 1588. Diana was the daughter of Giovanni Battista Mantuano, and was married to Francesco da Volterra, architect; the date of her death is not known.

(Gandellini, *Notizie Istoriche degl' Intagliatori*; Bartsch, *Peintre-Graveur*; Brulliot, *Dictionnaire des Monogrammes*, &c.)

MANUEL, NICOLAS, sometimes called Deutsch, a celebrated Swiss painter, was born at Bern, in 1484. He is the Emanuelo Tedesco who studied under Titian at Venice about 1511, and he became very celebrated for a series of pictures (probably in distemper) of the Dance of Death, *Todtentanz*, painted between 1514 and 1522, in the cloister of the Dominican convent at Bern. The picture consisted of forty-six subjects, forty-one of which were the actual *Todtentanz*; it has been long since destroyed, but the compositions are preserved in prints and copies: the wall on which it was painted was pulled down in 1660. Manuel was an active reformer, and many of these designs are reflections upon the abuses of the Roman church: he was also a great politician; from 1523 he took an active part in an official capacity in the government of Bern. He died in 1530. His own portrait in oil and several drawings are in the library of Bern. There are a few other of his oil pictures at Basel and at Bern.

Of Nicolas Manuel, until recently, little was known beyond what Sandrart says of him in his 'Teutsche Académie.' He appears to have been a man of universal ability; he was painter, sculptor, wood-engraver, poet, soldier, and statesman; and he was lately made the subject of an elaborate work by Dr. Grüneisen—'Nicolas Manuel, Leben und Werke eines Malers, Dichters, Kriegers, Staatsmannes, und Reformators,' Stuttgart and Tübingen, 1837.

(Nagler, *Neues Allgemeines Künstler-Lexicon*.)

MANURES. [Manure, P. C.; Guano, P. C. S.]

MAPES, WALTER DE. [GEOFFREY OF MONMOUTH, P. C.]

MAPS AND CHARTS. [COPYRIGHT, P. C. and P. C. S.]

MARCELLUS, U'LPIUS, a Roman jurist, who lived under Antoninus Pius and his successors. He was employed by Pius as one of his legal advisers (Capitolinus, *Anton. Pius*, 12), and also apparently by Aurelius, the successor of Pius (*Dig.* 28, tit. 4, s. 3), for Marcellus speaks of the proceedings in a case before Aurelius, A.D. 166, in which the emperor delivered judgment. Marcellus (*Dig.* 26, tit. 2, s. 19), as quoted by Ulpianus, cites an oratio of the Divi Fratres, which proves that he survived Aurelius, if the word Divi was used by him, and is not introduced by Ulpianus. It is conjectured that this is the Ulpius Marcellus who commanded in Britain during the reign of Commodus, the successor of Aurelius, and by his military success excited the jealousy of the emperor. (Dion Cassius, lxxii. 8.) But it is doubtful if this Ulpius Marcellus is the jurist. (See the note of Reimarus on Dion Cassius.)

The writings of Marcellus mentioned in the Florentine Index are thirty-one books of Digesta, six books on the Leges Julia et Papia, and two books of Responsa. There are 159 excerpts from Marcellus in the Digest; and other works of his are cited besides those just enumerated. Marcellus is quoted by Marcianus, Ulpianus, and Paulus frequently, and by Modestinus.

MARCH, a market and post town in the chapelry of March in the parish of Doddington, in the northern division of Witchford hundred in the Isle of Ely, Cambridgeshire, 92 miles north of London, viz. 72 miles by the Eastern Counties Railway to Ely, and from thence 20 miles by coach-road through Chatteris to March. The area of Doddington parish is 38,240 statute acres, that of the chapelry of March 20,440 acres; the population of the parish in 1841 was 8648, of whom 5706 were in the chapelry of March. The population of the chapelry at the former enumerations was, in 1801, 2514; 1811, 3098; 1821, 3850; 1831, 5117. The number of houses in the chapelry in 1831 was 1016, inhabited by 1023 families; 42 uninhabited and 16 building; in 1841 it was 1163 inhabited, 32 uninhabited, and 12 building. In these returns the town is not distinguished from the rural districts of the chapelry.

The town consists principally of two streets, in the form of the letter T: the street which forms the stem of the letter runs north and south, and is lined with houses on both sides; the cross street runs in an irregular line on the north bank of the old river Nene, having scarcely any houses except on the north side of the street, the south side being for the most part closely skirted by the river, which is crossed by a bridge at the junction of the two streets. The church, or rather chapel, stands at the southern extremity of the town: it is dedicated according to some statements to St. Mary, according to others to St. Wendreda, and is said to have been erected in the middle of the fourteenth century; it is a handsome Gothic structure, with a spire at the west end. There is a modern and commodious town-hall, where manorial courts are held. The town is within the jurisdiction of a Court of Requests established in the Isle of Ely for the recovery of debts under 10*s*. There is a weekly market on Friday for butcher's meat, and there are two yearly fairs. Some trade in agricultural produce is carried on by means of the river Nene, which is navigable.

The chapelry of March is united with the vicarage of Doddington; the clear yearly value of the united benefices is 7306*l*., with a glebe-house; they are in the rural deanery, archdeaconry, and diocese of Ely. There were in the chapelry in 1833 nine day-schools, with 552 children of both sexes, giving not one in nine of the population (according to the census of 1831) under daily instruction. Two of the schools, with 304 children, were national schools supported by various endowments, and attended by the children on Sunday also; and there were two other Sunday-schools supported by Dissenters, with 170 children.

(*Ordnance Survey*; *Parliamentary Papers*; Lysons' *Magna Britannia*.)

MARCIA'NUS AELIUS, a Roman jurist, who was writing after the time of Septimius Severus, for he calls him Divus (*Dig.* 50, tit. 4, s. 7). He also survived Caracalla, the successor of Severus, for he names him Divus (*Cod.* 9, tit. 8, s. 8). He probably wrote chiefly under the reigns of Septimius and his son Caracalla. The works of Marcianus which are mentioned in the Florentine Index are sixteen books of Institutiones, four books entitled Regularia, two books on Appellationes, two books on Publica Judicia, a single book on Delatores, a single book on the Hypothecaria (formula), and a single book Ad Senatusconsultum Turpilianum. Marcianus is cited by Ulpianus and Paulus (*Cod.* 7, tit. 7). There are 275 excerpts from Marcianus in the Digest.

MARCUS GRÆCUS. Of this writer, and his *Liber ignium*, nothing is known but one old mention and a quotation. A certain Græcus is mentioned (about A.D. 800) by the Arabic physician whose name is latinized into Mesua. John Mesua's medical works were printed at Venice, 1581, folio. There is a surmise by Fabricius and Dutens, that this same Græcus is mentioned by Galen. His name first appears, as far as we can find, in Dr. Jebb's edition of Roger Bacon. In speaking (preface, sheet C, leaf 1) of Bacon's distinct reference to some sort of detonating powder, Jebb thinks he may have drawn his account from the *Liber Ignium* of a certain Marcus Græcus, of which work he (Jebb) had seen a manuscript in the possession of Dr. Richard Mead. Dutens, author of the 'Origine des Découvertes attribuées aux Modernes,' procured the account from Dr. Jebb, and ascertained that there was a manuscript in the Royal Library at Paris. But the work has never been printed, nor has any notice been taken of it, that we can find, except such references to Jebb and Dutens as that made by Dr. Hutton. [BACON, ROGER, P.C.] As the passage in question is not easily met with entire, and certainly describes gunpowder and its consequences, in the form of a rocket, we shall transcribe it, seeing that the early existence of some such thing as gunpowder is clearly indicated, not merely by the passage itself, but by Bacon's reference to it or a similar account:—

'Secundus modus ignis volatilis hoc modo conficitur: lib. i sulphuris vivi; lib. ii carbonis salicis; salis petrosi vi libras, quæ tria subtilissimé terantur in lapide marmoreo. Postea pulvis ad libitum in tunica reponatur volatili, vel tonitrum faciente. Nota quod tunica ad volandum debet esse gracilis et longa, et prædicto pulvere optimè conculcato repleta. Tunica vel tonitrum faciens debet esse brevis, grossa, et prædicto pulvere semiplena, et ab utraque parte filo fortissimo bene ligata. Nota quod in qualibet tunica primum foramen faciendum est, ut tenta imposita accendatur, quæ tenta in extremitatibus fit gracilis; in medio vero lata, et prædicto pulvere repleta. Nota quod ad volandum tunica plicaturas ad libitum habere potest, tonitrum vero faciens quam plurimas plicaturas. Nota quod duplex poteris facere tonitrum ac duplex volatile instrumentum, vel tunicam subtiliter in tunica includendo.'

MARGARITO'NE D'AREZZO, a celebrated old Italian painter, sculptor, and architect, was born at Arezzo, about 1215, or perhaps a little later, but he was probably at least twenty years older than Cimabue, who was born in 1240.

Margaritone was a painter of the Greek or Byzantine school, and of great reputation in his day. He executed many works in Arezzo, both in tempera and in fresco; in the latter style he painted the whole interior of the church of San Clemente, an old church which, with other buildings, was destroyed by the duke Cosmo de' Medici in 1547, to make room for improvement in the fortifications of Arezzo. Most of Margaritone's works have now perished; but one, which, according to Vasari, Margaritone considered one of his masterpieces, namely, San Francesco, painted for a convent in Sargiano, still exists, and is engraved in Lastri's 'Etruria Pittrice,' i. 7. Vasari speaks highly of a picture on canvas, illustrating the lives of the Virgin and John the Baptist, in small figures, and in which, says Vasari, Margaritone much surpassed his larger works; but this picture has also perished. There is still an old painted wooden crucifix by Margaritone in the church of Santa Croce at Florence, where it is placed by the side of a similar work by Cimabue. Margaritone's fame was very great in his time, but it was almost wholly eclipsed by the reputation of Cimabue and Giotto. He had a peculiar way of stretching and priming his canvases; they were primed with plaster mixed with size or glue made of strips of parchment, and were stretched and fastened with the same glue upon a pannel.

In sculpture, says Vasari, Margaritone was more successful than in painting. There is still by him, in the cathedral of Arezzo, a reclining marble statue of Gregory X. over the tomb of that pope, which was also constructed by Margaritone; in the upper part of the tomb was also Gregory's painted portrait, but this has been defaced by time: this monument, according to Vasari, is Margaritone's masterpiece. As an architect, Margaritone conducted the building of the cathedral of Arezzo, some time after the death of Jacopo

Lapo, but according to the design of that architect, from about 1277 until 1289, when a war broke out between Arezzo and Florence. He died at Arezzo, probably shortly after 1289, aged seventy-seven, and was buried in the old cathedral of that place, where his portrait was painted by Spinello Aretino, and the following epitaph was inscribed upon his tomb:—

Hic jacet ille bonus pictura Margaritonus,
Cui requiem Dominus tradat ubique plus.

(Vasari, *Vite de' Pittori*, &c., and the Notes to the German translation of Vasari by Schorn.

MARINERS' CONTRACT. [Ships, P. C.]

MARI'NUS TY'RIUS. [Ptolemæus, Claudius, P. C., p. 104.]

MARMION, SHAKERLEY, the son of a Northamptonshire squire, was born in that county, became a gentleman commoner of Oxford in 1617, and proceeded master of arts in 1624. He squandered a good fortune; took military service in the Low Countries; and in 1639 became one of the officers in the troop raised by Sir John Suckling for the king in his expedition against the Scots. But, becoming sick at York, he returned to London, and died there before the end of the year. Besides small scattered poems, he wrote three plays: 1, 'Holland's Leaguer, an excellent comedy,' 1632, 4to.; 2, 'A Fine Companion,' a comedy, 1633, 4to.; 3, 'The Antiquary,' a comedy, 1641, 4to., a drama of considerable merit, which is reprinted in the tenth volume of Dodsley's Collection.

MARQUOI'S RULERS. Among the methods which have been devised for facilitating the operation of drawing parallel lines, those which consist in making one ruler slide along the edge of another are in almost every case the most expeditious and accurate.

A triangular ruler having two of its edges at right angles to one another being made so to slide with one of its edges perpendicular to the length of a common rectangular ruler constitutes, apparently, one of the first contrivances of this nature. It is said to have been originally employed in Germany, from whence its use extended to other parts of Europe. A triangular ruler of the form just mentioned is called by the French artists an *équerre*.

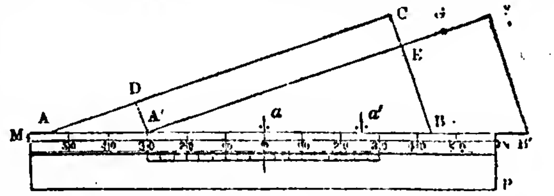
The most approved construction and application of a triangular ruler are due to an artist named Marquoi, who resided in London, and by his name only the instrument is now known. Where many lines are to be drawn parallel and perpendicular to one another, as in making plans or elevations of buildings, or the horizontal projections of the ramparts of fortresses, such an instrument is particularly useful. The right-angled triangle, as well as the rectangular rulers which accompany it, is made of box-wood, ivory, or some metal; and on the surfaces of the latter rulers are certain scales with graduations in equal parts.

The ratio of the hypotenuse to the shorter side of the triangular ruler is usually as three to one; and on one of the surfaces, about the middle of the hypotenuse, there is drawn a short line which serves as an index. The rectangular rulers which are used with the triangle are each about 12 inches long; they have scales on both surfaces, and the graduations are cut close to the edges in order that the coincidence of the index on the triangle with any required division may be accurately made.

Parallel to each scale there is generally cut another, each of its divisions having the same proportion to each division on the corresponding scale at the edge as the shortest side of the triangle has to the hypotenuse (1 to 3 usually). This second scale is used entirely as a plotting scale for the purpose of laying on paper lines of given lengths in feet, yards, or other measure, or of measuring them when traced; the former scale being intended wholly for the peculiar purpose of the sliding triangle.

The plotting, or, as they are called, the natural scales, are of various kinds, but usually from 20 parts to 60 parts in an inch; the others, which are called artificial scales, vary consequently from divisions equal to $\frac{3}{20}$ to such as are $\frac{3}{60}$ or $\frac{1}{20}$ of an inch.

When it is required to draw lines parallel to others at any given distance on a scale representing feet (for example), the apparatus is used in the following manner. Let M P be a rectangular ruler on the edge M N of which is the scale to be used: if, for example, the drawing is to be made on a scale of 30 feet to an inch, the scale is that whose divisions are each equal to $\frac{3}{30}$ of an inch: then, the edge A C of the triangle being made to coincide with a given line, the index a must first, by a movement of the ruler M N, be placed in coincidence with the zero of the scale (in the middle of the length of the ruler),



the triangle must then be moved along M N till the index a is (suppose at a') in contact with the number on the scale which expresses the number of feet in the perpendicular distance between the given line and that which is to be drawn. If the triangle be then in the position A′ B′ C′, a line drawn along its edge A′ C′ will be the line required; for it will be parallel to A C at a distance from it equal to the given number of feet on the natural scale. The reason is manifest; for imagine A′ D to be drawn parallel to B C, then the triangle A A′ D is similar to A B C: consequently, since A A′ is equal to the distance $a a'$ between the two positions of the index, A′ D will be the same part of A A′ or $a a'$ as B C is of A B; that is, by the construction of the triangle, A D, the interval between the parallel lines is one-third of the distance $a a'$ on the scale, or equal to the corresponding distance on the natural scale.

Lines may be drawn parallel to one another by means of the side B C of the triangle; and it is evident that the distance between them (E C′ for example) will bear the same proportion to A C as B B′ or $a a'$ bears to A B; that is as $\sqrt{8}$ to 3. But the edge B C is principally used in drawing lines perpendicular to given lines; if, for example, the edge B C were in coincidence with a given line, and it were required to draw, through a given point G, a line perpendicular to such line, the triangle must be moved along M N till A C passes through the given point; then the line A′ C′ will be perpendicular to that line.

When lines are to be drawn parallel to one another at considerable distances, the edge B C is made to coincide with an edge M N of the rectangular ruler; and, both ruler and triangle being moved together till A C, then perpendicular to M N, coincides with the given line, the triangle is moved along M N till the same edge A C is at the required distance from the original line; when the line may be drawn.

Marquoi's rulers have occasionally been formed and used in a different manner. Instead of one triangle with several scales, a single scale on the ruler M N has been made to serve the purpose by means of several triangles in which the lengths of the sides have different ratios to one another. Thus, if a scale of divisions each equal to one-tenth of an inch be formed at an edge of M P, and if a right-angled triangle in which the hypotenuse is twice the length of one of the sides be used with it; on sliding the index of the triangle over each division on the scale, the interval between the lines drawn contiguously to the longer side of the triangle will be $\frac{1}{20}$ of an inch: if the hypotenuse be four times the length of the shortest side, lines drawn contiguously to the longer side will, on sliding the index over one division of the scale, be equal to $\frac{1}{40}$ of an inch; and so on.

MAROCCO. [Algiers, P. C. S., p. 83.]

MARSH-MALLOW. [Althæa, P. C.]

MARSHALL, JOHN, Chief Justice of the United States of North America, was born in Fauquier County, Virginia, September 24, 1755. He was the son of Colonel Thomas Marshall, and the eldest of fifteen children. He received a little instruction in Latin and Greek, but went through no regular course of education, and was never at any college. On the breaking out of the American war, he engaged with enthusiasm in the cause of his country. In 1776 he was appointed a first lieutenant, and in 1777 was promoted to the rank of captain. He was present at the battles of Brandywine, Germantown, and Monmouth. There was however a redundancy of officers in the Virginian army, and Marshall having applied himself to the study of the law, was admitted to the bar in 1780, and in 1781 resigned his commission in the army. Thenceforward he devoted himself to the law, and rose rapidly to great distinction in the profession.

Marshall was a member of the Virginia Convention for the ratification of the constitution of the United States, and both then as well as subsequently in the Virginia legislature distinguished himself by his judgment and eloquence. He was twice offered the situation of attorney-general, and on both occasions declined on private grounds to accept the offer. In June, 1797, John Marshall, Charles Cotesworth Pinckney, and Elbridge Gerry, jointly and severally, were sent to France as envoys extraordinary and ministers plenipotentiary. Marshall returned to America in 1798. In 1799 he became a member of Congress, and on the 13th of May, 1800, he was appointed secretary of state. On the 31st of January, 1801, he succeeded John Jay as chief justice of the United States, and from that time till his death continued to fill the office with increasing reputation for ability and integrity. He died July 6, 1835, at Philadelphia, to which city he had gone from his residence at Richmond in Virginia, in hope that by medical advice and change of scene his declining health might be improved. Three of his children were with him, but his eldest son died suddenly at Baltimore, on his journey to attend his father's death-bed.

Judge Marshall was the author of the 'Life of Washington,' originally published in London, in 5 vols. 4to., the first volume in 1804, the fifth in 1807. The work was criticised by the 'Edinburgh Review' (October, 1808) severely, but perhaps not unfairly, as having been swelled out to an unreasonable bulk by historical matter unconnected with the life of Washington; as containing no details of his private character and habits, which Judge Marshall had ample opportunities of knowing; as diffuse and undiscriminating in narrative, and heavy and unanimated in style. This criticism seems not to have been thrown away. Marshall published a second edition of the work in 1832, compressed into two volumes, and greatly improved. The 'History of the American Colonies,' which in fact occupied the first volume of the original work, he had published in a separate form in 1824.

As a judge, it is admitted that he was one of the most distinguished that America has produced. Judge Story, who was twenty-four years his associate on the bench of the Supreme Court, wrote in 1828 an article in the 'North American Review' (vol. xvii.), 'On the Public Services of Judge Marshall,' in which he says:—'Splendid as has been the judicial career of this eminent man, it is scarcely possible that the extent of his labours, the vigour of his intellect, or the untiring accuracy of his learning, should be duly estimated except by the profession of which he was so great an ornament.' . . . . 'Many of those exquisite judgments which have cost days and nights of the most elaborate study, and for power of thought, beauty of illustration, variety of learning, and elegant demonstration, are justly numbered among the highest reaches of the human mind, find no admiration beyond the ranks of lawyers, and live only in the dusty repositories of their oracles.' . . . . 'We emphatically say of Chief Justice Marshall that his master-mind has presided in our deliberations, and given to the results a cogency of reasoning, a depth of remark, a persuasiveness of argument, a clearness and elaboration of illustration, and an elevation and comprehensiveness of conclusion, to which none others offer a parallel.'

(*American Almanac*, 1830, 1836; *North American Review*, vol. xvii.; *Edinburgh Review*, vol. xiii.)

MARSHMAN, JOSHUA, D.D. [SERAMPORE MISSION, P. C. S.]

MARTINO. [MEMMI DI MARTINO, SIMONE, P. C. S.]

MARY, SAINT, is the easternmost of the Azores or Western Islands, and lies near 37° N. lat. and 25° W. long. It is about seven miles in length from east to west, and five miles in breadth from north to south, and contains an area of 36 square miles, or 27,000 acres. The island consists of a plain and an elevated district. The plain occupies about one-third part on the west side of the island, the other part being formed of an elevated ridge running from north-west to south-east, which rises to a double peak (Pico Alto) 1889 feet above the sea, and of which the sides decline on the north, east, and south to mural cliffs, about 200 feet in height, with which it terminates on the shore. The plain is slightly undulating, and like the higher tract cut by ravines, terminating in cliffs more than 100 feet high. The aspect of St. Mary is therefore on all sides bold, and the coast abrupt or precipitous, and surrounded by the usual accumulations of fallen masses.

The surface on the west side is much overlaid with stones, and bears a spare vegetation of grasses and weeds. The most elevated part of the higher grounds is covered with common heath and some other shrubs; on the east side only is there any land which is fit for cultivation. The cultivation is limited to wheat, Indian corn, potatoes, and beans and peas. There are few plantations of trees, but those of oranges have been lately increased. Aloes and the prickly-pear cactus grow wild, and the Rocella tinctoria to a large size. Nothing is known respecting the climate of the island, except that there is much less rain in this island than in that of St. Michael's.

The population, according to the census of 1840, was composed of 4666 individuals, of whom about one-half belonged to the small town of Villa do Porto and two hamlets: the remainder were dispersed over the island in single farm-houses. There were then 2213 males and 2453 females. There are some public schools, established by government, but in 1840 they were only attended by fifty-two pupils, all males. The course of education does not comprehend more than the elements of reading and writing.

The whole quantity of agricultural produce is comprised in 2500 quarters of wheat, 2500 quarters of Indian corn, 200 boxes of oranges, and a small quantity of wine, potatoes, beans, peas, and other articles. About one-half of the wheat and all the oranges are exported to St. Michael's. This produce is derived from one-sixth of the whole area; the remainder is sterile. The greater part of the western plain is only fit for pasturage. There are about 2800 head of horned cattle, 2000 sheep, 1200 pigs, 600 goats, and 100 horses and asses. For these the grass and other fodder of the island does not afford a sufficient supply of food, and they are therefore fed in winter on the bruised leaves of the aloes, which are cultivated for that purpose on the stony ground and the otherwise unprofitable sides of the ravines.

St. Mary was discovered in 1431 by Gonsalvo Velho Cabral, a Portuguese, who was sent by the Prince Don Henrico to explore the part of the sea in which the Azores are situated, and the island received from him its name, because he discovered it on the 15th of August, the festival of the Assumption of the Virgin Mary. Soon afterwards it was settled by Don Gonsalvo.

(Hunt, *Description of the Island of St. Mary*, in *London Geogr. Journal*, vol. xv.; Birch, *Description of the Azores or Western Islands*.)

MARY, DUCHESS OF WÜRTEMBERG, or the Princess Marie d'Orleans, was born in April, 1813, during the exile of her father Louis-Philippe, then Duke of Orleans, and residing at Palermo with his wife Amelia, second daughter of King Ferdinand of Naples. The Princess Marie spent much of her childhood at Twickenham, near London; her youth was passed under the care of her mother at Neuilly, until her father was raised in 1830 to the dignity of King of the French. From her childhood a devoted love for art had been a distinctive feature of her character, and as soon as she was at an age to benefit by the instruction of masters, Louis-Philippe commanded some of the most skilful artists in their several styles to attend upon her. Ary Scheffer was her master in design and painting, Pierre Jean David instructed her in modelling and in sculpture, and Mr. Newton Fielding taught her drawing in water-colours. She was married to the Duke of Würtemberg in 1837, and she died at Pisa, in January, 1839, in consequence of injuries suffered from the conflagration of her palace at Stuttgart.

She is said to have left numerous designs, and to have executed many beautiful drawings. Some of her works in sculpture have already acquired her a European reputation; among these her marble statue of Joan of Arc is the most popular. Joan is standing with her eyes fixed upon the ground in deep meditation, her arms are crossed upon her breast, and in her right hand she grasps her sword; her costume is that of a female and a knight combined. The original statue, now at Versailles, is of the size of life, but it has been copied in many materials and in many sizes. She executed also an equestrian statue of Joan of Arc at the moment after having slain an Englishman with her battle-axe: there is also a small model by her of the Death of the Chevalier Bayard. And in a chapel at Fontainebleau there are some windows painted after her designs. Many contemporary journals, French and foreign, celebrated the character and ability, and deplored the untimely fate of this accomplished princess.

MARYGOLD. [CALENDULA, P. C. S.]

MASCARA. [ALGIERS, P. C., p 330.]

MASCHERO'NI, LORENZO, an Italian mathematician, was born at Bergamo in 1750. His studies were at first directed to the languages and literature of Greece and Rome, and to these subjects he applied himself with unwearied diligence. At eighteen years of age he was appointed professor of humanity in the university of his native city, and he attracted some notice at that time by a poetical dissertation on what he called the false eloquence of the pulpit. He afterwards became professor of Greek in the university of Pavia; and, having taken orders in the church, he acquired the title of Abbé.

It was not till he was twenty-seven years of age that he began the study of mathematics; but he rapidly acquired a taste for the sciences, which induced him to abandon his classical pursuits, and so great was his progress in this branch of learning that he was appointed professor of geometry in the college Mariano at Bergamo.

When the Revolution took place in the north of Italy, on the invasion of the country by the French, Mascheroni was chosen a member of the legislative body in the Cisalpine Republic; and soon afterwards he was sent to Paris to assist in the formation of the new system of weights and measures. He was at one time also engaged at Bologna, with other mathematicians, in the performance of experiments with a view of proving the rotation of the earth on its axis by the place at which a body struck the ground when let fall from the upper part of a lofty building.

Mascheroni published in 4to. a work entitled 'Sulle Curve che servono a delineare le Ore ineguali degli Antichi nelle superficie Plane,' Bergamo, 1784; and in the following year, at the same place, a tract, also in Italian, on the Equilibrium of Vaults, 4to. In this tract the higher branches of analysis are employed, and the investigations are extended to subjects beyond those which are treated in the works of the earlier writers on the applications of science to practical engineering. In 1795 he published at Milan, in 8vo., a work entitled 'Geometria del Compasso,' in which are ingenious solutions of several geometrical propositions by means of a pair of compasses only; that is, by the intersection of circular arcs, without the assistance of a ruler. Among these propositions is one in which it is required to find between or beyond two given points, and in the direction of a straight line joining them, other points whose distances from the former are in any assigned proportions. There are given in the work methods of finding points in lines perpendicular or parallel to, or making given angles with, a line joining two points whose positions are assigned; of determining a mean proportional between, and third, fourth, &c., proportionals to two given lines; and of inscribing polygons in circles. There are also approximative solutions of problems, such as the duplication or multiplication of a cube, and the trisection of an angle, which require, in the usual method of operating, applications of the conic sections or other curves.

Besides the mathematical works just mentioned, and a tract containing notes on Euler's 'Institutiones Calculi Differentialis,' Mascheroni published some verses which were addressed to the Countess Grismondi, an elegy on the death of Borda, and a poem entitled 'Invito di Dafni a Lesbia,' in which he introduced a precise description of the objects contained in the museums of natural history and philosophy at Pavia.

He died in July, 1808, in consequence, it is said, of too close application to his scientific studies, leaving several manuscripts, and among them one on 'Pyramidometry,' a subject which La Grange had previously investigated, but which Mascheroni had the merit of placing in a new light.

(*Biographie Universelle*; Montucla, *Hist. des Mathématiques.*)

MASSE'NA, ANDRE', Prince of Essling, Duke of Rivoli, and Marshal of France, was born at Nice, 6th May, 1758. 'Several of the French marshals,' says D'Israëli, 'and the most famous—Masséna, for example—was a Hebrew; his real name was Manasseh' ('Coningsby,' ii. 203). Left an orphan at an early age, his education was greatly neglected. He appears to have spent some years of his youth at sea with a relation who was captain of a trading vessel, but having taken a dislike to a sea-faring life, he abandoned it, and in 1775 entered the army as a private soldier in the regiment Royal Italian, in which one of his uncles was a captain. After a diligent discharge of his duties in that regiment for fourteen years, he only attained the rank of sergeant, which, when he afterwards became marshal, he declared was the step in his military career which had cost him the most to gain. Discouraged by this slow promotion, he retired to his native city, where he made an advantageous marriage. Events connected with the French revolution recalled him to his former profession, and he was appointed by the suffrages of his fellow-soldiers to the rank of adjutant-major of the battalion raised in the department of the Var, of which regiment he subsequently became colonel. In August, 1793, he was made general of brigade, and general of division a few months after. In the Italian campaigns of 1794 and 1795 he served under the generals Kellerman and Scherer, and it was chiefly owing to his skill as a tactician that the victory was gained in the defile of Saorgio (August, 1794), and on the Col de San Giacomo in 1795. Indeed the great success of these campaigns has generally been attributed to the ability of the plans which the influence of his talents caused to be adopted. When Bonaparte assumed the command of the army in Italy he employed Masséna actively on all occasions of importance, the brilliancy of whose military conceptions he so justly appreciated, that he surnamed him the 'favoured child of victory.' The scenes of his principal exploits were Montenotte (9-11 April, 1796), Millesimo (14 April), Castiglione (29 June—5 July), Arcola (15-17 Nov.), and Rivoli (9 January, 1797). At the peace of Campo Formio, October 17, 1797, Masséna was sent to France to present to the Directory the ratification of the treaty of peace by the Emperor of Austria. In February, 1798, he was appointed to the command of the army which, under General Berthier, was occupying Rome and the Papal States. His appointment to this office was equally disliked both by the French soldiers and the inhabitants of the subjected country, for they both became the victims of that insatiable avarice which on every occasion characterized this general. The multiplied complaints which his disposition gave rise to at last obliged him to resign his command and to return to Paris. He there published a 'Mémoire' in justification of his conduct, notwithstanding which he was left without employment till 1799, when the important command of the armies of the Danube and of Switzerland was confided to him. In the direction of this campaign he evinced a military talent of the highest order. The memorable battle of Zürich (5th and 6th of June, 1799), in which he obtained considerable advantages over the Russian army under Korsakow, saved France from the invasion of the allied powers, and led to the dissolution of the coalition which had been formed between the Russians and Austrians.

On the return of Bonaparte from Egypt, Massena was employed by him to defend Genoa, which was at that time invested by a large Austrian army, and closely blockaded by the English fleet under Lord Keith. He arrived there on the 18th of February, 1800, and defended it against immensely superior forces, and amidst the horrors of famine, till the 3rd of June, when, unable to prevent the rising of the inhabitants, he was compelled to agree to an honourable capitulation. Only eleven days after this capitulation, Bonaparte, conqueror at Marengo, stipulated the evacuation of this city, which was again re-entered by the French under General Suchet, on the 24th of June, 1800. [GENOA, P. C.]

Masséna's name does not appear connected with any event of importance till May, 1804, when, on the same day that Napoleon became emperor, Masséna was created a marshal of France. In 1805 he was again appointed to the command of the army in Italy, where he was opposed to the Austrian army under the Archduke Charles: he conducted this campaign with varying success, but he was at last enabled to drive back the Austrians into Germany, and to effect a junction with the grand army of Napoleon. After the peace of Presburg (20th Dec., 1805), Masséna had the command of the army which was to conduct Joseph Bonaparte [BONAPARTE, JOSEPH, P. C. S.] to Naples, which kingdom had been bestowed upon him by his brother (from whence he returned after having established by force of arms the authority of the new king). By his success over the insurgent Calabrians and the reduction of the fortress of Gaëta (18th July, 1806), he enabled Joseph to take possession of his new kingdom. In 1807 he was appointed to the command of the right wing of the army opposed to the Russians in Poland, and his services during this important campaign were rewarded by the title of Duke of Rivoli, in commemoration of the skill and bravery which he had displayed in that celebrated battle (1797) [RIVOLI, P. C.]: a large sum of money was at the same time given him to support his new dignity.

A singular and untoward circumstance occurred on his return to Paris. He, who had exposed his person in so many battles without receiving a wound, had the misfortune to lose the sight of his left eye while on a hunting-party, a portion of shot having accidentally struck it.

The Austrian campaign of 1809 shed considerable lustre on the already high military character of Masséna. He greatly distinguished himself at Landshut and Eckmühl. The rapid capture by storm of the strong castle of Ebersdorff, which, from its position on the river Traun, was deemed almost impregnable, especially attracted the admiration of Napoleon. At the battle of Essling [LANNES, P. C. S.] the defence of the village of Aspern was confided to Masséna, and it is generally believed that to his obstinate resistance in that village the French army was indebted for its preservation. His eminent services on that most critical occasion were rewarded by the rank and title of Prince of Essling.

The same success attended the operations of Masséna at Engerdorf and at Wagram. At the battle of Wagram he was obliged to direct the movements of the left wing of the army while seated in a carriage, on account of an injury produced by a fall from horseback. An incident there occurred which showed that in more than one respect he was 'the favoured child of fortune;' at one time success appeared doubtful, and to animate his soldiers he insisted on being placed on horseback; he had scarcely been so when a cannon-ball struck the vacant carriage and shattered the seat which he had occupied. In 1810 Marshal Masséna was appointed to the chief command of the army in Portugal, which was about seventy-two thousand strong: his commission was to drive the British, under Wellington, from Portugal. His exploits in this campaign, though in many instances marked by great military talent, have not added to his reputation as a general, while the frequent examples of his cruelty, avarice, and breach of faith, recorded in the histories of that period, have left a deep stain upon his memory. One achievement, however—his masterly retreat into Spain after the failure of his attempts on the lines of Torres Vedras—has been the subject of the highest praise and admiration, as far as military skill was concerned, by both English and French historians. (Sir W. Scott, *Life of Napoleon*, vol. vii. p. 136.)

Masséna was recalled from Spain in 1812, and the command of the army which he left was bestowed upon Marshal Marmont. His health having severely suffered, he was unable to join the expedition to Russia. In the latter end of 1813 he was sent to Toulon to take the command of the eighth military division, from which place he formally declared his adhesion to the Bourbons, on the 6th of April, 1814, and was by them confirmed in his command. On the return of Napoleon from Elba, after some hesitation, he recognised his government, but kept aloof from all active participation in the events which took place during the Hundred Days. After Napoleon's second abdication he was appointed commander-in-chief of the national guard of Paris. Being chosen a member of the Council of War which was assembled for the trial of Marshal Ney, he at first declined sitting as a judge on a fellow-soldier with whom he had been for some time at variance, and when this objection was over-ruled he joined the majority of members in pronouncing for the incompetency of the court. [NEY, P. C. S.] Some months after these events he was denounced in the Chamber of Deputies on the charge of having been at the head of a conspiracy for the return of Napoleon. He was however satisfactorily acquitted, and he afterwards publicly repelled the accusations which had been brought against him, in a 'Mémoire Justificatif,' to which a reply was published in a pamphlet entitled 'A Letter of a Citizen of Marseille to Marshal Masséna,' which was written in a spirit of such bitter invective that it produced a sensible effect on his mind and health, already enfeebled by bodily infirmities, and is said to have hastened his death, which took place on the 4th of April, 1817. His funeral eulogium, which was pronounced by General Thiébault, was inserted in the 'Mercure,' and afterwards published separately.

Masséna was gifted by nature with a powerful frame of body and with indomitable resolution. His bravery was rather characterised by perseverance than by impetuosity. He was considered the most skilful tactician among Napoleon's generals, and on the field of battle he was remarkable for the coolness and precision of his orders and for his penetrating insight into the intended movements of the enemy. He had moreover the invaluable quality in a commander of not being dispirited by defeat. His faults and vices we have already alluded to; they were principally rapacity and avarice, and they frequently brought down upon him the displeasure and punishment of his chief.

(Alison, vol. iii. iv.; Las Cases, *Mémorial de St. Hélène*; *Court and Camp of Napoleon*; *Dict. Hist. des Batailles*; *Biographie Moderne*; Pelet, *Mémoires sur la Campagne de* 1809, Paris, 1823-26, 4 vols. (this accurate military writer was aide-de-camp to Masséna); Napier, *Hist. of the Peninsular War.*)

MASSON, ANTOINE. This celebrated French engraver and painter was born at Loury, near Orleans, in 1636, and was originally an armourer and *damasquineur*, damaskenator, or ornamental engraver and inlayer of metals, an artist in much request in the days of armour and chivalry. Masson, who in engraving appears to have been self-taught, had extreme facility and certainty of execution, and he was one of the first artists who made a marked distinction in the textures of the objects which he engraved; he was also extremely successful in his mode of representing colour. The fantastic and eccentric mode however in which he sometimes engraved his portraits, has been condemned by some critics as mere bravura to display his own remarkable facility in handling the graver; in some heads the features are engraved in continuous and peculiar lines. He was very fond of displaying his skill also in executing hair, whether of man or beast, though he frequently sacrificed truth to his propensity for making these fine lines, and in draperies and animals he has gone so far beyond the truth, that this peculiarity is the most striking feature of some of his works. A print, after Titian, of the Disciples at Emmaus, is from the nature of the cloth on the table generally known as La Nappe, and there is a dog in the picture which is such a mass of hair, that upon a close inspection it appears, says Watelet, to be made entirely of straw; yet notwithstanding these peculiarities, says the same intelligent critic, this print is the best engraving after Titian. Watelet says that Masson's faults are faults which he would have, and that they are always compensated by his beauties. The print of the Disciples at Emmaus has an additional value beyond its merits as an engraving, for, with the exception of that of Christ, all the heads are portraits—the praying disciple is the Pope Adrian IV., the other is the Emperor Charles V., the host is the emperor's confessor, and the attendant is Philip II. of Spain. Masson died at Paris, in 1700, as engraver in ordinary to the king, and a member of the French Academy of Painting. He has executed many portraits, several after his own paintings, and some of them are nearly of the size of life. Masson's portraits have a peculiar interest also as representing a great portion of the most distinguished men during the reign of Louis XIV. His historical pieces are not numerous, but they are all excellent.

(Watelet and Levesque, *Dictionnaire des Beaux Arts*; Robert Dumesnil, *Peintre-Graveur Français*; Nagler, *Neues Allgemeines Künstler-Lexicon*.)

MAST. [SHIP-BUILDING, P. C.]

MASTER AND SERVANT. [SERVANT, P. C.]

MASTER OF A SHIP. [SHIPS, P. C.]

MASTERS IN LUNACY. [LUNACY, P. C. S.]

MAS'U'DI', ABU'-L-HASA'N 'ALI' BEN-HUSEI'N BEN-'ALI', one of the most celebrated Arabian writers, was born, according to his own statement, at Baghdád, in the 3rd century of the hejra, or the 9th of the Christian æra. He belonged to the illustrious family of 'Abdallah-ben-Mas'úd, of the tribe Hodzáíl, and one of his ancestors was among the few early followers of Mohammed who accompanied the prophet on his flight from Mecca to Medina. Mas'údí was gifted with great talents, which he applied at an early age to learned pursuits. He gathered an immense stock of knowledge in all branches of science, and his learning was not mere book learning, but he improved it in his long travels through all parts of the East, Turkey, Eastern Russia, and Spain. In A.H. 303 he visited India, Ceylon, and the coast of China, where the Arabs had founded numerous small colonies; thence he went to Madagascar and Southern Arabia; thence through Persia to the Caspian, and he visited the Khazars in Southern Russia. [TARTARS, P. C.] In A.H. 314 he was in Palestine; from 332 to 334 in Syria and Egypt, and he says that in 345, when he wrote his last work, the second edition of his 'Golden Meadows,' he was in Egypt, and had been a long time absent from his native country, Irák. He says that he travelled so far to the West (Morocco and Spain), that he forgot the East, and so far East, that he forgot the West. Mas'údí died probably at Kahirah (Cairo), in A.H. 345, (A.D. 956), and since he visited India as early as A.H. 303, it is evident that those who say he died young are mistaken.

No Arabian writer is quoted so often, and spoken of with so much admiration by his countrymen, as Mas'údí, and although only a small portion of his numerous and voluminous works is known to Europeans, it is sufficient to show that he deserves his reputation. The variety of subjects on which he wrote astonishes even the learned, and the philosopher is surprised to see this Arab of the middle age resolving questions which remained problems to Europeans for many centuries after him. Mas'údí knew not only the history of the Eastern nations, but also antient history and that of the Europeans of his time; he had thoroughly studied the different religions of mankind, Mohammedanism, Christianity, those of Zoroaster and Confucius, and the idolatry of barbarous nations. His geographical knowledge was no less extensive and correct than his acquaintance with history, and no Arabian writer can boast like him of learning at once profound and almost universal. In the introduction to Dr. Sprenger's translation of the 'Golden Meadows,' Mas'údí is thus compared with Herodotus—'If it is the warmth for his own nationality and tenets without prejudice against what is foreign; the elasticity of mind to receive impressions, and to appreciate opinions, without want of firmness and principles; the thirst for correctness of information without preconceived criticism, which rejects what is unknown if it differs from known facts; the vastness of experience and deep learning acquired through extensive journeys, frequent intercourse with men of all nations and opinions, without neglecting that self-knowledge which is acquired in solitary self-contemplation and the basis of history (?); and if it is that extensive knowledge and enlarged mind which embraces all past, reflecting on the present: and that sound criticism, which, entering into the feelings of nations, and penetrated by those ideas, imaginations, and tendencies which mankind feel at all times, select what is national and characteristic although it may not always bear the stamp of logical reasoning; if it is for these merits that Herodotus has acquired the name of father of history, and of the greatest of all historians—El-Mas'údí has a just claim to be called the Herodotus of the Arabs.'—A characteristic feature of Mas'údí is his want of method in arranging the prodigious number of facts which a rare memory never failed to supply him with while he was writing. He illustrates the history or geography of the West with analogies or contrasts taken from China or Arabia; he avails himself of his knowledge of Christianity to elucidate the creeds of the different Mohammedan sects; and while he informs the reader of the mysteries of the extreme North, he will all at once forget his subject and transfer him into the desert of the Sahara. In this respect the Arab has a striking resemblance to B. G. Niebuhr, although this peculiarity of the German historian is less apparent in his works than it was in his lectures.

The principal works of Mas'údí are: 1, 'Akhbár-ez-zemán,' or 'History of the Times.' This work, the wonder and delight of the learned in the East, was too voluminous to meet with popularity. According to Burckhardt there is a MS. of it in the library of the mosque of St. Sophia, which, incomplete as it is, consists of twenty large volumes in 4to., and ten at least are said to be wanted to make it complete. The 'Akhbár-ez-zemán' was a general history of all nations; it has never been printed; MSS. are very rare in the East, and there are none in Europe. In the royal library in Paris however there is a MS. fragment of it on Egypt, of which there is a MS. translation by Pétis de la Croix, which has been perused by later orientalists. The Arabic work 'Kitáb taríkh-al-júmán fí mokhtasár ákhbár-ez-zemán,' or 'The Book of Pearls gathered from the History of the Times,' of which there is a MS. copy in the Royal Library at Copenhagen, and another in that of Paris, is an extract from the 'Akhbár-ez-zemán,' according to the Danish orientalist Rasmussen. Saint Martin however doubts this. This extract was made in the 9th century of our æra, by Shehább-ed-dín Ahmed-am-Mokrí, a native of Fez in Morocco. 2, 'Kitáb-al-áúsat,' 'The Book of the Middle,' the word 'áúsat' the plural of 'wesat,' being probably taken in the sense of 'proportionate,' 'not exceeding a certain size.' This is the complement to No. 1, and treats of the most curious and important questions in history and geography. There is no MS. of it in Europe, and we know some of its details only through the quotations of other Arabic writers. Aware that his works were too voluminous, Mas'údí wrote, 3, 'Morúj-ad-dhehel we m'ádin-al-jewáhir,' his celebrated 'Meadows of Gold and Mines of Gems.' This is an extract with additions from No. 1 and 2. In the Leyden MS. perused by Dr. Sprenger, the work is divided into 132 chapters, of which the doctor gives the titles in the introduction to the first volume of his translation of the work; in a Paris MS. it is divided into 129 chapters, 65 of which treat on foreign countries, and the remainder on the Empire of the Arabs. Mas'údí wrote this work in A.H. 332, in the space of one year, according to the author, for each chapter bears the date when the author finished it. This seems, however, scarcely credible. In A.H. 345 the author issued a second edition containing 350 chapters, but this work was again too voluminous, and met with less favour from the public than the first edition, of which there are many MSS. in the East as well as in Europe; but there is no MS. extant of the second edition. A Spanish Arab, El-Shatíbi, a native of Xativa, made an extract from the 'Golden Meadows,' and so did Reiske during his residence at Leyden. The 'Historia Joctanidarum,' in Schultens' 'Monumenta Antiquissima Historiæ Arabum,' is a translation of a chapter of the 'Golden Meadows;' and it appears that the Arabic treatise of which Renaudot published a translation under the title 'Anciennes Relations des Indes et de la Chine do deux Voyageurs Mohammedans' is likewise a fragment of that work, though probably of the second edition. Dr. Gildemeister published a translation of a chapter of it on India, entitled 'De Indis,' Bonn, 1836, 8vo. The Oriental Translation Fund intends to publish a translation of the whole work, of which the first volume, containing the first seven chapters, translated by Dr. Aloys Sprenger, with the co-operation of the late Earl of Munster, appeared under the title 'El-Mas'údí's Historical Encyclopædia entitled Meadows of Gold and Mines of Gems,' 1st vol., London, 1841, 8vo. The 'Golden Meadows' treat on the history, geography, religion, manners, and politics of most of the Eastern and European nations, and are full of matter both important and curious.

The following are works of Mas'údí, some of which are extant in MS., but most of them are only known by being quoted by other writers:—

4, 'Kitáb fonún-al-m'árif,' &c., 'Different Branches of Science, and of what has happened in bygone times;' 5, 'Kitáb dekháír-al-'olum,' &c., 'Treasury of Science,' &c.; 6, 'Kitáb-al-ístib sár,' 'The Book of Consideration,' treats on a matter of the highest importance to all Moslems, namely on those who were entitled to succeed Mohammed as Khalif; 7, 'Kitáb-al-mesáíl,' &c., 'The Book of Questions on the Causes of Religion;' 8, 'Kitáb-al-ábánah,' 'On the Principles of Religion;' 9, 'Kitáb-as-safwah,' 'On Sincerity,' treats on the different Mohammedan sects. Mas'údí was a schismatic, and it is believed that he left his nativo town, and settled abroad, on account of some religious differences; 10, 'Kitáb sirr-al-háyáh,' 'On tho Secret of Life,' especially on the soul, and its transmigration; 11, 'Kitáb-al-d'áwí-ash-shenf'ah,' 'On Extravagant Opinions.' It is much to be regretted that there is no translation of this work; 12, 'Kitáb tabl-an-nofús,' 'The Physician of the Soul,' with a metaphysical digression on dreams; 13, 'Hadáík-al-ábazár,' 'Beds of Flowers,' contains historical information on the descendants of Mohammed and their virtues; 14, 'Al-mabádí we al-tarákíb,' 'On Principles and Compositions,' treats among other subjects on the influence of the sun and the moon; 15, 'Kitáb-ar-rús as-sehf'yah min as-síásah am-molúkíah,' 'The Book on the Seventy Chapters,' treats on the policy of kings, and is a very remarkable work. We close this list with, 16, 'An Account of the Establishment of the Fatemite Dynasty in Africa, from a MS. ascribed to Mas'údí,' with notes, by John Nicholson, Ph. D., Tübingen and Bristol, 1840, 8vo. According to Kosegarten and Silvestre do Sacy, this work is a fragment either of No. 1 or No. 2 in our list. The MS. used by Dr. Nicholson is one of those which the unfortunate Dr. Seetzen purchased at Damascus; it is now No. 261 in the library of the reigning duke of Saxe-Coburg-Gotha, at Gotha; it was written in A.H. 627, and is consequently of more modern date. An orientalist well acquainted with the works of Mas'údí would confer a great benefit on geographers by writing a commentary on the geographical system of the author. Mas'údí had thoroughly studied the systems of Ptolemy and Marinus of Tyre, and he distinguishes between the maps of Ptolemy and those of the Syrian geographer. There is consequently no doubt that the geography of Marinus was extant in the 10th century of our æra. Mas'údí speaks of the Arabic origin of the kings of Tibet, a fact which is likewise mentioned in the Chinese annals; of a Syrian empire anterior to that of Nineveh; of Wán in Armenia as the city of Semiramis; of cuneiform inscriptions, and other matters. And since the Arabic poem of which the Rev. Charles Forster has availed himself for deciphering the Himyaritic inscription of Husein Ghoráb and others, was taken from Schultens' 'Historia Joctanidarum' mentioned above, it seems that there is no small chance of finding a clue to the Himyaritic characters in the works of Mas'údí.

(Haji Khalfah, *Biographical Dictionary*; Herbelot, *Bibliothèque Orientale*; Quatremère de Quincy, *Mémoire sur Masoudi*, in 'Journal Asiatique,' 3ième Série, vol. 7 (January, 1839), a very valuable reference; the *Introductions* to the Translations by Dr. Sprenger and Dr. Nicholson mentioned above.)

MATCH, in Gunnery, is a material employed in firing military mines or in discharging pieces of ordnance. Before the invention of fire-locks, hand-guns or small-arms were fired by matches, which the soldiers carried with them on service; and match-lock fire-arms are still used in some parts of Asia.

What is called *slow-match* is only a piece of slightly twisted hemp which has been well soaked in a strong solution of saltpetre with boiling water. When fire has been communicated to it, it burns very slowly, and a piece one yard long is scarcely consumed in eight hours. In use, the end to which fire has been applied is blown upon by the breath, when it is capable of setting fire to gunpowder or to the cotton-wick inserted in the composition which fills a fuze.

The materials employed in the formation of *quick-match* consist of a mixture of saltpetre and mealed gunpowder with spirit of wine and rain-water. The water, in which the saltpetre is put, is made to boil for an hour in a copper vessel, a wick of cotton being coiled in the liquid; the alcohol is then added and the mixture is allowed to simmer over a slow fire for a quarter of an hour. Some of the powder is afterwards introduced, and the whole is left during twenty-four hours. The cotton is then wound on a reel and the remainder of the powder is sifted over it. The match is then left for several days in order that it may become thoroughly dry, after which it is fit for use.

MATHAM, JACOB, a celebrated Dutch engraver and painter, was born at Haarlem in 1571. He was the pupil of Golzius, who married Matham's mother, by whom he acquired considerable fortune. Matham's prints are very numerous; Bartsch describes nearly 300. He died in 1631.

(Bartsch, *Peintre-Graveur*.)

MATICA or MATICO,—*Medical Properties of.* This name is applied to an astringent plant brought from Peru, where it has long enjoyed a high reputation for its styptic properties. Doubts exist as to the botanical origin of the plant, some ascribing it to a Labiate plant, resembling a *phlomis*, while others refer it to a piperaceous plant, and even assert that it is the piper asperifolium, Ruiz et Pavon, a native not only of Peru, but also of Cayenne, and the Caribbean islands. The odour of the leaves, somewhat resembling a mentha, and the large quantity of volatile oil obtained from them, lend countenance to the former opinion; while the alternate position of the leaves in most of the specimens described, entirely negatives this notion. The probability is, that two distinct plants pass under the name of Matico, which, though they have a distinct origin, have similar properties. Frequent instances of this are found in Brazil, where numerous plants are called *caa-peba;* and several, reputed antidotes to the bites of serpents, are all termed *guaco*. The analysis of the leaves seems to have been made on the piperaceous plant, which is stated to yield a drink employed by the Indians to produce effects similar to the bang obtained from the Cannabis Indica. This fact strengthens the idea of its being a piper, since the piper methysticum yields a highly intoxicating beverage. Matico has been analysed by Dr. Hodges, who found it to contain 1, chlorophylle; 2, a soft dark-green resin; 3, a brown colouring matter; 4, a yellow colouring matter; 5, gum, and nitrate of potash; 6, a bitter principle, *Maticine*; 7, an aromatic volatile oil; 8, salts; 9, lignin.

Cold water extracts, in about four hours, all the medicinal virtues of the plant, and is an eligible means of administering it. A tincture is also employed, and the powdered leaves are given both internally and applied externally. It does not owe its astringent properties to tannin: and it seems to exert a vital action on bleeding vessels, so as speedily to arrest the hæmorrhage. It has been used to check other discharges, such as the profuse expectoration and also the night-sweats of consumptive patients. Few drugs exert more than a temporary influence over these symptoms; but among such, Matico seems well entitled to attention.

MATRICA'RIA, a genus of plants belonging to the natural order Compositæ, the suborder Corymbiferæ, the tribe Senecionideæ, and the section Anthemideæ. It has a nearly flat involucre with an elongated conical receptacle: the fruit angular, not winged; the pappus is either absent, or in its place there is a slight membranous border.

M. Chamomilla, Wild Chamomile, has bi-pinnate smooth leaves, capillary simple or divided segments, solitary heads of flowers, and a hollow receptacle. This plant is common throughout Europe, on dung-hills, in cultivated ground, and on way-sides and waste places. It was formerly used as a medicine, but its place has been taken by the common Chamomile and other plants of the same order. It is the ἀνθεμίς of Dioscorides, lib. 3, cap. 144. The *Pyrethrum Parthenium*, Fever-few, is by some botanists referred to Matricaria. This plant appears to be the ἀνθέμιον of Theophrastus, 'Hist. Plant.' lib. 14, cap. 7; and the παρθένιον of Dioscorides, lib. 3, cap. 135; and of Plutarch (*Sulla*, cap. 13). Other plants, as species of Parietaria, Chrysocoma, &c., were called παρθένιον by the Greek writers.

(Babington, *Manual of British Botany;* Fraas, *Synopsis Floræ Plant. Classicæ*.)

MAURICE, THE REV. THOMAS, was born about 1755, at Hertford, where his father was then head master of the Christ's Hospital school. After his father's death the family was impoverished by an unfortunate marriage of the widow: and his education proceeded irregularly till Dr. Parr, on opening his school at Stanmore, was prevailed on to receive him as a pupil, and treated him with great generosity and kindness. At the age of nineteen he was entered at St. John's College, Oxford, whence he removed next year to University College. After taking his degree of B.A., he was ordained by Bishop Lowth; and he held for some time the curacy of the large parish of Woodford in Essex, which in 1785 he resigned for a chapel at Epping, in order to obtain greater leisure for study. Next year he married; but his wife lived for no more than four years. He had already published a translation of the 'Œdipus Tyrannus,' and several other volumes of poems; and he long continued to publish volumes of verses. But his turn for historical studies had been fostered at University College by his distinguished tutor Lord Stowell; and before removing to Epping he had begun to concentrate his attention on the history of India, for dealing with which he made proposals in 1790 in a published letter addressed to the East India Directors. The irreligious spirit of the French revolution, alarming Mr. Maurice's mind, induced him to remodel his first work after it was nearly completed, and to devote a considerable proportion of it to dissertations on the Hindu mythology. His 'Indian Antiquities' began to be published in 1791, when two volumes appeared, in octavo: the rest were brought out at intervals, the completion of the work being mainly owing to the liberality of the Earl of Harborough; and the seventh and last volume appeared in 1797. Meantime he had undertaken his 'History of Hindostan,' the three volumes of which, in quarto, were published in 1795, 1798, 1799; and a second edition appeared in 1821. In 1798 Earl Spencer presented him to the vicarage of Wormleighton in Warwickshire: next year he was appointed assistant librarian in the British Museum: in 1800 Bishop Tomline obtained for him the pension that had been held by the poet Cowper: and in 1804 he received from the Lord Chancellor the vicarage of Cudham in Kent. His 'Modern History of Hindostan,' in two volumes, appeared in 1802 and 1804. Several other volumes on Eastern history and theology, and attempts in verse, succeeded this work: and one of his last undertakings was his 'Memoirs; comprehending the History of the Progress of Indian Literature, and Anecdotes of Literary Characters in Britain, during a period of thirty years.' Of this work the three volumes appeared in 1819, 1820, and 1822. Mr. Maurice died at his apartments in the British Museum, on the 30th of March, 1824.

MAURICIA'NUS, JU'NIUS, a Roman jurist, who appears to have been writing in the time of the emperor Antoninus Pius, from an expression which he uses (*Dig.* 33, tit. 2, s. 23); he was therefore a contemporary of Gaius. The only work of his that is mentioned in the Florentine Index is six books Ad Leges. There are four excerpts from Mauricianus in the Digest.

MAURY, JEAN SIFFREIN, Cardinal, was born on the 26th June, 1746, at Vauréas, in the Venaissin, of poor but respectable parents. He showed at a very early age a great disposition for learning, and, being destined by his parents for the ecclesiastical profession, he was placed at the seminary of St. Garde, at Avignon, to pursue his theological studies. At the age of eighteen he proceeded to Paris, in the expectation of earning a subsistence by the cultivation of his talents. Though he was without friends in that city, his first publication attracted considerable notice. Encouraged by this early success he took orders, and devoted himself to the study of pulpit eloquence. In 1772 an 'Eloge' on Fénélon, which he published, was favourably received by the French Academy, and caused him to be appointed vicar-general of the Bishop of Lombez. He however soon returned to Paris, where he became very popular as a preacher. A panegyric of St. Louis, which he delivered before the French Academy, and one of St. Augustine before an assembly of the clergy, met with so much success that the abbey of Frenade in the diocese of Saintes was bestowed upon him by the king, Louis XVI., who likewise appointed him preacher to the court. In 1785 he became a member of the Academy in the place of the lyric poet Lefranc de Pompignan; and the following year the valuable benefice of the priory of Lioris was conferred upon him. At the assembly of the States-General in 1789 he was named deputy of the clergy for the bailiwick of Péronne, and soon took a prominent part in the debates. From the first he enlisted himself on the aristocratic side, where his energetic eloquence and peculiar talent at reply rendered him a formidable antagonist to Mirabeau. [Mirabeau, P. C.] His impressive and impassioned oratory, though it expressed opinions hostile to the great majority of the assembly, was often listened to with admiration and greeted with applause. His great moral courage and firm adherence to the principles which he had adopted secured for him the respect and esteem of the more enlightened portion of his enemies. 'Opposed in debate by Mirabeau, Barnave, and Clermont-Tonnerre; interrupted at every step by the hisses or cries of one or two thousand spectators in the galleries; certain of being defeated in all his efforts by an overwhelming majority; in danger of being stoned, strung up to the lamp-post, or torn to pieces at the close of every interesting debate, by the furious mob which often surrounded the Assembly, he never deviated from his duty, but was ever to be found at his post. A true soldier of the church, he threw himself with undaunted valour into the breach, and it was hard to say whether, in oratorical contests, the vehement fervour of his declamation, the cutting force of his sarcasm, or the inexhaustible resources of his knowledge, were most conspicuous.' (Alison, *History of Europe*, vol. i. p. 539.) On the 27th of November, 1790, a decree was passed in the National Assembly, by which every ecclesiastic in the kingdom was required to take an oath to maintain with all his power the new constitution; and, in case of any priest's refusal, it was declared that he should be held to have renounced his benefices. To this constitution the pope had refused his sanction, on account of its hostility to the interests of the church, and the oath was indignantly refused by the great majority of the clergy. When the day arrived for the taking it by the bishops and clergy of the Assembly, an infuriated mob surrounded the hall, threatening death to all who should refuse. On this occasion also Maury displayed his usual intrepidity, and boldly advocated the independence of his order. 'Strike, but hear me,' was his exclamation, when the last efforts of his impassioned eloquence in that Assembly were interrupted by the incessant cries of his political antagonists. At the close of the stormy session of the National Assembly, Maury, who could lend no further aid to the prostrate cause of royalty and religion, quitted his native country, and, at the invitation of Pius VI., took up his residence at Rome. He was there received with the highest distinction, and the loss of his benefices in France was more than compensated by his speedy elevation to the highest situations in the Roman church. In 1792 he was named Archbishop of Nicæa 'in partibus infidelium,' and afterwards appointed apostolical nuncio to the diet held at Frankfort for the election of the emperor Francis II. This mission accomplished, in 1794 he was elevated to the dignity of a cardinal, and was instituted to the united sees of Monte-Fiascone and Corneto.

On the invasion of Italy by the French in 1798, though every effort was made to seize Cardinal Maury, he escaped under disguise to Venice, where he assisted at the conclave assembled for the election of Pius VII. In 1799 he returned to Rome upon the conquest of Italy by Suwarrow, and was accredited as ambassador to his exiled king, Louis XVIII., who was at that time residing at Mittau. This office he resigned on the reconciliation of the church of Rome with the government of France under Napoleon, on which occasion he addressed to the First Consul a letter, couched in the most submissive language, praying for permission to return to France. This letter, which was deemed not to be in unison with the tenor of his former conduct, subjected him in after-times to the reproaches and persecutions of the party whom he had served with so much personal hazard. Napoleon gladly received the proposal of a reconciliation with so distinguished a member of the church whose establishment he was restoring in France: an interview took place between them at Genoa, and in May, 1806, Maury reappeared at Paris. The flattering reception he there met with was calculated to attach him to the interests of this chief, who admitted him to his intimacy, and availed himself of his counsels in ecclesiastical matters. He received the pension assigned to the dignity of a French cardinal, and was appointed First Almoner of Jerôme Bonaparte. In 1807 he was elected a member of the Institute in the place of Target, one of the advocates of the unfortunate Louis XVI. His acceptance in 1810 of the Archbishopric of Paris subjected him to the displeasure of Pius VII., between whom and Napoleon there had arisen much disagreement. Cardinal Maury was a warm and sincere admirer of the emperor, and he not only espoused his cause in the disputes with the head of the church, but took every occasion, which the frequent victories of this chief afforded him, of testifying his gratitude by the expressions of admiration which were contained in his mandates to the clergy of his diocese. These mandates, written in a style of the most florid eloquence, do not remind us of the impressive and energetic orator of the National Assembly; they were severely criticised by the adherents of the antient régime and by the witty frequenters of the Parisian saloons, who styled them 'archiepiscopal dispatches,' in allusion to their military tone, and their imitation of the style and manner of Napoleon's bulletins.

After the capitulation of Paris on the 30th of March, 1814, Maury was deprived by the Bourbons of the administration of his diocese; and in their resentment for his adherence to Napoleon's fortune they forgot his former daring and powerful support of their tottering throne. He then returned to Rome, where he was imprisoned during one year by the orders of the pope; he was afterwards allowed to live in retirement on a pension which was given to him in compensation for his resignation of the see of Monte-Fiascone. In this retirement, deeply affected by the ingratitude of his former party and that of the pontiff, to whose elevation he had been instrumental, he died on the 11th of May, 1817.

'Notwithstanding his extraordinary eloquence,' says the Duchess of Abrantes, who knew him intimately, 'the Abbé Maury had been before the Revolution, what he was in proscription, what he continued under the empire, a man of talent rather than a man of sense, and a curate of the time of the League rather than an abbé of the reign of Louis XIV.' She adds that his figure was in the highest degree disagreeable, but the description she gives of it appears rather a caricature than a portrait.

His principal work, 'Essais sur l'Eloquence de la Chaire,' 3 vols. 8vo., published after his death by his nephew Louis Siffrein Maury, still maintains its well-merited popularity. His mind was formed to appreciate the eloquence of Massillon, Bossuet, and Bourdaloue, and his criticisms on the other French divines are in general as correct as they are temperate. In his review, however, of English pulpit oratory he manifests a want of acquaintance with the writings of our most celebrated preachers, such as Jeremy Taylor, Sherlock, and Barrow, and he selects Blair as the best model of English eloquence; the comparison which he draws between him and Massillon is necessarily most unfavourable to the former. His own Panegyric of St. Augustine is esteemed one of the finest pieces of French pulpit eloquence. He is also supposed, conjointly with l'Abbé de Boismont, to be the author of a work entitled 'Lettres sur l'Etat actuel de la Religion et du Clergé de France.'

There is a notice of the life of Cardinal Maury in 'L'Ami de la Religion et du Roi,' vol. xii.

(*Biographie Nouvelle des Contemporains*, vol. xiii.; Alison, *Hist. of Europe*, vol. i.; *Mémoires de la Duchesse d'Abrantes*; *Biographie Universelle Classique*, Deuxième Partie, Paris, 1829; *Biographie Moderne*, vol. ii.; and a curious work entitled *Dictionnaire des Girouettes*, Paris, 1815, in which are fully detailed the political variations of the most remarkable characters of the Revolution and the empire, though sometimes with more sarcasm than truth.)

MAXIMUM IN MACHINES. In all machinery there are certain relations between the motive powers and resistances to be overcome, which render the effect produced a maximum with respect to quantity of motion or velocity, or which render the time of the performance a minimum.

In investigations relating to this subject it is usual to consider that in every machine there is a certain point at which, if the moving power were immediately applied, and a certain point at which if the resistance to be overcome were immediately applied, the effect produced would be the same as that which is produced by the machine in its actual state. Thus, in a machine consisting of several wheels and axles with which weights are raised by means of ropes passing over their circumferences, the points at which the ropes immediately connected with the moving power and resistance are tangents to the circumferences are those at which the forces are conceived to be applied. Also, if several forces act at once as moving powers, and resistances are to be overcome at once at various points, the resultant of all the forces and that of all the resistances must be taken for the effective moving power and the effective resistance. The points of application of these resultant forces are to be found, and at these points such resultant forces are conceived to be applied: the effects of friction, the rigidity of ropes, and every other impediment to the action of the machine, are also to be estimated and applied as additions to the resistance which is to be overcome; and thus a complex machine is reduced to an equivalent mechanical power of a simple form. The velocities of the points at which these resultant forces are conceived to be applied are equal to the velocities of the power and resistance.

The motion in machines may be of two kinds. On the application of force to a machine previously at rest a certain movement is induced, and this movement for a time is accelerative; but in some machines, after a while, the resisting power and the friction of the materials destroy the acceleration, when, unless the machine is subject to variations of force, as is the case with those which are impelled by the wind or by the force of men or animals, the movement will become uniform. On the other hand, there are machines which are acted on by a constantly accelerative power, as when a weight at one end of a rope passing over a wheel descends from an elevated place and raises a weight attached to the other extremity.

If the velocities of the points of application of the equivalent forces are uniform, a simple equation will express the dynamical equilibrium of the machine; for, F representing the moving power, and V the velocity with which it moves, f the force of resistance and v its velocity, we have in the case of equilibrium

$$FV = fv\ ;$$

the first member of the equation is frequently designated the momentum of impulse, and the second the effect produced by the machine.

But the effect of a moving power on a machine in motion is different from that of an equal power on a machine at rest; for the effect produced by any constant power in the former case depends upon its relative velocity, or the difference between its own velocity and that of the machine, and, by Dynamics, it varies with the square of the relative velocity. Therefore, in order to introduce the absolute effect of a force into the equation of equilibrium in place of the efficient force, there must be given the velocity which would render the force quite ineffectual, as well as the actual velocity of the point of application: let the former be represented by V′, and the latter by V; then F′ representing the absolute force when the velocity is zero, and F the actual force when the velocity is V (F′ being determined by the weight or resistance which is just sufficient to prevent the power from communicating motion to the machine, and V′ by the velocity with which the machine can move when the resistance is zero),

$$F' : F :: V'^2 : (V'-V)^2\ ;$$

whence $F = F'.\dfrac{(V'-V)^2}{V'^2}$.

Then the first member of the equation $FV = fv$ becomes

$$F'\frac{(V'-V)^2}{V'^2}.V:$$

or, putting v' for $V'-V$, which gives $V = V'-v'$, it becomes

$$F'\left(\frac{v'}{V'}\right)^2(V'-v').$$

Now, in order to find the velocity which is consistent with the production of the greatest effect by the machine, this expression, which represents the equivalent of fv, the efficient action of the machine, is to be a maximum; therefore, differentiating that expression, v' being the variable, and making the result zero, we have

$$2V'-3v'=0\ ;\quad \text{whence } v'=\frac{2}{3}V'$$

and, by substitution, $V = \dfrac{1}{3}V'$.

Hence, if the resistance opposed to the machine is susceptible of being varied, it should be rendered such that the velocity V of the point of application of the equivalent force is one-third of the greatest velocity V′ which the power can produce if unresisted. Substituting this value of V in the above equation for F we get $F = \dfrac{4}{9}F'$; therefore F V, the momentum of impulse, or the effect of the machine, becomes $\dfrac{4}{27}F'V'$ when that effect is a maximum, the resistance remaining unaltered.

If two bodies are connected together by a flexible line (supposed to be without weight) passing over a pulley at the common summit of a doubly inclined plane, the parts of the line being parallel to the surfaces of the two planes; the relation between the weights may be determined so that the momentum of that which is to be raised by the descent of the other may be a maximum. Let p and w be the weights of the bodies, or the forces of gravity acting on them vertically, and let θ and θ' be the respective inclinations of the planes on which they are placed, to the horizon; then $p \sin.\theta$ and $w \sin.\theta'$ are the forces of gravity on the planes, and consequently $\dfrac{p\sin.\theta - w\sin.\theta'}{p+w}$ is the accelerative force by which p descends.

Now, by dynamics, the velocity of a body varies with the force and time; therefore, v representing the velocity of p or w, and t the time of motion,

$$v \propto \frac{p\sin.\theta - w\sin.\theta'}{p+w}\,t\ ,$$

and consequently the momentum wv varies with

$$\frac{pw\sin.\theta - w^2\sin.\theta}{p+w}\,t\ :$$

this expression is to be a maximum; therefore, differentiating it, w being the variable, and making the result equal to zero, the value of w may be found in terms of p by a quadratic equation: thus the required relation may be obtained.

If it were required to find, in any machine which when reduced to its most simple state may be considered as a lever or a wheel and axle, the ratio of the velocity of the moving power to that of the resistance to be overcome when the latter is a maximum, the following process may be used.

Let the arms of the supposed lever, or the semidiameters of the supposed wheel and axle, be represented by r and r', the power p being applied at the extremity of r, and the resistance w at that of r'. By the nature of the lever, $p = \dfrac{wr}{r}$ in the case of equilibrium; therefore, when the power is such as to produce motion, the motive force may be expressed by $p' - \dfrac{wr'}{r}$ if applied at the extremity of r. Now, in order that the momentum of the inertia of w at a distance r' from the fulcrum may be made equivalent to the momentum of inertia of a body at a distance r, on representing such body by p'', we have $p''r^2 = wr'^2$; whence $p'' = \dfrac{wr'^2}{r^2}$: the whole inertia to be overcome, if applied at a distance r from the fulcrum, will therefore be $p + \dfrac{wr'^2}{r^2}$, and the accelerative force at the extremity of r will be

$$\frac{p+\dfrac{wr}{r}}{p+\dfrac{wr'^2}{r^2}} \quad\text{or}\quad \frac{r^2p - wrr}{r^2p + wr'^2}\ .$$

But, by dynamics, the velocity of a body varies with the force and time; therefore, representing the velocity at the end of the arm r by v,

$$v \propto \frac{r^2p - wrr}{r^2p + wr'^2}\,t\ .$$

in order to obtain the velocity at the end of the arm r, the expression for v must be reduced in the ratio of r to r'; therefore the velocity at the latter extremity varies with

$$\frac{rr'p - r'^2w}{r^2p + wr'^2}\,t\ .$$

This expression is to be a maximum; therefore, on differentiating it, r' being the variable, and making the result equal to zero, there will be obtained the ratio of r to r' (which is the same as that of the velocities of p and w) consistently with the condition that the velocity of w is a maximum.

MAXIMUS, RUTILIUS, a Roman jurist, whose period is uncertain, but he probably wrote under Severus and Caracalla. The only work of his mentioned in the Florentine Index is Ad Legem Falcidiam, or a commentary on the Lex Falcidia (*Dig.* 30, s. 125). There is one excerpt from Maximus in the Digest.

Q. CORNELIUS MAXIMUS, a contemporary of Cicero, was the master of C. Trebatius Testa, the friend of Cicero and Horace (Cicero, *Ad Diversos*, vii. 8, 17; *Dig.* 1, tit. 2, s. 2, s. 45). There is no excerpt from his writings in the Digest, but he is once cited by Alfenus Varus (*Dig.* 33, tit. 7, s. 16), who prefers his opinion to that of Servius on the question that if a vinea (vineyard) was bequeathed with the 'instrumentum,' the word 'instrumentum' comprised the rakes, spades, poles, and stakes.

MAY-FLY, the popular name of the *Neuropterous* insects of the genus *Ephemera* and its allies. [EPHEMERA, P. C. S.] *Baetis* (referred to *May-fly* in P. C.) is one of the genera of *Ephemeræ*. The *Baetis venosa*, an insect inhabiting a great part of Europe, is the type.

MAYER, SIMONE, a composer of great repute during the later part of the last, and early in the present century, was born in Bavaria (at Sandersdorf, in 1760, according to Gerber; at Mendorf, in 1763, as stated by Lichtenthal), and at an early age sent to study music in Italy, in which country he passed the greater portion of his life, and drew his last breath. In 1802 he was chosen as Maestro di Capella to the church of Maria Maggiore in Bergamo. In 1799 appeared his first distinguished opera, now known under the title of 'Il Fanatico per la Musica.' In 1802 he produced his 'Misteri Eleusini,' which on the Continent has always been considered a work of the first class, though we believe it never reached this country. It is supposed to have prepared the way for the reception of Mozart's compositions in Italy, by the introduction of richer harmony and fuller and bolder accompaniments. In 1803 he brought out, at Vienna, 'L'Equivoco,' an opera buffa; and in the same year 'La Ginevra di Scozia,' founded on the episode of Ariodante, in the 'Orlando Furioso,' which yet keeps possession of the Italian lyric stage. So indeed do his 'Lodoiska,' 'Aleramo ed Adelasia,' and 'La Rosa Bianca, e la Rosa Rossa,' the subject of the latter from the history of our wars of the Red and White Roses. But the greatness of his conceptions, and the most striking proof of the energy of his mind, are evidenced in his serious opera, 'Medea,' first made known in London by Madame Pasta, whose personation of the Sorceress of Colchis was by all acknowledged to be one of the finest histrionic efforts that any stage in any country had exhibited, and who did no less justice to the vigorous music of the composer than to the classical taste of the poet, the living and well known Signor Rosetti, who built his drama on the foundations laid by Euripides and Corneille.

The bold determination of Mayer (and also of Paer) to draw more effects from the orchestra—to give to his compositions a higher colouring, as well as deeper contrasts of light and shade, than had been allowed by the Italian school—met at first with much opposition from the sturdy non-progressionists, and, through their influence, from the public generally. But the enlarged powers of the art thus obtained soon became apparent, overcame all resistance, and the Italy of our day adds another to the numberless instances of one extreme passing into its opposite; for the clamour of all kinds of braying instruments at present supplies the want of invention, nay even of taste in plagiarism. Hence what Gretry unjustly and captiously, if not jealously, said half a century ago—that Mozart 'placed the statue in the orchestra, the pedestal on the stage'—may now with the strictest propriety be affirmed of recent Italian composers; with this addition, that the statue exhibits nothing but distorted features and false proportions. Mayer died December 2nd, 1845.

MAYHEM. [MAIM, P. C.]

MAYNE, JASPER, was born in 1604, in Devonshire. After having continued at Westminster school till nineteen years old, he was entered as a servitor of Christchurch, Oxford; and in 1631 he commenced M.A. Taking holy orders, he became a popular preacher; and, being presented by his college to two livings in the neighbourhood, continued to reside in the university. He was created D.D. in 1646. Firmly devoted to the royal cause, he was deprived of his student's place in 1648, and soon lost both of his vicarages. But his spirit was unbroken; and in 1652 he held a public disputation with a noted Anabaptist preacher. Afterwards he resided, till the Restoration, as chaplain in the family of the Earl of Devonshire. In 1660 he was restored to his livings; he then became chaplain in ordinary to the king, a canon of Christchurch, and archdeacon of Chichester. He died at Oxford, in 1672, and was buried in the aisle adjoining to the choir of Christchurch. Dr. Mayne published, in 1662, a translation of a part of Lucian's Dialogues; and also several sermons and scattered poems. But he is now remembered only through the humour which marked his conversation, and which gave birth to two plays of his: 1, 'The City Match, a Comedy,' 1639, folio; 1658, 4to.; 1659, 8vo.; and in the ninth volume of Dodsley's 'Old Plays;' a work considerably more amusing than decorous, and especially lively in its satire on the Puritans; 2, 'The Amorous Warre, a tragi-comedy,' 1648, 4to.

MAZZOLI'NI, LODOVI'CO, a celebrated painter of Ferrara, sometimes called Lodovico Ferrarese, was born about 1481. Mazzolini, like several other distinguished painters not Florentines, owing to the silence of Vasari regarding them, has only recently received his due meed of praise. His name is sometimes confounded with Mazzolino, a name given by Lomazzo to Parmigiano, as the diminutive of Mazzuola, and Vasari has noticed him slightly under the name of Malini, whence, says Lanzi, he has been divided into two—Malini and Mazzolini, and treated as two distinct scholars of Lorenzo Costa, instead of one and the same; an error which is not corrected by Baruffaldi, the historian of the Ferrarese painters, who appears to have had very imperfect knowledge of him. Mazzolini was nevertheless, in pictures of small dimensions and small figures, one of the most successful of all the early Italian painters. His works are miniature altar-pieces, and are excellent in colour, light and shade, and expression; and even in composition they are equal to the best works of their style, the symmetrical. They are on the whole little inferior to the small works by Garofalo. Mazzolini generally painted architectural backgrounds, and these are remarkable for the beautiful detail of the ornaments and figures in basso-rilievo which are introduced into them. He died at Ferrara in 1530.

The works of Mazzolini are not numerous. There are several in the Capitol and in the Doria Gallery at Rome; four in the Gallery of Berlin, among which is a valuable large picture on wood, of Christ disputing with the Doctors; it is marked MDXXIV. Zenar Ludovicus Mazzolinus Ferrariensis. There are two also very characteristic works of this master in the National Gallery, in London; and two in the Gallery of Bologna. Besides these, there are very few authenticated works by this painter, many being no doubt ascribed to other masters, especially to Gaudenzio Ferrari, as is the case with a beautiful Nativity in the Florentine Gallery.

(Lanzi, *Storia Pittorica*, &c.)

MECCA, the birth-place of Mohammed, and the holy city of the Mohammedans, is situated in that part of Arabia which is called El Hedjaz or Hedj, about 21° 30′ N. lat. and 40° 20′ E. long., and seventy miles from the Red Sea, in a straight line.

This city is situated in a narrow and sandy valley, the main direction of which is from north to south. The breadth of the valley varies from one hundred to seven hundred paces: the chief part of the city is placed where the valley is widest. In the narrower part are single rows of houses only or detached shops. The town itself, or that part where the houses are contiguous to one another and constitute one mass, covers a space of about fifteen hundred paces in length, but the whole extent of ground comprehended under the denomination of Mecca amounts to three thousand five hundred paces in length. The mountains enclosing the valley are from two to five hundred feet in height, completely barren and destitute of trees. The valley slopes gently towards the south. Most of the town is situated in the valley itself, but there are some parts built on the sides of the mountains, especially on the eastern chain.

The streets of Mecca are in general broader than those of eastern cities, the houses lofty and of stone, and the numerous windows that face the streets give them a more lively and European aspect than the streets of Egypt or Syria, where the houses present few windows towards the exterior. Many houses are three stories high. In most towns of the Levant the narrowness of the streets contributes to their coolness, and in countries where wheel-carriages are not used, a space that allows two loaded camels to pass is considered sufficient. In Mecca it was necessary to leave the passages wide for the visitors who crowd here.

The only public place in the body of the town is the large square of the great mosque, which is only enlivened during the Hadj (Pilgrimage) by the great number of well-stored shops. The streets are all unpaved, and in summer the sand and dust are as great a nuisance as the mud is in the rainy season, during which they are scarcely passable after a shower.

Mecca is badly provided with water; there are few cisterns for receiving rain, and the well-water is too brackish except for culinary purposes, though during the time of the pilgrimage the lowest class of hadjis drink it. The famous well of Zemzem in the great mosque is indeed copious enough to supply the whole town, but the water is not well tasted. The best water is brought by an aqueduct from the vicinity of Arafat, six or seven hours distant. This aqueduct is wholly built of stone, and all those parts of it which appear above ground are covered with a thick layer of stone and cement. There are two places in the interior of Mecca where the aqueduct runs above ground, and in these parts it is let off into small channels or fountains, at which some slaves of the sherif are stationed to exact a toll from persons who fill their water-skins.

All the houses in Mecca except those of the principal and richest inhabitants are constructed for the accommodation of lodgers, and divided into numerous separate apartments, each consisting of a sitting-room and a small kitchen. Since the pilgrimage has begun to decline, numerous buildings in the outskirts have fallen into ruin, and in the town many houses are rapidly decaying. Except four or five houses belonging to the sherif, two *medresa* or colleges, and the mosque, Mecca has no public edifices, and in this respect is perhaps more deficient than any other Eastern city of the same size. Burckhardt thinks that the want of splendid buildings is to be attributed to the veneration which the inhabitants entertain for their temple, and which prevents them from constructing any edifice that might possibly rival it.

The mosque, called Beitullah (God's House), or El Haram, is only remarkable for the Kaaba, which it encloses; for there are several mosques in other places of the East nearly equal to it in size and superior in beauty. The Kaaba stands in an oblong square, surrounded by colonnades; on the east there are four rows of pillars and on the other sides only three. They are united by pointed arches, every four of which support a small dome, plastered and whitened on the outside. The number of these domes is one hundred and fifty-two, and that of the pillars is variously stated at four hundred and fifty and five hundred. The columns are from one foot and a half to one foot and three-quarters in diameter, and above twenty feet in height, but otherwise there is little regularity in them. No two capitals or bases are exactly alike. The capitals are of coarse Saracenic workmanship, and some, which had served for other buildings, have, by the ignorance of the workmen, been placed upside down upon the shafts.

Seven paved causeways lead from the colonnades towards the Kaaba, or Holy House, in the centre. The whole area of the mosque is upon a lower level than any of the streets surrounding it. There is a descent of eight or ten steps from the gates on the north side into the platform of the colonnade, and of three or four steps from the gates on the south side.

Towards the middle of this area stands the Kaaba, which, according to the belief of the Mohammedans, was constructed in heaven two thousand years before the creation of the world, and Adam, the first believer, erected the Kaaba upon earth on its present site, which is exactly below the spot which it occupied in heaven. It is an oblong massive structure, eighteen paces in length, fourteen in breadth, and from thirty-five to forty feet in height. It is constructed of the grey Mecca stone, in large blocks of different sizes, joined together in a very rough manner and with bad cement. It stands upon a base two feet in height, which presents a sharp inclined plane. As the roof is flat, it has at a distance the appearance of a perfect cube. The only door which leads into it is opened only two or three times in the year: this door is on the north side and about seven feet above the ground: it is entered by wooden steps. At the north-eastern corner of the Kaaba, near the door, is the famous Black Stone; it forms a part of the sharp angle of the building, and is four or five feet above the ground. It is an irregular oval, about seven inches in diameter, with an undulating surface, composed of about a dozen smaller stones of different sizes and shapes, well joined together with a small quantity of cement and perfectly smoothed. Every pilgrim kisses this stone. As its surface has been much worn by the kisses and touches of the pious, it is difficult to determine the nature of the stone. It appeared to Burckhardt to be a lava, containing several small extraneous particles of a whitish or of a yellowish substance. The colour is now a deep reddish brown approaching to black. The four sides of the Kaaba are covered with a black silk stuff, hanging down and leaving the roof bare. This covering is renewed annually at the time of the hadj, and is brought from Cairo, where it is made at the expense of the Turkish sultan. An opening is left for the black stone. The Kaaba remains without a cover for fifteen days before the new one is put on. The black colour of the covering spread over a large cube in the midst of a vast square, gives to the Kaaba, at first sight, a very singular and imposing appearance. As it is fastened slightly, the least breeze causes it to move with a slow undulation, which is hailed by the assembled congregation as a sign of the presence of the guardian angels, whose wings by their motion are supposed to produce the waving of the covering. Seventy thousand angels have the Kaaba in their holy care, and are ordered to transport it to Paradise when the trumpet of the last judgment shall be sounded.

There are several other buildings within the area of the mosque, mostly appropriated to reading prayers, preaching, or the performance of devotions. The Zemzem, or holy well, is supposed to be the spring found in the wilderness by Hagar, at the moment when her infant son Ishmael was dying of thirst. It seems probable that the town of Mecca owes its origin to this well; for many miles round no sweet water is found, nor is there in any part of the adjacent country so copious a supply. It is enclosed by a square building of massive construction, with an entrance to the north opening into the room which contains the well. This room is beautifully ornamented with marbles of different colours; and adjoining to it, but having a separate door, is a small room with a stone reservoir, which is always full of Zemzem water; this the hadjis get to drink by passing their hand with a cup through an iron grated opening, which serves as a window, into the reservoir without entering the room. From before dawn till near midnight the well-room is constantly filled with visitors. It is considered a miracle that the water of this well never diminishes notwithstanding the continual draught from it. Burckhardt learned that the water flows at the bottom of the well, and that it is supplied by a subterraneous rivulet.

The revenue of the mosque is considerable, there being few towns or districts of the Turkish empire in which it does not possess property in land or houses; but the rent of this property is often withheld by the provincial governors, or at least it is reduced by the hands through which it passes, to a small proportion of its real value.

The inhabitants of Mecca, with few exceptions, are Arabians from different countries; but they have amalgamated, and they wear the same sort of dress and have adopted the same customs. They have two kinds of employment, trade and the service of the Beitullah; but the former has the preference, and there are very few ulemas, or persons employed in the mosque, who are not engaged in commercial affairs, though they are too proud to pursue them openly. With the exception of a few potteries and dyeing-houses, the people of Mecca have not a single manufacture. During the hadj Mecca becomes one of the largest fairs in the East, and certainly the most interesting, from the variety of nations which frequent it. The merchants of the place make large profits during this time by their merchandise. They have also a considerable trade with the Bedouins, and especially with the inhabitants of the towns of the Nedj, who are in want of India goods, drugs, articles of dress, and corn. The greatest profit however is derived from supplying food for sixty thousand hadjis and twenty thousand camels. The consumption of grain is much greater in Arabia than in any of the surrounding countries, for the great mass of the population live almost entirely on wheat, barley, lentils, and rice, and use no vegetables, but a great deal of butter. The wholesale merchants are very rich, and have establishments at Jidda, whence they receive nearly all their merchandise.

Mecca was, up to recent times, governed by a sherif, who was raised to this station by force or by personal influence, and the consent of the powerful sherif families of Mecca. He held however his authority from the Turkish Sultan, who invariably confirmed the individual who had got possession of the government. When the power of the Turks in Arabia diminished, and the Porte was no longer able to send large armies with the hadj caravans, the sherifs of Mecca became entirely independent, and disregarded the orders of the Porte. But Mohammed 'Ali of Egypt has restored the authority of the Osmanlis in the Hedjaz, and usurped all the power of the sherif, allowing to the present sherif a merely nominal sway. The sherif is chosen from one of the many tribes of sherifs, or descendants of the Prophet, who settled in the Hedjaz; they were once numerous, but are now reduced to a few families of Mecca. The succession is not hereditary, but although it seldom takes place without some contest, there is little bloodshed in general; and though instances of cruelty sometimes have occurred in these contests, the principles of honour and good faith which distinguish the wars of the Desert have generally been observed.

(Burckhardt's *Travels in Arabia*; Ali Bey's *Travels in Morocco, Tripoli, Cyprus, Egypt, Arabia, Syria, and Turkey*.)

MECHANICAL POWERS is the name given to certain simple machines or engines, for these words are applied indifferently, either of which is occasionally used by itself in moving bodies or raising weights, or any of which are combined together in the formation of the complex constructions which are employed in manufactures and the arts. Frequently however, in investigations relating to statical equilibrium, the properties of the mechanical powers are introduced when no machine is contemplated; as when, at some part of a plane surface, the effect of a pressure at another part is determined by the ratio of the distances from a supposed point of support.

The several machines to which the name of mechanical powers is applied are the LEVER, the WHEEL AND AXLE, the INCLINED PLANE, the WEDGE, the SCREW, and the FUNICULAR MACHINE: the first five have been fully described under those words in the body of this work, and the last in the Supplement.

The object proposed in every machine is to transmit a force from the point at which it is immediately applied to that at which some resistance is to be overcome or some operation to be performed; and, in the transmission, the intensity of the motive power is to be increased so that effects may be produced which could not be accomplished by that power alone. The increase of the power is obtained by causing part of the resistance which is to be overcome to rest on the machine or on the fixed points which serve for its support, so that only the part which remains is opposed to the motive force. Thus, if it be required to raise a heavy body to a certain height from the ground, no exertion of human or animal strength may be sufficient, if directly applied, to accomplish the end; but if a plane inclined to the horizon and extending from the object to the spot to which the latter is to be raised be formed, and the object can be placed on its foot, the force of gravity in the vertical direction being resolved into two forces, one of which is destroyed by the reaction of the plane, the other may be overcome by a motive power less in intensity than that which would be required if a direct application of force were made; in fact the force which will suffice for the attainment of the end diminishes in proportion as the length of the plane is greater.

The manner of overcoming a resistance, which is specified in this example, will serve also to illustrate the well known fact that in every application of a mechanical contrivance to overcome a resistance, as much advantage is lost in respect of time or space as is gained in respect of power. For it is evident that, in order to raise the object vertically through a space equal to the height of the plane, it would be necessary to move it over a space equal to the length of the plane; that is, through a space which bears the same ratio to the vertical height as the weight of the object bears to the power required to move it up the plane.

An account of the applications of the mechanical powers in the construction of complex machines would involve descriptions of most of the engines by which human labour is abridged or dispensed with; and therefore the reader is referred to works in which machines or engines are expressly described, as Gregory's 'Mechanics,' vol. ii., and Barlow's 'Treatise on Manufactures,' in the 'Encyclopædia Metropolitana.'

In determining the efficacy of the mechanical powers it is evidently necessary to consider their parts as mathematical lines, to assume that the axles are without friction and cords without rigidity, so that a perfect equilibrium may subsist in the machine itself before the moving power is applied. The most simple lever, for example, of a physical kind, is a rod of wood or a bar of iron, the arms of which, on opposite sides of the fulcrum, are of unequal weights; and, in order to reduce such a lever to a state from which the exact relation between the opposing powers may be found, the weight of each arm must be computed, and being, in imagination, applied at the centre of gravity of the arm, the product of the weight multiplied by the distance of the centre of gravity from the fulcrum is to be added to the momentum of the weight actually applied to the same arm of the lever. The sums of these momenta, when the actual machine is in equilibrio, serve to determine the correct relation between the opposing powers. The conditions of equilibrium being determined, any excess of the motive power above that which enters into those conditions will evidently overcome the resistance, or produce motion in the machine.

MECKENEN, MEKENEN, or MECHELN, ISRAEL VAN, a celebrated old goldsmith, engraver, and painter of the fifteenth century, born probably at Meckenen near Bocholt, in the bishopric of Münster, though this is a matter of speculation, and his name is written in a great variety of ways, but the above form has met with most supporters, as it is found written in full on his tombstone and upon two of his prints: some however have supposed that the engraver and painter were two distinct artists, or that Israel van Meckenen is not Meister Israel the painter mentioned by several old writers. There are eighteen beautiful old oil-paintings in the Pinakothek at Munich, and some in other collections, which are attributed to Meister Israel; they are of the Van Eyck school, but most of them have been found in the neighbourhood of Cologne and Coblenz, which is one of the reasons for concluding that Meckenen in Westphalia was the artist's birthplace, notwithstanding Meckenheim near Bonn is in the very district in which these works have been collected. There is very good evidence in favour of Meckenen, as Israel was buried at Bocholt, and he appears to have resided there. In Ottley's 'Early History of Engraving' there is a print from a drawing in the British Museum, which was made from Israel's tombstone (since lost), which contains an inscription in the old Gothic character to the following purport:—'In the year of our Lord 1503, died Master Israel van Meckenen; his soul rest in peace. Indē: iear: unses: heeren: m: V: en: iij: up: sinte: mertijns: avend: starf de: erber: meister: Israhel: vā mecknē: sijn: siele: roste in: vrede.'

Israel Van Meckenen was evidently an engraver, from the signatures on his numerous prints, and we know him to have been a goldsmith, from accounts in the old Bocholt records in which his name occurs, from 1482 to 1498 inclusive; but he is on no occasion mentioned as a painter. Yet a painter of the name of Israel is mentioned by several writers, and among them by Jacob Wympfeling, in his 'Rerum Germanicarum Epitome,' c. 67, 'de pictura et plastice;' but from this very circumstance it is argued that the goldsmith and engraver Israel van Meckenen cannot have been the painter Israel Alemannus mentioned by this writer, as engraving was not known until the latter part of the fifteenth century, and subsequent to the time that Wympfeling appears to indicate. Wympfeling however does not say *picturae* or *tabulae depictae*, but *icones* Israëlis Alemanni, which may mean prints as well as pictures, and he certainly speaks of Israel as of his own time and contemporary with Albert Dürer, while he notices Martin Schoen, or Schongauer, an excellent engraver, as already dead, of whom he says, 'qui fuit tam eximius.' He therefore clearly writes at a time when engravings were not only known, but very generally spread over Europe: his book appeared first in 1505, at Strassburg, only two years after the death of Israel van Meckenen. From these facts it is evident that there are not, as far as Wympfeling is concerned, the slightest grounds for disputing the identity of Israel van Meckenen the engraver and Israel Alemanuus the painter.

Lomazzo, in his 'Trattato della Pittura,' which was published in 1584, also notices a German engraver of the name of Israel. He calls him Israel Metro (Meken?), and says he was the master of Martin Schön; but if we substitute pupil for master we shall probably have the truth, for Israel studied the engravings of Martin, and there are still extant forty copies by him of Martin's prints. It is remarkable that out of the three hundred prints and upwards, attributed with and without certainty to Israel, one only has the date fixed to it, and that is the Virgin Mary crowned by two angels and standing upon the half-moon, with the infant Christ on her left arm, and in her right-hand a crucifix; the whole surrounded by a glory of angels. On the margin of this print is 'Dns maculavit Adam propter me et matrem meam,' &c., with the following signature and date—'Israhel V. M. A 1502,' the 5 being reversed. It is No. 44 in Heineken's list. His prints are generally signed Israhel V. M.; I.V.M.; I. M.; and sometimes

Israhel alone. He has engraved his own portrait twice: in one, his name is signed in full 'Israhel van Meckenen, goldsmit;' the other, in which his wife is also engraved, is marked 'Figuracio Facicrum Israhelis et Ide ejus uxoris—I. V. M.' The pictures attributed to Israhel van Meckenen, upon what authority is not explained, are all upon gold grounds and upon pannel. They are some of them on a large scale, many of the figures being about half the size of life, and in execution are equal to any works of their style extant; their expression is often excellent, and the colouring very clear, forcible, and effective. The Ascension and Coronation of the Virgin, Joachim and Anne at the golden gate, and several pictures of Apostles, in the Pinacothek at Munich, are very beautiful works, and if by Van Meckenen, he is evidently entitled to rank with the Van Eycks, Wilhelm von Köln, Hans Burgkmair, Hans Memling, Lucas van Leyden, and other distinguished masters of that time and school. Some of these pictures were drawn in lithography, in 1822, by N. Strixner. The supposed signature of Van Meckenen, with date, on a picture in the gallery of Vienna, mentioned in the catalogue of Von Mechel, is according to Bartsch an error.

(Heineken, *Neue Nachrichten von Künstlern und Kunstsachen;* Fiorillo, *Geschichte der Zeichnenden Künste*, &c.; Bartsch, *Peintre-Graveur;* Becker, *Kunstblatt*, 1839; Nagler, *Neues Allgemeines Künstler-Lexicon;* Dillis, *Gemälde in der Königlichen Pinakothek zu München;* Brulliot, *Dictionnaire des Monogrammes*, &c.)

MECONO'PSIS (from μήκων, a poppy, and ὄψις, a resemblance), a genus of plants belonging to the natural order Papaveraceæ, and formerly referred to Papaver. This genus stands between Papaver and Argemone. It has 4 petals, numerous stamens, a short style, 5-6 radiating free stigmas, the capsule obovate, opening by pores beneath the apex.

There is but one species, *M. Cambrica*, the Welsh Poppy, and this is a native of Great Britain, but it is a rare plant. It is also found in many parts of Europe. It has yellow flowers which are very fugacious, and are seated on long peduncles which are inflexed before the opening of the flower, so that the flower-bud is drooping. It is an ornamental plant, and may be introduced into the garden. It will grow in a rich light soil, in a shady situation. It may be propagated by dividing the roots, or by seeds.

MEDICA'GO (from μηδική, the Greek name of one of the species), a genus of plants belonging to the natural order Leguminosæ, to the tribe Loteæ, and the subtribe Trifolieæ. It has the calyx somewhat cylindrical 5-cleft, the keel rather removed from the vexillum; the stamens diadelphous; the legume many-seeded, of various forms, reniform, falcate, or cochleate, but usually twisted in a spiral manner. The species are herbs or shrubs, with the stipules usually cut; the leaves triofoliate, the leaflet usually toothed, and the peduncles 1-2-many flowered. They are exceedingly numerous, upwards of eighty species having been described.

M. sativa, Lucern, has many-flowered racemes; the pods compressed, spiral, with two or three turns, downy, unarmed; the pedicels shorter than the calyx or bract; the leaflets obovate, oblong, dentate above, emarginate. This plant is a native of Europe, and is found wild in England and Scotland. It has an erect stem, with yellow or violet flowers. It is commonly cultivated in the fields of Europe [Lucern, P. C.], and Babington says that 'the wild specimens found are scarcely naturalised.' This is the μηδική of Theophrastus, 'Plant. de Caus.' lib. 2, cap. 20; and the Medica of Pliny, lib. 18, cap. 16.

M. falcata has the racemes many-flowered, the pods compressed, sickle-shaped, downy, unarmed; the pedicels shorter than the calyx, longer than the bract; the leaflets obovate-oblong, dentate above, emarginate, mucronate. It is a native of Europe on dry mountainous pastures. In England it is a rare plant, but is occasionally found on dry gravelly banks and old walls. This species is said to be the Lucern which is cultivated in Switzerland.

M. Lupulina, Black Medick, or Black Nonsuch, has many-flowered dense oval spikes; the pods compressed, kidney-shaped, with a spiral point rugged with longitudinal branched prominent veins; the stipules obliquely ovate, slightly toothed; the leaflets roundish-obovate, denticulate above, emarginate, mucronate. It has a procumbent stem with yellow flowers, and is a native of Europe in meadows, pastures, and waste grounds, and is plentiful in Great Britain. It affords excellent fodder for sheep, and must be treated in the same way as lucern.

M. arborea, Tree Medick, is a villous shrubby plant; it has obovate-cordate leaflets nearly entire; the stipules linear, acute, entire; the peduncles racemose; the legumes stipitate, twisted, reticulated from transverse veins; 2-3-seeded, the seeds somewhat kidney-shaped. This plant is a native of the south of Europe, and appears to be the κύτισος of Theophrastus, 'Hist. Plant.' lib. 4, cap. 5; lib. 1, cap. 9; 'De Caus. Plant.,' lib. 5, cap. 6; and the κύτισος of Dioscorides, lib. 4, cap. 113. It is also the Cytisus of the Romans: Pliny, lib. 13, cap. 24; Virgil, 'Ecl.' i. 79; 'Georg.' ii. 431.

Besides the first three species, described above, *M. maculata*, *M. minima*, and *M. denticulata* are natives of Great Britain. *M. muricata* was at one time admitted into the British Flora as growing on the sea-shore at Orford in Suffolk; Mr. Babington, in his 'Manual,' states that he is 'convinced, from personal observation, that no such plant now exists in that locality.'

In cultivation the species may be easily raised from seed, and the shrubby species propagated by cuttings. The perennial herbaceous species may be propagated by dividing their roots.

(Babington, *Manual Brit. Bot.;* Fraas, *Synopsis Plantarum Floræ Classicæ.*)

ME'DICI, GIA'N GIA'COMO, Marquis of Marignano, born at Milan in 1495, was the son of a steward of the Duke of Milan. He entered early the military profession, in which he showed great courage, accompanied with a want of all principle. In the war between the Italian powers and the French, for the disputed possession of Lombardy, Medici took the part of his countrymen, and served under Pescara in the campaign of 1522, in which the French were driven out of Lombardy. He acquired the confidence of the Duke Francis Sforza and of his chancellor Morone, who employed him to murder Astorre Visconti, a descendant of the former dynasty of the dukes of Milan, who gave umbrage to the actual occupant of the ducal throne. Medici, having committed the deed, was sent to assist in recovering the castle of Musso, situated in the mountains above the lake of Como, which was still held by the French. He succeeded in taking possession of it, and he kept it for himself for years after, defying from his stronghold the duke's authority, and making predatory incursions among his neighbours. When Francis I. again invaded Lombardy, in 1525, Medici made an incursion into the Valtellina which belonged to the Grisons, and took possession of Chiavenna. The Grisons, alarmed for their own country, recalled their troops which were serving as auxiliaries in the French camp, and this defection is said to have contributed to the defeat of King Francis at Pavia. In consequence of this service, Medici was acknowledged by the duke as feudatory of Musso and other places, with the title of Chatelain.

In the subsequent quarrel between Duke Sforza and his overbearing allies the Spaniards, Medici put himself at the head of the disaffected Milanese emigrants, and annoyed the Spaniards, but after a time, the Spanish governor of Milan succeeded in conciliating Medici, on whom he conferred the title of Marquis of Musso. The object of Medici was to carve out a principality for himself at the expense of his neighbours. He again invaded the Valtellina and took Morbegno. At last, in the year 1532, Duke Sforza, partly by force, and partly by offering him a sum of money with an amnesty for the past, made him give up Musso and his other strongholds. Medici then retired to Piedmont and entered the service of the Duke of Savoy. Here his career as an adventurer terminated. Medici afterwards served in the campaign of 1536 against the French in Piedmont. Having returned to Milan after the death of Duke Sforza, he was made Marquis of Marignano by Charles V. He then went to Spain, from whence he accompanied Charles in his expedition against the revolted Flemings. From thence he went to Hungary to fight for the emperor against the Turks, and afterwards he served in Germany under Charles himself against the Duke of Saxony. Returning to Italy, Medici was appointed to the command of the expedition against Siena, which city he took after a long siege in the year 1555. On his return he was received by Duke Cosmo I. of Tuscany at Florence, with great honour, and on this occasion his relationship to the Medici of Tuscany was acknowledged by Cosmo, notwithstanding which it is still greatly doubted, or rather disbelieved. On his return to Milan, Medici fell ill and died in November, 1555. The Duke of Alba, Spanish governor of Milan, attended him in his last moments. His body was buried at Marignano with great pomp, but afterwards his brother Cardinal Giovanni Angelo Medici having become pope, in 1559, by the name of Pius IV., built him a splendid monument in the cathedral of Milan, whither his remains were transferred. Gian Giacomo Medici was one of the most able and successful commanders of the age of Charles V., but was likewise one of the most unprincipled, rapacious, and cruel.

(Missaglia, *Vita di Jo. Jacopo Medici, Marchese di Marignano;* Verri, *Storia di Milano.*)

MEDINA, the second holy city of the Mohammedans, and the place where their Prophet was buried, is situated in that part of Arabia which is called El Hedjaz, or Hedj, about 25° 15′ N. lat. and 39° 30′ E. long., and about 110 miles from the town of Yembo on the Red Sea, which is the harbour of Medina.

Medina is built on the elevated plain of Arabia, not far from the eastern base of the ridge of mountains which divide the table-land from the lower country between it and the Red Sea. The town stands on the lowest part of the plain, in which the watercourses unite, which produce in the rainy season numerous pools of stagnant water, and render the climate unhealthy. Gardens and date-plantations, interspersed with fields, enclose the town on three sides; on the side towards Mecca the rocky nature of the soil renders cultivation impossible.

The city forms an oval about 2800 paces in circuit, ending in a point. The castle is built at the point on a small rocky elevation. The whole is enclosed by a thick wall of stone, between thirty-five and forty feet high, flanked by about thirty towers and surrounded by a ditch: it is well fortified for an Arabian town, and has always been considered the principal fortress in Hedjaz. Three well-built gates lead into the town. The houses are well built, entirely of stone, and generally two stories high. As the stone is of a dark colour, the streets have rather a gloomy aspect, and are for the most part very narrow, often only two or three paces across; a few of the principal streets are paved with stone. The diminution in the number of pilgrims of late years has caused a great part of the houses to fall into decay. There are only two large streets which contain shops. There are very few large buildings within the precincts of the city. The great mosque containing the tomb of Mohammed is the only temple. There are two fine medresses or colleges. The castle, standing at the western extremity of the city, is surrounded by strong walls and several high and solid towers. It contains sufficient space for 600 or 800 men, has many arched roofs, bomb-proof, and may be deemed impregnable against an Arabian force. It contains a deep well of good water.

The suburbs extend on the west and south of the city, and cover more ground than the city. They are separated from it by an open space, narrow on the south, but forming on the west a large public place. The side of the suburbs towards this open place has no walls, but on the outside they are enclosed by a wall of inferior size and strength to that of the city. Four gates lead through this wall from the suburbs into the open country. The greater part of the suburbs consist of large court-yards with low houses built round them, and separated from each other by gardens and plantations: they are inhabited by the lower classes of the town and all those who are engaged in agriculture. Each court-yard contains thirty or forty families, so as to form a hamlet by itself. The cattle are kept in the midst of the court-yard, where there is a large well, and the only entrance is shut at night. In the western portion of the suburbs are regular and well-built streets with houses resembling those of the city. There are two mosques in the suburbs, one of which is called Mesdjed Ali, or the mosque of the prophet's cousin.

The town is supplied with sweet water by a subterraneous canal which runs from the village of Koba, about three-quarters of a mile distant in a southern direction. The water is abundant, and in several parts of the town steps are made down to the canal, where the inhabitants supply themselves with water; for the water in the canal runs at the depth of twenty to twenty-five feet below the surface. The water however is bad, and, as it contains nitre, it produces indigestion when used by persons not accustomed to it. There are also many wells scattered over the town; every garden has one, by which it is irrigated; and when the ground is bored to the depth of twenty-five or thirty feet, water is found in plenty. During the rainy season many torrents descend from the higher grounds to the lower depression in which Medina is built, and part of the city is inundated. All these circumstances have united to make a plentiful supply of water in the environs of Medina, a circumstance which made this a considerable settlement of Arabs long before it became sacred among the Mohammedans by the flight, residence, and death of the prophet, to which it owes its name of Medina or Medinet el Neby (the City of the Prophet).

The mosque containing the tomb of Mohammed bears, like that of Mecca, the name of Haram, on account of its inviolability; but in other Mohammedan countries goes by the name of Mesdjed el Neby, the Mosque of the Prophet, who was its founder. It is situated towards the eastern extremity of the city, and its dimensions are much smaller than those of the mosque at Mecca, being a hundred and sixty paces in length and a hundred and thirty in breadth; but it is built much upon the same plan, forming an open square surrounded on all sides by covered colonnades, with a small building in the centre of the square. The colonnades are much less regular than those of Mecca. On the southern side of the square the colonnade is composed of ten rows of pillars behind each other; on the western side are only four, and on the northern and part of the eastern sides only three rows. The columns themselves are of different sizes. On the southern side, where the prophet's tomb stands, and which forms the most holy part of the building, they are of larger dimensions than in the other parts, and about two feet and a half in diameter. They have no bases and the shafts rest on the ground. The columns are of stone, but being all plastered white it is difficult to decide of what kind. The roof of the colonnade consists of a number of small domes, white-washed on the outside. The interior walls are whitewashed all around, except the southern one and part of the south-eastern corner, which are cased with slabs of marble, nearly up to the top. The floor under the colonnades on the western and eastern sides and part of the north, has a coarse pavement and is nearly covered with sand, as is likewise the open square. On the southern side the whole is paved with fine marble across the whole colonnade, and in those parts nearest the tomb of Mohammed this pavement is of mosaic, of excellent workmanship. Large lofty windows, with glass panes, admit the light through the southern wall; some of them are very well painted. On the other sides there are smaller windows along the walls, but they are neglected.

Near the south-eastern corner of the mosque stands the famous tomb, detached from the walls so as to leave between it and the southern wall a space of about twenty-five feet, and fifteen between it and the eastern wall. The enclosure which protects the tomb from visitors, forms an irregular square of about twenty paces, in the midst of the colonnade, several of its pillars being included within it; it is an iron railing painted green, about two-thirds of the height of the columns. The railing is of good workmanship in imitation of filigree, and is decorated with open-worked inscriptions in yellow bronze. It is of so close a texture that no view can be gained into the interior except by several small windows, about six inches square, which are placed in the four sides of the railing, about five feet above the ground. On the southern side, which contains the two principal windows, before which the visitors stand when praying, the railing is thinly plated over with silver, and the inscription 'There is no God but God, the evident truth,' is repeated in silver letters across the railing all round these windows. This enclosure is entered by four gates, three of which are constantly kept shut, and one only is opened every morning and evening to admit the eunuchs, whose office it is to clean the floor and light the lamps. The enclosure is called El Hedjra. Permission to enter it is granted gratis to people of rank, and may be purchased by other people, from the principal eunuchs, for about twelve or fifteen dollars; but on entering the enclosure nothing more is to be seen than what may be observed when peeping in at the windows of the railing. At the distance of only a few paces from the railing is a curtain carried all round; it is equal in height to the railing. It is made of a rich silk brocade of various colours, interwoven with silver flowers and arabesques, with a band of inscriptions in golden characters running across the middle of it. This curtain has a small opening at the northern end, which is always shut, no persons whatever being permitted to enter within its holy precincts, except the chief eunuchs, who take care of it, and who put on during the night the new curtain sent from Constantinople, whenever the old one is decayed, or when a new sultan ascends the throne. The old curtains are sent to Constantinople, and serve to cover the tombs of the sultans and princes.

According to the historians of Medina the curtain covers a square building of black stone supported by two pillars, in the interior of which are the tombs of Mohammed and his two earliest friends and successors, Abu Beker and Omar. These tombs are deep holes, in which the coffins are deposited; that of Mohammed is cased in silver. The floor between the curtain and the railings is inlaid with variously coloured marble in mosaic; glass lamps are suspended all round the curtains, which are lighted every evening and remain burning all night. The whole of the enclosure is covered with a fine lofty dome rising far above the domes which form the roof of the colonnades, and is visible at a great distance from the town. As soon as pilgrims to Medina catch sight of it they repeat some prayers.

Near the curtain, and within the railings, is the tomb of Setna Fatme, the daughter of Mohammed and wife of Ali; it consists of a catafalque forming a cube, covered with a richly embroidered black brocade, and without any other ornament.

Mohammedan tradition says, that when the last trumpet shall sound Aysa (Jesus Christ) is to descend from heaven to earth, and to announce to the inhabitants the great day of judgment; after which he is to die, and will be buried in this Hedjra by the side of Mohammed; that when the dead shall rise from their graves, they will both rise together and ascend to heaven, where Aysa will be ordered by the Almighty to separate the faithful from the infidels. In conformity with this tradition the spot is pointed at through the curtain of the Hedjra where the tomb of Aysa will be placed.

Four gates lead to the interior of the mosque; a few steps are to be ascended from the neighbouring streets up to the gates, the area of the mosque being at a somewhat higher level, contrary to what is the case at Mecca. About three hours after sunset the gates are regularly shut by means of folding doors coated with iron, and not opened till about an hour before dawn; but those who wish to pray all night in the mosque can easily obtain permission from the eunuch on guard, who sleeps near the Hedjra. During Ramadhan the mosque is kept open the whole night.

The inhabitants of Medina, like those of Mecca, are not Bedouins, but strangers, who have come to the place as pilgrims and afterwards settled there, or they are descendants of such strangers. Medina is not so great a place of commerce as Mecca, and the merchants are not so rich, but it has the advantage of having a considerable tract around which is fit for cultivation, and there are many wealthy landowners in the town, who let out their possessions to poorer people. Wheat and barley are cultivated, but the chief profit arises from the plantations of date-trees, the fruit of which is held in greater estimation than the dates of Egypt.

(Burckhardt, *Travels in Arabia.*)

MEDITA'TIO FUGAE WARRANT, in the law of Scotland, is a writ by which a debtor, supposed to be about to make his escape from the country, is arrested and kept in custody, until he pay the debt, or find security to pay it if he shall be judicially found liable to do so. It deserves notice from its being an old consuetudinary practice in Scotland, which happens to be in unison with the late legislation of England on the subject of debtor and creditor. In Scotland no such system as that of arrest on mesne process according to the law of England anterior to the 1 & 2 Vict. c. 110, appears to have ever been acknowledged; and it was only on the ground that he was about to flee the realm, that a debtor could be arrested, unless on the authority of a final judgment of a court of law, or on the extracted registration of one of those documents in which by 'a clause of registration for execution' or by commercial custom (as in the case of bills of exchange) the granter agrees to be put in the position of having a decree recorded against him. A meditatio fugae warrant may be granted by any judge having jurisdiction in questions of debtor and creditor, as by a sheriff, a magistrate of a burgh, a justice of peace, &c. When granted by a sheriff, it has, by a late act, the advantage that it may be executed in any part of Scotland, whether without or within the jurisdiction of the sheriff who grants it (1 & 2 Vict. c. 119, § 25). The ground on which the judge grants the warrant is, in the first place, the oath of the creditor, who must distinctly set forth the amount, nature, and origin of the debt. The debtor is then brought before the judge, who, hearing the statement of both parties, must act on his discretion. It is said that if a magistrate on a distinct oath of debt should refuse to commit, he is personally liable to the creditor for the consequences, and that if, on the other hand, he grant a warrant on an improbable or incoherent statement, he will be liable in damages to the person committed. At all events a person desiring a meditatio fugae warrant is liable to damages if he obtain it on a false statement. A person imprisoned on such a warrant must be liberated in six months, unless his further imprisonment be authorized by other judicial proceedings. By 5 & 6 Wm. IV. c. 70, imprisonment for any debt under 8*l.* 6*s.* 8*d.* (100*l.* Scots) was abolished in Scotland, and it was lately found by the court of session that meditatio fugae warrants come within the act.

MEGALI'CHTHYS, a genus of fossil Ganoid fishes, from the carboniferous strata of Edinburgh, Glasgow, Leeds, Manchester, Wigan, &c. (Agassiz, *Récherches sur les Poissons Fossiles.*)

MEGA'LODON, a genus of fossil Conchifera, proposed by Goldfuss. From the Devonian strata.

MEGA'PHYTON, a genus of fossil plants, from the coal-measures. (Artis, *Antediluvian Phytology.*)

MELALEUCA (from μέλας, black, and λευκός, white), a genus of plants belonging to the natural order Myrtaceæ. It has the calyx-tube nearly hemispherical, the limb 5-partite; the petals 5; the stamens numerous, combined into 5 elongated bundles, which alternate with the petals; the anthers incumbent; the style filiform, the stigma obtuse; the capsule connate with and enclosed in the thickened tube of the calyx, which is sessile on, and adnate at its base, to the flower-bearing branch, 3-celled, many-seeded; the seeds angular. The species are trees or shrubs with alternate or opposite entire leaves, equal at the base, with flowers perfectly sessile, or somewhat combined with the branch, arranged in spikes or heads, and of a white, yellowish, or purplish colour.

M. Cajuputi, Roxburgh, *M. minor*, Smith, has the leaves alternate, elliptic-lanceolate, acutish, rather falcate, 3-5-nerved; the flowers rather distant in spikes, the rachis and calyxes villous. This is the species which yields the chief part of the oil brought to Europe under the name of Cajeput oil. It is a native of Amboyna and other East India islands. [MELALEUCA CAJEPUTI, P. C.]

M. Leucodendron, White-tree, or Cajeput-tree, has alternate long lanceolate acuminated falcate 3-5-nerved leaves; the flower-bearing branches pendulous; the flowers in spikes rather distant, which, as well as the rachis, are quite glabrous. It is a native of the East India islands, and was at one time supposed to yield the oil of commerce. Roxburgh asserts that it possesses little or no fragrance in its leaves, and that it is seldom or never used for the distillation of the oil which is used in the European markets.

Upwards of thirty species of Melalenca have been described, the majority of which are natives of New Holland. Many of them are fine plants with beautiful blossoms, and very desirable for the conservatory or greenhouse. They grow well in a mixture of peat, loam, and sand, and may be propagated by cuttings, which will readily take root if planted in a pot of sand and placed under a hand or bell glass.

(Lindley, *Flora Medica*; Don, *Gardener's Dictionary.*)

MELAMPY'RUM (from μέλας, black, and πυρός, wheat), a genus of plants belonging to the natural order Scropbularineæ or Scrophulariaceæ. It has a tubular 4-toothed calyx; a ringent corolla; the upper lip compressed laterally with reflexed margins; the lower lip furrowed, trifid; the capsule oblong, obliquely acuminate, compressed; one or two seeds in each cell, smooth. The species are annual plants, with opposite lanceolate linear entire leaves, with opposite usually secund terminal flowers. Eight species are enumerated by Don, six of which are European and two American. Of the six European four are natives of Great Britain.

M. cristatum, Crested Cow-wheat, has the spikes densely imbricated, 4-sided, and the bracts heart-shaped. It is a native of woods and thickets in the eastern counties of England, and also generally of the north and middle of Europe.

M. arvense, Purple Cow-wheat, has lax conical spikes, and ovate lanceolate attenuated bracts. The bracts are of a purple rose-colour; the flowers yellow, variegated with rose-colour and purple. It is a native in fields of wheat in the south of Europe, and is found in Great Britain, though only rarely, in Norfolk and the Isle of Wight.

M. pratense has the flowers axillary, secund in distant pairs; the calyx closed; the upper lip protruded. It has large pale yellow flowers. It is a native of Great Britain, but not a common plant. There is one other British species, *M. sylvaticum*, with an open calyx, and lips equal in length. It is a rare plant, and is found in alpine woods.

(Babington, *Manual of British Botany*; Don, *Gardener's Dictionary.*)

MELA'STOMA (from μέλας, black, and στόμα, a mouth, because the berries when eaten stain the mouth black), a genus of plants, the type of the natural order Melastomaceæ.

It has the tube of the calyx ovate, half-adhering to the ovary, densely covered with scales or bristles; the limb 5- rarely 6-cleft, the segments alternating with the appendages, both deciduous; the petals 5-6; the stamens twice the number of the petals; the anthers oblong linear, a little arched, opening by a pore at the apex, each furnished with a stipe-formed connective, which is in some species elongated, and in others short, but always biauriculate or emarginate in front; the free part of the ovarium conical and bristly; the style filiform, somewhat thickened at the apex; the stigma a pruinose dot; the capsule baccate, 5-6-celled, opening irregularly; the seeds cochleate. The species of this genus are shrubs, which are usually covered with strigæ. The leaves are petiolate, and either quite entire or serrulated. The flowers are large, white, rose-coloured, or purple.

M. Malabathricum, Malabar Melastoma, is a shrubby plant with tetragonal branches rough from strigæ; the leaves elliptic-oblong, obtuse at the base, acute at the apex, quite entire, green on both surfaces, and scabrous from strigæ; the corymbs 1-5-flowered; the calyx clothed with adpressed strigose scales, with ovate acute lobes, the connectives of the anthers short, or very long. It is a native of the East Indies, and frequent in the Indian Archipelago. The leaves of this plant are employed by the natives, where it grows, as a remedy in diarrhœa, dysentery, and mucous discharges.

Between thirty and forty species of Melastoma have been described. They grow in the warmer districts of the Old and New World, and are found in South America, Asia, and Africa. Their flowers are very handsome, and all the species may be cultivated for ornament. They grow well in a mixture of loam, peat, and sand, and young cuttings root freely in sand in heat under a band-glass.

(Lindley, *Vegetable Kingdom*; Don, *Gardener's Dictionary*.)

ME'LICA, a genus of plants belonging to the family of Grasses. It has nearly equal glumes, with lateral ribs, nearly as long as the ovate spikelet of 1 or 2 flowers rounded on the back, and a club-like rudiment of one or two more; the paleæ hardening on the loose fruit; the styles terminal. There are two British species of this genus, *M. uniflora* and *M. nutans*, which are found in damp shady woods.

(Babington, *Manual of British Botany*.)

MELILO'TUS (from μέλι, 'honey,' and λωτός, 'lotus'), a genus of plants belonging to the natural order Leguminosæ. It has a calyx with five nearly equal teeth, the keel obtuse, the filaments filiform, the ovary straight, the pod subglobose or oblong, 1-celled, 1-4-seeded, longer than the calyx, the petals distinct, deciduous. The species are herbaceous plants with stipules adnate to the petiole, and trifoliate leaves with usually toothed leaflets. None of them are ornamental plants, and they are seldom cultivated except in botanical collections. Two of the species are used as fodder for animals. [MELILOT, P. C.] Two species are found native in Great Britain. *M. officinalis*, the common Melilot, has lax racemes, with the corolla twice as long as the calyx; the wings, keel, and standard equal; the pods ovate, acute, compressed, transversely wrinkled, hairy; the leaflets serrate, truncate, narrowly ovate; the stipules setaceous, entire. *M. vulgaris* has the wings and keel equal, but shorter than the standard; the pods ovate, obtuse, mucronate, reticulate, rugose, and glabrous. It is a rare plant, and is found in sandy and gravelly places near the sea.

M. Messanensis, Messina Melilot, has an erect stem, with obovate-cuneated denticulated leaflets; the stipules broad at the base, toothed, linear at the apex; the racemes few-flowered; the teeth of the calyx nearly equal, hardly shorter than the tube; the legume lanceolate, acute, very much nerved, 1-seeded; the seeds ovate, compressed, large, black, rugged from dots. This plant is a native of Barbary, Sicily, Piedmont, and the Straits of Messina. It is the Λωτός of Theophrastus, *Hist. Plant.*, lib. 7., cap. 9 and 14; the λωτός ἥμερος of Dioscorides, lib. iv., cap. 171. It is also the *Lotus* of the Romans (Pliny, xiii. 17; xxxii. 21; Virgil, *Georgic.* ii. 84, and iii. 394).

None of the species of this genus are worth cultivating as ornamental plants. They may be easily propagated by seeds, which should be sown in the open border in spring. A light dry soil suits them best.

(Fraas, *Synopsis*; *Manual of British Botany*; Don, *Gardener's Dictionary*.)

MELISSA (from μέλισσα, a bee), a genus of plants belonging to the natural order Labiatæ or Lamiaceæ. This genus has been variously defined according to the different views of systematic botanists. Bentham, in his monograph on the Labiatæ, has referred about 30 species to this genus. They are all known by the common name of Balms, and some of these species have been described under CALAMINTHA, P. C. S. The genus thus extended has the following characters:—The calyx is tubular, 13-nerved, usually striated, bilabiate; the upper lip generally spreading tridentate; the lower lip bifid; the throat naked or villous inside; the tube of the corolla straight or incurvedly ascending, naked inside, usually exserted, the throat generally inflated, the limb bilabiate, the upper lip erect, flattish, entire, or emarginate; the lower one spreading, with flat lobes, the middle lobe usually the broadest, entire or emarginate; the stamens 4, didynamous, ascending, approximate by pairs at apex, or rarely a little distant, lower two the longest, the superior two sometimes sterile, the filaments toothless, anthers free, two-celled, the connective often thickened, the cells distinct, parallel, diverging; the lobes of style sometimes equal, subulate with minute terminal stigmas; sometimes the lower lobe is elongated, recurved, flattened, with stigmatiferous margins; the achenia dry and smooth. The species are usually herbs, sometimes under-shrubs, with a variable inflorescence.

The only species of the old genus Melissa admitted into the British Flora is *M. officinalis*, common Balm. It has ovate crenato-serrato acute leaves, paler beneath, the calyx subcampanulate, slightly ventricose in front, distinctly 2-lipped, the upper lip flat truncate, with three short broad teeth, the lower with two lanceolate teeth. This plant, although it has a place in the British Flora, is a doubtful native. In its recent state it has a rough aromatic taste and a pleasant lemon-like smell. It is frequently used in infusion, under the name of Balm Tea, as a common drink in fevers. It was one of the medicines recommended by Paracelsus, but at the present day it is only used as a popular remedy.

(Don, *Gardener's Dictionary*; Babington, *Manual of British Botany*.)

MELLAN, CLAUDE, a French painter and distinguished engraver, was born at Abbeville, in 1601. He studied in Rome under the then celebrated Vouet, but he soon gave up painting for engraving, which from that time became his chief business. He remained some years in Rome, and engraved many plates there, executed in the ordinary method of line-engravers. He did not altogether adopt his own peculiar method of engraving by a single line, until his return to France. He latterly executed all his plates by single lines, that is, instead of crossing one set of lines by a second or even a third set, where great depth was required, he accomplished a similar effect by merely thickening the single set of lines; the varieties of light and shade he produced wholly by varying the thickness of the line. Mellan carried this peculiarity to a great extreme on one occasion; he engraved a Sancta Veronica, or the Face of Christ, as large as life, by a single spiral line, commencing at the end of the nose; the execution is beautiful, and it is an extraordinary monument of patience and perseverance, but what it has gained in singularity it has lost in effect as a work of art: he made two preparatory drawings for this print; one is in the Royal Library at Paris.

Mellan's prints are very numerous: they amount, according to some accounts, to upwards of 500; many of them are after his own designs. His masterpieces are Rebecca at the Well, after Tintoretto; St. Peter Nolascus borne by two Angels, after a design by himself; and Pope Urban VIII., after Bernini. He enjoyed a great reputation during his lifetime; Charles II. invited him to England, and Louis XIV. granted him an annual pension, and gave him apartments in the Louvre. He died at Paris, in 1688, aged eighty-seven.

(Florent Le Comte, *Cabinet des Singularités*, &c.; Huber, *Manuel des Amateurs*, &c.)

ME'LOE. The Linnean genus *Meloe* included the several genera of heteromerous Coleoptera now forming the family *Cantharidæ*, interesting on account of its including those beetles known under the name of 'blistering flies,' and employed in medicine. The term *meloe* is now restricted to the apterous *Cantharidæ*, and the species are all beetles with large and swollen bodies, and short oval elytra, lapping over each other at the base of the suture. They are sluggish creatures and feed on various plants, especially the species of ranunculus. When alarmed they emit from the articulations of their legs an oily, yellow, or reddish liquid. Latreille maintained that this insect was the *buprestis* of the antients, to which noxious qualities were attributed. (See his paper on the subject in the 12th volume of the *Mémoires du Mu-*

eum d'Hist. Naturelle.) The nature of the larva of the *meloe* has been a subject of considerable discussion among entomologists, having been supposed to be a minute, active, parasitic animal found on bees and flies. Most entomologists have held this view since the time of Linnæus, but the observations of Geoffroy, Newport, and Westwood, go far to prove that it is a mistake, and that there is no anomaly in the case.

MELVILLE ISLAND is situated on the northern coast of Australia, between 11° and 12° S. lat. and 130° 20′ and 131° 34′ E. long. It is separated from Bathurst Island, which lies east of it, by Apsley Strait, which is forty-six miles long, and between two and four miles wide. East of the island lies Coburg Peninsula, where a British colony was established some years ago [ESSINGTON, PORT, P. C. S., vol. i. p. 345], and between them a strait, which at the narrowest place is fifteen miles wide. This strait is called Dundas Strait. The eastern end of Melville Island is only fifteen miles from the mainland of Australia, and the sea between them was called Clarence Strait by Captain King. It is studded with small islands, rocks, and reefs, between which run rapid currents. The area of the island may be about 1800 square miles.

The northern line of coast, and also the western, along Apsley Strait, are low, intersected by swamps, and covered by impenetrable woods of mangroves. The interior is more elevated, and has an undulating surface. In the centre it rises about 130 feet above the sea-level, but towards the southern side there are a few small elevations, which probably rise to 200 feet. The island is well clothed with wood, and presents one mass of thick green foliage. The surface of the elevated ground is covered with small shining masses of ironstone having a metallic lustre as if they had been ejected from a furnace. The sloping sides are less stony, and the flat ground is generally quite free from stone. Streams of water are scarce, but the swamp water is generally drinkable, and by sinking wells a constant supply of excellent water is obtained. The swamps are generally full of long grass and reeds, intermixed with small trees. Narrow gullies choked up with a kind of cane or rattan (Flagellaria indica, Linn.) lead into these swamps.

The soil of the island is of inferior quality, partaking of the character of the ironstone which is generally spread over it. The subsoil after digging two feet and a half is much better, being a brown mould of a saponaceous texture. Close to the shore the country is very rocky, and the soil is light and shallow, intermixed with sand and gravel. Bordering on the swamps it is richer and more productive, and it is supposed that some of the flats so situated are capable of producing rice.

Vegetation is very luxurious, and during the whole year there is plenty of grass for cattle. The timber is in general of good quality, and although trees which are small in the stem predominate, there are many of considerable dimensions, and applicable to house-building, furniture, ship and boat building, and to agricultural purposes. The average number of trees to an acre is about one hundred and twenty, but in some places they amount to one hundred and eighty. Among these forest-trees several species of eucalyptus are most abundant. The cabbage-tree is common. Ginger grows wild.

The most common quadrupeds are kangaroos, opossums, bandicoots, native dogs, a small brown rat, and a species of squirrel. The Ternate bat or flying fox is very numerous. The birds are mostly distinguished by their beautiful plumage, especially some species of cockatoos and parrots. There are also several varieties of king-fisher, among them the gigantic king-fisher (Dacelo gigantea), swamp pheasants, quails, curlews, wild ducks, sand-larks, wild geese, several kinds of cranes, and a wild fowl of the gallinaceous order of considerable size. Many beautiful small birds are very abundant. There is a great variety of snakes, measuring from one foot to twelve in length; some of them are venomous. There is also a great variety of lizards of beautiful colours: the largest are the frilled iguana (Chlamydosaurus Kingii), and the common iguana (Iguana delicatissima). Alligators abound in Apsley Strait, and turtles are found at some places on the coast. The most destructive of the numerous insects are the white ants.

The number of natives is rather large, considering that they lead a wandering life, and during the dry season live on kangaroos, opossums, bandicoots, iguanas, and lizards; and during the wet season on fish, turtles, crabs, and other shell-fish; their vegetables are the cabbage-palm and fruit of the sago-palm. They are evidently of the same stock as the natives of Australia, but they are more athletic, active, and enterprising. Their language is said to be so far different, that a native of the southern coast could not understand one word of what they said. In the construction of their canoes, spears, and waddies, they show much ingenuity, although the workmanship is rough from want of tools. Their canoes, water-buckets, and baskets are made of bark, neatly sewed together with strips of split cane. They are extremely diffident of strangers, and it was found impossible to enter into any friendly intercourse with them during the four years that the British colony existed on Aspley Strait.

The settlement on Aspley Strait, called Fort Dundas, was formed in 1824, for the purpose of attracting to it the commerce of the eastern part of the Indian Archipelago. But the inhabitants of these islands did not resort to the new colony, and it was ascertained that the soil was far from being fertile, and the climate very debilitating to Europeans, although not decidedly unhealthy. These combined circumstances led to the abandonment of the settlement in 1828, but in 1837 a new one was established in Port Essington on Coburg Peninsula, a place which is visited by the inhabitants of Macassar and other islands, to fish for trepang.

(Campbell's *Geographical Memoir of Melville Island and Port Essington*, in 'London Geogr. Journal,' vol. iv.)

ME'LYRIS, a genus of Coleopterous insects established by Fabricius, for the reception of certain species of the Linnæan genera *Cantharis* and *Dermestes*. It belongs to the family *Serricornes* of Latreille, and constitutes the type of the family *Melyridæ*. The *Melyridæ* are active and often gaily coloured little beetles, usually found on flowers, which they frequent for the purpose of preying on other insects. They have soft, oblong, or ovate depressed bodies; short, filiform, pointed palpi; exserted heads; dentated mandibles; and usually filiform and serrated antennæ. Some of the species of *Malachius*, a genus of *Melyridæ*, found in Britain, are furnished with red bladder-like appendages at the anterior angles of the thorax and base of the abdomen, capable of being contracted or dilated at the will of the insect, and usually exhibited when it is alarmed. Mr. Westwood regards these bodies as portions of an apparatus for emitting an offensive effluvium, and Curtis as means of enabling the insect to increase or decrease its gravity during flight. The larvæ, as well as the perfect insects, are carnivorous. The family is intermediate between the *Telephoridæ* and *Cleridæ*. The genera *Malachius*, *Dasytes*, *Enicopus*, *Dolichoroma*, and *Aplocnemus*, contain British species. See Westwood's *Modern Classification of Insects*.

MEMLING, HANS, or JAN, until recently more commonly called *Hemling*, and sometimes *Hemmelinck*, and *Memmelinck*: Memling appears to be the correct form. This admirable painter of the old Flemish or German school of the fifteenth century has been lately the subject of several inquiries, but even the correct spelling of his name is not yet agreed upon, though the majority of writers have adopted the form Memling. The place of his birth is likewise a matter of doubt. Dr. Boisserée writes his name Hemling, and upon the strength of a manuscript found by Herr von Lassberg at Eppishausen near Constanz, has assumed Constanz to be the place and 1439 to be the date of his birth. This date is later, though approximate to the common account, and accords with the dates on most of his pictures. Van Mander calls him Memmelinck, and a native of Bruges: according to some accounts he was born at Damme near Bruges, about 1425.

Regarding the spelling of his name, the correct form is apparently Memling, for, as shewn by M. de Bast of Ghent, the initial letter of the name on his pictures is the very same letter as the initial of Maria on a coin of Mary of Burgundy, and in many other names commencing with M in documents of the period. It is the capital M of that time, though more like the modern H: it very much resembles an H with an additional short stroke in the middle, reaching from the under side of the cross line to the bottom of the letter; or somewhat like a small Roman m, the two outside strokes being twice the height of the middle one. This peculiar letter however occurs in two instances as an H also; the question is therefore not absolutely decided. Because a Hans Hemling or Memling is mentioned in a German MS., it does not follow of necessity that he is identical with the celebrated painter of this name; nor, on the other hand, does Memling's residence in Bruges prove that he was a Fleming, as he may have been attracted there by the fame of John van Eyck. Marcus van Vaernewyck, in his 'Historie van Belgis,' 1565, notices a German painter of the name of Hans who lived at

Bruges, and he alluded very probably to Memling. Vasari also apparently alludes to Memling when he speaks of Ausse (Ansse) of Bruges. The dates of Memling's pictures range, according to the printed accounts, between 1450 and 1499. The date 1450 is found on the portrait, at Venice, of Isabella of Aragon, wife of Philip of Burgundy; this picture is mentioned in the anonymous Journal published by Morelli in 1800 —'Notizia d'Opere di Disegno nella prima Metà del Secolo XVI., esistenti in Padova, Cremona, Milano, Pavia, Bergamo, Crema, e Venezia, scritta da un Anonimo di quel Tempo,' in which the painter is called Mamelino or Memelingo. If this date be correct, Memling must have been born before 1439, and cannot have been the Hans Hemling of Constanz. The date 1499 is found on a small picture in the possession of M. van Ertborn at Utrecht; it is also the year in which he finished some paintings for the Carthusian convent of Miraflores near Burgos in Spain, in which he is said to have died not long afterwards: the account is given by Ponz, in his 'Viage do España.' This convent was destroyed by the French in 1812. Memling appears to have lived some years in Spain: he is supposed to be the Juan Flamenco of Flanders who was at Miraflores between 1496 and 1499, and perhaps later. He probably also visited Italy and Germany, and certainly Cologne; and he is said to have served Charles the Bold, Duke of Burgundy, both as painter and as warrior. The story is, that he was at the battles of Granson and Morat, in 1476; and in the beginning of 1477 was admitted, ill from wounds and destitute, into the Hospital of St. John at Bruges, a religious institution, into which, by provision of its foundation, none but inhabitants of Bruges or Maldeghem could be admitted. It was during his residence in this hospital that he painted the beautiful pictures which still adorn that establishment and Bruges, and have placed his name among the first of the painters of the fifteenth century.

The principal work by Memling in this hospital is the history, in minute figures, of St. Ursula and her companions, exquisitely painted in oil, in many compartments, upon a relic case of a gothic design, known as La Châsse de S. Ursule. This châsse, or shrine, has been made the subject of a special work by Baron von Keversberg, intituled 'Ursule, Princesse Britannique, d'après le Legende, et les Peintures d' Hemling,' Ghent, 1818. The paintings have been drawn in lithography by MM. Manche and Ghemard. Memling painted also during his stay in this hospital the small picture of the Adoration of the Magi, and the splendid large altarpiece of the Marriage of St. Catherine; both of which are still there.

The Marriage of St. Catherine, in which the figures are much larger than is usually the case in Memling's works, was painted in 1479, and is one of the most brilliant pictures of the fifteenth century. It is in three compartments, a centre and two revolving wings. In the centre is the marriage of St. Catherine, attended by angels and various saints; and in the background are painted episodes illustrating the lives and martyrdoms of the attendant saints and of St. Catherine herself. The left wing is the beheading of John the Baptist; the right wing is the vision of John the Evangelist in the island of Patmos: the last is a remarkably comprehensive composition. On the exterior of the left wing are two Hospital Brothers, the Apostle James, and St. Antony of Padua; on the right exterior are two of the Hospital Sisters, with saints Agnes and Clara. There is an inscription on this work, but as it has been renewed, it cannot be taken as an authority in a difference respecting the signification of letters: it is however variously reported. There are three other pictures by Memling in this hospital:—a Descent from the Cross, on wood, with two wings; the Madonna and Child, with a portrait of Martin van Nieuwenhoven, burgomaster of Bruges in 1497, on two pannels closing one upon the other, painted in 1487; and a female, inscribed 'Sibylla Sambetha quæ et Persica an: ante Christ nat. 2040.' There are other works by this painter in the Academy of Arts, and in other buildings of Bruges.

There is, or was in 1832, a small portrait of a young man in the costume of the hospital brothers of St. John, in the collection of Mr. Aders in London, which is said to be that of Memling himself, but the date on the picture is 1462, fifteen years before Memling is supposed to have entered that hospital, and the history of the picture is not positively known. Passavant has engraved it in his 'Kunstreise durch England und Belgien.' Dr. Waagen does not mention it. Another very interesting work, by Memling, in the collection of Mr. Aders, is the travelling altarpiece or altar of the Emperor Charles V., which was preserved in the cathedral of Burgos until the French invasion of Spain, when it was taken to Paris and sold, and it was again sold subsequently in London. It consists of three equal-sized pannels, joined together laterally by hinges, and shutting into one. They are semicircular at the top, and each measures 25 inches by 16 inches. The paintings are in honour of the Virgin Mary: they are described minutely by Dr. Waagen in his work on 'Arts and Artists in England.'

There are also pictures attributed to Memling at the Hague, at Antwerp, at Louvain, at Berlin, and at Munich. The nine works attributed to him at Munich are worthy of all the praise that has been bestowed upon Memling; they were nearly all formerly in the Boisserée collection. Of these nine the following are remarkable pictures:—Israelites collecting the Manna; St. Christopher carrying the infant Christ; Abraham and Melchisedek; the Seizure of Christ in the Garden: a Sancta Veronica, or Face of Christ; and above all, the Joys and Sorrows of the Virgin, and the Journey of the three Kings from the East, with their numerous retinues, six feet wide by two feet and a half high. Few pictures can have cost so great an amount of labour as this last mentioned. Besides an extensive and elaborate landscape covering almost the whole pannel, for the point of sight is very high, it contains about fifteen hundred small figures and other objects of various kinds, all executed with the minutest attention to detail, with extreme care, and with a clearness and brilliancy of colouring which could not easily be surpassed, and has certainly seldom been equalled. Memling, not satisfied with the mere representation of the epiphany or the adoration of the kings, has represented them in every stage of their expedition from the setting-out to the accomplishment of their mission; he has represented all the countries they journeyed through, and in the extreme distance, even their own kingdoms and homes, with their cities and their palaces. In the foreground are represented also, besides the nativity and adoration of the kings, the flight into Egypt, the murder of the Innocents, and the other principal events of the life of Christ, to his ascension, and to the descent of the Holy Ghost. The figures range in size from about six inches to one, and the whole is well modelled and arranged, and perfectly harmonious in light and shade and colour.

Rathgeber enumerates upwards of one hundred pictures which are attributed to Memling, but few of them can be authenticated. Some of them have been lithographed by Strixner. Memling also decorated missals and other books of church service: there is one in the library of St. Mark at Venice. There are other similar works attributed to him in different parts of Europe.

The date and place of Memling's death are as uncertain as those of his birth, but it probably took place in Spain, between 1499 and 1506.

(Descamps, *Voyage Pittoresque de Flandre*, &c.; *Notice des Tableaux qui composent le Musée de l'Hôpital Civil de S. Jean, à Bruges*, 1842; Passavant, *Kunstreise durch England und Belgien*, and in *Kunstblatt* for 1841; Schnaase. *Niederländische Briefe*; Johanna Schopenhauer, *Johan van Eyck und seine Nachfolger*; De Bast, *Messager des Sciences et des Arts*, Ghent, 1825, 1832, 1836; and the *Kunstblatt*, 1821, 1822, 1826, 1833, 1841; Rathgeber, *Annalen der Niederländischen Malerei*, &c.)

MEMMI, SIMONE, or SIMONE DI MARTINO, was a very celebrated Italian painter of the fourteenth century. Though he is called Memmi by Vasari and Lanzi, Martini appears to be the more correct name, as Martino was the name of his father, and he has inscribed his name as Simon Martini upon some of his works. Memmo, or Guglielmo (William), was the name of his father-in-law, and he is said to have also inscribed himself Memmi upon some of his pictures. The date of Simone's birth is uncertain, but he was born at Siena in 1284, or, according to Vasari, about 1285: he is supposed by some, upon the authority of Vasari, to have been the pupil of Giotto, which Rumohr and others consider scarcely possible. He was the rival of Giotto: Petrarch speaks of the two together in one of his letters in the following terms:—'I have known two excellent painters, Giotto, a citizen of Florence, whose fame among the moderns is immense, and Simone of Siena.' Simone now owes his fame chiefly to Petrarch: they were both living at the same time at Avignon during the residence of the popes there, and Simone painted the portrait of the celebrated Madonna Laura for the poet, who, through admiration and gratitude, wrote two sonnets on the painter (Son. 56 and 57), by which he has given him an undying name. Few of Memmi's works now remain, and these are dry and meagre performances. The principal are the frescoes of the chapter of the chapel degli Spagnuoli at Florence, painted in 1332: they consist of stories from the lives of Christ, San Domenico, Saint Peter Martyr, and part of the history of the order of the Dominicans or Predicants. In one of the last works are the reputed heads of Petrarch and Laura, but this story, as Lanzi says, is a mere fable, for Memmi did not paint Laura until four years after the completion of these works, in 1336, after he was invited to Avignon. [Gaddi, Taddeo, P. C. S.] There are also some stories by Memmi, from the life of San Ranieri, in the Campo Santo at Pisa: they are engraved in Lasinio's 'Pitture del Campo Santo.'

Simone painted also in miniature. There is a MS. of Virgil, with the commentary of Servius, now in the Ambrosian Library at Milan, but formerly in the possession of Petrarch, which is preceded by a miniature of Virgil seated with his pen in his hand, invoking the poetic muse; before him is Æneas in armour, with his sword, representing the Æneid; there are likewise a shepherd and a tiller of the soil, representing the Bucolics and Georgics; and Servius is also there, drawing a fine veil to himself, as symbolical of the elucidation of his commentary. This design, supposed to have been made at the instance of Petrarch, is inscribed with the following couplet:—

'Mantua Virgilium qui talia carmina finxit,
Sena tulit Simonem digito qui talia pinxit.'

Memmi died at Avignon in 1344, according to the necrology of the Dominicans at Siena, aged sixty, according to Vasari, but much older according to Della Valle and some others.

Notwithstanding Vasari's encomium upon the style of Memmi, which he said was worthy of one of the moderns, his remaining works are not at all beyond his age, and he was surpassed by the two Gaddi: his design is meagre and ugly. Of his portrait of Laura nothing whatever is known. The reputed head of Laura above mentioned is engraved in D'Agincourt's 'Histoire de l'Art par les Monuments,' Peint. pl. cxxii. 2, and in Cicognara's 'Storia della Scultura,' i. pl. 43. Cicognara has disputed the authenticity of this and some other reputed portraits of Petrarch and Laura, at considerable length in the third volume of his History. The only authentic portrait of Laura extant, of that age, appears to be a miniature in a MS. in the Bibliotheca Laurentiana at Florence, which however may have been copied from the original work by Memmi: there is an outline of this also in Cicognara's work, i. pl. 42.

Vasari gives the following as the inscription on Simone's tomb, but he does not say where:—'Simoni Memmio pictorum omnium omnis aetatis celeberrimo. Vixit ann. LX. mens. ij. D. iij.' His chief excellence was invention.

Lippo Memmi, the brother-in-law of Simone, assisted Simone in some of his works, and completed others which were left unfinished at his death. He was not equal to Simone, though a better colourist than he: there are a few of his works still extant. He was living in 1361.

(Vasari, *Vite de' Pittori*, &c., and the notes to Schorn's German translation of Vasari; Della Valle, *Lettere Sanesi;* Lanzi, *Storia Pittorica*, &c.; Rumohr, *Italienische Forschungen*.)

MEMMI DI MARTINO. [Simone, P. C. S.]

MENANDER, ARRIUS, a Roman jurist, of the time of Severus and Caracalla. The only work of his mentioned in the Florentine Index is four books on Militaria. There are six excerpts from Menander in the Digest.

MERCHANT SEAMEN. [Ships, P. C.]

MERCIER, LOUIS SEBASTIEN, a prolific writer on men and manners, politics, science, the drama, literary criticism, and many other subjects. The greater part of his works are sunk in oblivion, but several of them still deserve and obtain attention. He was born at Paris on the 6th of June, 1740. He was for some years professor of rhetoric in the college of Bordeaux. The works for which he chiefly deserves attention at the present day are his attacks on the manners and morality of his age. The first of these appeared in 1771, with the title 'L'An 2440; Rêve, s'il en fut jamais.' In 1781 he commenced the publication of the 'Tableau de Paris.' Having courted the attention of the authorities to his authorship of this book which, by its bitter remarks on all the social institutions of France, was sure to provoke their wrath, he found it prudent to retire to Switzerland, where he completed this remarkable work. Without holding with its author that the 'Tableau de Paris' produced the French Revolution, there is no doubt that it did much to open the eyes of mankind to the immoral and corrupt state of the social system of the French capital, and the inapplicability of the great national institutions of the country to supply their proper end of doing good to the nation at large. Mercier wrote with an animated, descriptive, and biting pen. He occasionally appealed to a high sense of morality, but his chief power lay in showing his readers the bad taste and the folly of the prevalent habits of the day. Wherever he had to depict honest industry struggling against false social laws, or the remains of pristine simplicity holding out against the inroads of corrupting manners, his tone has dignity and feeling. When he speaks of the profligate administration of the laws, of the artificial and vicious tastes of the leaders of fashion, of the tyranny over the free expression of opinion, he overwhelms with sarcastic ridicule. The work is a curious anatomy of Parisian society, and exposes many evils incident to large cities, of which the lapse of sixty years has not entirely enabled us to find the remedy. The sanatory regulations which have lately so much occupied the attention of society, and other means of social organization, are intended to supply deficiencies which Mercier points out in his own peculiar fashion: whether *he* could have devised remedies for the defects he discovers may be questioned. He was an avowed hunter after paradoxes. In 1801 he published 'Néologie, ou Vocabulaire de Mots nouveaux, à renouveller, ou pris dans des Acceptions nouvelles,' a work in which he announced such propositions as 'Les prosateurs sont nos vrais poètes.' He made war on the chief ornaments of French literature; seeming, wherever public opinion had unequivocally declared itself, to find that he had to perform the function of reversing the judgment. In philosophy he was equally paradoxical, raising his voice against the best-established truths in physical science. From these peculiarities his attacks on the social morality of his age have been received as chance blows struck in a right quarter by a man who struck at everything. The censure of his 'Tableau' has thus frequently been looked on as no more the result of just observation than the censorious remarks of a universal grumbler, who, living in a brothel or a gambling-house, should complain from morning to night of the improprieties by which he was surrounded. But Mercier deserves a better appreciation, and none can attentively read his censures without seeing that they proceed not only from a condemnation of what is wrong, but a sense of what is right. A list of his works would be much longer than the present article. He passed a life of cheerful vivacity, surrounded by friends who seem not to have been the less attached to him that he perpetually displayed with singular simplicity his sublime self-conceit. He died on the 25th of April, 1814.

MERCURIA'LIS, a genus of plants belonging to the natural order Euphorbiaceæ, has diœcious or monœcious flowers; the perianth 2-3-parted; with 9-12-stamens in the male flowers; the style short and forked in the female flowers; the capsule 2-celled; the cells 1-seeded, bursting at the back. The species are herbs; two of them are natives of Great Britain.

M. perennis, Perennial Mercury, has a simple stem, the leaves stalked, ovate-oblong, rough; the female flowers on long common stalks; the root creeping. It is a native of woods and thickets.

M. annua, Annual Mercury, has the stem branched, leaves stalked, ovate, or ovate-oblong, smooth, the female flowers nearly sessile, the root fibrous. It is a common plant in waste cultivated lands. It once had a place in the British Pharmacopœia on account of its supposed efficacy as an emmenagogue, but it is not now used for that purpose. The leaves abound in mucilaginous matter, and are cooked and eaten in Germany in the same way as we eat spinach. Professor Burnett has pointed out the peculiar instability of the stamens of this plant. At the period when they are fully developed, if they are touched they become loosened from their footstalks, and vault off elastically towards the pistilline flowers.

(Burnett, *Outlines of Botany;* Babington, *Manual of British Botany*.)

MERCURY, DEPRESSION OF. [Depression of Mercury, P. C. S.]

MERIAN, MATTHEW, a very distinguished German portrait painter, was the son of the eminent engraver of the same name, who was born at Basel, in 1593, where the son was born in 1621. He was the pupil of Sandrart, who was much attached to him; he studied also after Vandyck in London; became acquainted with Le Sueur and Vouet in Paris, and studied under Sacchi and Carlo Maratti at Rome. From about 1650, when the elder Merian died, Matthew conducted his father's book and print business, at Frankfort on the Main, but he did not give up his own profession. He painted the Emperor Leopold I. on horseback, and many other German princes and nobles. He also painted some historical pieces, and engraved a few plates, which are marked M. Merian, junior. He died at Frankfort, in 1687.

Matthew's sister Maria Sibylla Merian was an eminent insect and flower painter. She died at Amsterdam in 1717, aged seventy.

(Sandrart, *Teutsche Academie*, &c.; Fiorillo, *Geschichte der Zeichnenden Künste*, &c.)

MERIVALE, JOHN HERMAN, was born at Exeter in 1779, in which neighbourhood his father, John Merivale, Esq., resided, and was possessed of some landed property: his grandfather, the Rev. Samuel Merivale, was a Presbyterian minister at Exeter, and tutor at the dissenting theological academy there. Mr. Merivale entered St. John's College, Cambridge, in 1797, but took no degree, in consequence of the impediment of his dissenting persuasion, although at a later period he joined the Church of England. He married Louisa, daughter of the Rev. Dr. Drury, head master of Harrow School: was called to the bar in 1805, and practised in the Court of Chancery. He published three volumes of Chancery Reports from 1815 to 1817, of cases decided by Lord Eldon and Sir William Grant. In 1825 he was a member of the commission for inquiring into the state of the Court of Chancery, which was appointed in consequence of the attacks made at that period on Lord Eldon; and wrote a 'Letter on the Chancery Commission' in 1827, as well as some other pamphlets on law reform. He became a commissioner of bankrupt on the then newly organised system in 1831; and continued to hold that office till his death in April, 1844. From his early youth Mr. Merivale was addicted to literary and antiquarian pursuits, especially to the study of Italian and, in his later years, of German literature. He contributed a large proportion of the translations contained in the 'Collections from the Greek Anthology,' published in 1813 under the editorship of the Rev. Robert Bland; of which Mr. Merivale brought out a second edition, enlarged, in 1833. In 1814 appeared his poem of 'Orlando in Roncesvalles,' a tale in the ottava rima, being chiefly a free abridgment of part of the 'Morgante Maggiore.' In 1841 Mr. Merivale published two volumes of 'Poems, original and translated,' comprising most of his earlier pieces; and in 1844, shortly before his death, a volume of translations of the 'Minor Poems of Schiller, of the second and third periods, with a few of those of earlier date.' This was perhaps the most successful of his productions. It is an essay towards the rendering the lyrical pieces of the German poet in the same, or nearly the same, metres with the originals, and with an approach to close but not literal version. The more metaphysical or subjective poems of Schiller's later period—those which it is the most difficult to bend to this species of treatment—the Gods of Greece, the Feast of Eleusis, the Progress of Art (die Künstler), and others of the same character—are among the best executed parts of the work. Mr. Merivale was an extensive contributor to literary reviews, but none of his prose essays on these subjects are published in a separate form.

MESMERISM. [ANIMAL MAGNETISM, P. C. S.]

MESOLO'NGHI or MESSOLO'NGHI, perhaps the antient Olenus, Ὤλενος, in Aetolia, a small town in Greece, lies on the northern side of the Gulf of Patras, near its entrance, and right opposite Cape Kologria or Papas in the Morea. It became remarkable during the last Greek insurrection against the Turks, as is stated in the life of Bozzaris in the P. C., especially in consequence of the siege and capture of it by Ibrahim Pasha, the commander in chief of the besiegers. The heroic resistance of the Greek garrison, and their ultimate fate, made the name of Mesolonghi popular over all Europe.

Mesolonghi is built on the edge of a marshy plain, bounded on the north by the high ridge of Zygos, the antient Aracynthus, and is protected towards the sea by a lagune extending about ten miles along the coast and five in width; and hence perhaps the name of the town, which seems to be a contraction of the Italian (Venetian) words 'mezzo' and 'laguna.' With the exception of a few very tortuous channels, the lagune is impassable for any craft drawing more water than the 'monoxyla,' or small boats of the inhabitants. The main channel in the south is commanded by the mud-bank of Vassiladi, on which the Greeks had built a small fort; and the main channel in the north, by the islets of Poros and Anatoliko. At the time of the outbreak of the Greek revolution the town contained several thousand inhabitants, who derived wealth from their extensive fisheries. The fortifications were in such a neglected state that Lord Byron advised the Greeks to strengthen the place by additional works; but the Turks left them only time to add a rampart of earth faced with stones, and a ditch, which surrounded the town on the land side. After the progress of Reshid Pasha, the Turkish commander in Northern Greece, in the beginning of 1825, many Greek palikars and others flocked to Mesolonghi with their families, so that the garrison was increased to about 5000 fighting men. Their principal chiefs were the veteran Nothi-Bozzaris, Sornaris, Mitcho-Koutoyani, Liaketas, Lambro-Veikos, George Kizzos, Niketas, Iskos, Makrys, and others; and the body of officers was increased by many foreign volunteers, mostly German noblemen and gentlemen. On the 25th of April, 1825, Reshid Pasha appeared in sight of the town, with an army of 20,000 men and a numerous battering train, to which the besiegers could only oppose forty-eight bad iron guns of calibre varying from 4- to 48-pounders, two brass 10-inch mortars, one howitzer of 5 inches, and one mountain howitzer of 4⅗ inches. The Turks made the first trench on the 5th of May, and on the night of the 11th a terrible bombardment began. Bombardments and stormings now succeeded each other during two months, but the fire was well answered from the rampart, and the Greeks made frequent sallies, in which the besiegers were almost always defeated with great loss, especially on the 2nd of July. The Hydriotic fleet being stationed at the entrance of the lagune, there was no lack of ammunition and provisions in the town, till, on the 10th of the same month, the great Ottoman fleet appeared off the place, and, after having obliged the Hydriotic to avoid a certain defeat by a hasty retreat, landed a strong body of Turks, under Husein Bei. On the 28th of July, the 2nd of August, and in the night of the 3rd, the fortress was furiously assaulted, and a terrible cannonade carried destruction among the houses and their inhabitants; but the Greeks stood their ground, and were excited to hopes of certain victory when, a few days afterwards, the great Greek fleet under Miaulis and Sakhtouri came in sight, and after a severe conflict defeated and dispersed the Turkish fleet. The maritime blockade was now at an end, and in the beginning of September the garrison was still 4000 strong, with an additional population of 10,000 women, children, and aged or infirm men. Reshid Pasha, however, was far from being discouraged, and resolved upon still more vigorous attacks; but Sultan Mahmud, who was bent upon the possession of Mesolonghi, gave orders to Ibráhim Pasha, who commanded in the Morea, to take the chief command, while Reshid Pasha was to act as his first lieutenant.

The Egyptian forces consequently moved northward, and towards the end of November the combined fleet of Turkey, Egypt, and Barbary, drove the Greek fleet from the lagune, and kept a strict watch over its entrance. During the whole of the months of November and December scarcely a week passed without the Turks making an assault. In the first week of January, 1826, Ibráhim Pasha appeared in the Turkish camp with 14,000 Egyptians and an ample supply of provisions and ammunition. During the first fortnight he was nearly inactive, hoping that a strict blockade would compel the inhabitants to surrender for want of food, nothing having been introduced into the town since the end of November. Although the inhabitants were on the verge of starvation they would not capitulate, and continued their deadly sorties, when at last, Ibráhim, after having taken the islands of Poros and Anatoliko, made the town a heap of ruins by an uninterrupted bombardment from the 25th to the 27th of January. The fall of the fortress being now unavoidable, Sir Frederic Adam, the Lord Commissioner of the Ionian Islands, came to Krioneri, the land quarter of the Kapudan Pasha, for the purpose of offering his good services, and alleviating the lot of the Mesolonghians; but although he obtained an interview with the Turkish Admiral, Ibráhim Pasha declined any conference with him, and purposely avoided seeing him, so that he was obliged to depart without any prospect of saving the noble defenders of Mesolonghi. Ibráhim Pasha continued his terrible assaults. On the 6th of April, however, his forces were driven back with immense slaughter, and had the Greeks availed themselves of the confusion in the Egyptian camp, they might have escaped with their families without incurring great risk of being either driven back within the fortress, or made prisoners while in the midst of the enemy's army. Their ammunition and food being completely exhausted, so that even cats and rats were devoured with avidity, the garrison resolved to cut their way through the Egyptian camp, and effect a retreat into the neighbouring mountains. According to the best authorities the population consisted, in the month of April, of about 9000 persons. Three thousand fighting men were to rush headlong upon the besiegers and cut a way for 5000 women and children, while the retreat was to be covered by a thousand men, and the fortress guarded by a few devoted warriors who were ready to sacrifice their lives for the safety of their brethren. The 22nd of April was the day on which the Greeks were to try their last chance. But the plan was betrayed to Ibráhim Pasha by a Bulgarian deserter only a few hours before its execution, and when the heroes of Mesolonghi appeared outside their shattered stronghold, they were suddenly surrounded by the main body of the Egyptians. A dreadful conflict ensued. Five hundred men were cut down by the infuriated besiegers; 1800 persons, of whom 200 were females, escaped, of whom, however, 600 were starved to death in the mountains; and Ibráhim boasted of having taken prisoners 3000 soldiers, and from 3000 to 4000 women and children. Many of the captives were afterwards ransomed through the exertions of the Philhellenic societies in Europe. Nothi-Bozzaris and Mitcho-Koutoyani, though both upwards of seventy, escaped safely. Among the slain were Joseph, bishop of Rogon, the chief magistrato Papadiamandopoulos, the Generals Stornaris, Sadimus, and many other Greeks of note. Among the Germans, Baron von Riedesel and Lieutenant Rosser were killed during the siege; Colonels Dittmar and Delaunay, Captains Baron von Lützow and Stilzelberg, Lieutenants Klemp and Schipan, and several other gentlemen fell in the sortie. With them remained on the battle-field Dr. Meyer, another German, who was the editor of the 'Greek Chronicle,' and who was equally energetic with his pen and his sword: his wife and children were dragged into slavery. 'History will do us justice'—wrote the gallant doctor, a few days previous to the last sortie, to a friend—'and posterity weep over our misfortunes. May the relation I have drawn up of the siege survive me.' This relation was unfortunately lost.

Thus fell Mesolonghi after a siege of twelve months, and after 100,000 shot and shells had been exchanged between the besieged and the besiegers. Its melancholy fate excited the sympathy of all Europe, and there is scarcely a modern language in which poems were not written on the heroes of Mesolonghi.

(Gordon, *History of the Greek Revolution.*)

MESOPOTAMIA (from the Greek μεσος, 'middle,' and ποταμος, 'river'), 'the country between tho rivers,' is a term which was used by the Greek and Roman geographers (Strabo, and others) to comprehend all the countries which lie between the rivers Euphrates and Tigris, and it is still in use. The Arabs and Turks call this country by the corresponding name of Al Jesirah, or 'the island.' As Mesopotamia is not a political division, geographers do not agree as to the extent of the countries to be comprehended under this name. Somo confine it to the central countries, or those lying between 38° N. lat. and the Chalu or Median Wall (34° N. lat.), whilst others extend it northward to 40° N. lat., or the sources of the Euphrates, and southward to 30°, where the Tigris and Euphrates unite. We shall here givo a description of the countries included between tho parallels of 40° and 30° N. lat.

When a traveller departing from Trebizond or Rizeh, on the northern shores of the Black Sea, directs his steps southward, he passes over several mountain ridges running east and west, and is soon aware that the country rises rapidly. About seventy miles from the sea he finds himself on the most northern of the mountain ranges which traverse this portion of Asia from east to west, and which in antient times went by tho name of the Taurus and Antitaurus. This northern chain is traversed in its length by the parallel 40° N. lat., and is at present called Kop Dagh. Its highest part is always covered with snow, and many summits are 10,000 feet above the sea-level. From these mountains the view ranges southward over an elevated table-land, that of the Frat and Murad, which extends over two degrees of latitude, and whose surface varies from 3000 to 6000 feet above the sea-level, but several of the mountain masses attain 10,000 feet. On the south of it, between 38° and 36° 30′, lies the hilly region of Mesopotamia, or the subalpine region of the Taurus. The country here sinks gradually from 2500 feet to 1000 feet and less above the sea-level. It is succeeded on the south by the great desert plain of Mesopotamia, which embraces all the countries between the two rivers, or between 36° 30′ and 34° N. lat. This region is separated from the low plain of Babylonia by the Chalu or Median Wall, which begins on the banks of the Tigris, near 34° N. lat., and it terminates on those of the Euphrates, near 33° 30′ N. lat. This wall and the lower course of the two rivers up to their confluence, enclose the fourth region, the plain of Babylonia, or of Irak Arabi.

I. The *table-land of the Frat and Murad* lies between 40° and 38° N. lat., and between 38° and 44° E. long. In width from north to south it extends about 100 miles, and in length from east to west about 250 miles. This gives an area of 25,000 square miles, or somewhat less than that of Ireland. It constitutes the most elevated portion of the high grounds by which the table-lands of Asia Minor are connected with the great table-land of Iran or Persia.

The elevation of this table-land varies greatly. The highest part of it is on the north-east corner, where the lowest part of the country is about 6000 feet above the sea-level. Hence it descends rather rapidly along the banks of the Frat or Kara-su, for Erzerum is nearly 6000 feet, and Erzingan probably not more than 4000 feet, above the sea-level; where the Frat meets the Murad the elevation is less than 3000 feet. The descent along the Murad river is somewhat less rapid, as the town of Mush is still about 4000 feet above the sea; at Palu the level of the river is 2819 feet above the sea.

This table-land has a very unequal surface, but the inequalities constitute large masses. The Kop Dagh, which forms its northern boundary-line, rises, as already observed, to the height of 10,000 feet. Its northern face, or that which looks towards the Black Sea, is well wooded, but on its southern declivity there are no forests. Another mountain-chain, called the Kharzan Dagh, borders the table-land on the south. It begins on the east with the Nimrúd Tagh, a high peak west of the Lake of Van, and rises above the snow-line and more than 10,000 feet above the sea. Hence the Kharzan Dagh (the Niphates of the antients) runs nearly due west to the place where the Euphrates makes its great bend opposite the town of Malatiyah. Towards the east this range rises from 7000 to 8000 feet above the sea-level, for the mountain-passes which traverse it are from 6000 to 7000 feet high; but it appears to be lower towards the west; and that portion of it which surrounds the source of the Tigris is only 5000 feet high. This appears also to be the general elevation of this mountain-mass where it comes close to the bed of the Euphrates, where this river forms its three hundred cataracts between Isoglu or Fizoglu and Gerger. No mountain-range borders the table-land on the east, where it extends almost on a level between the Murad and Araxes rivers. But west of the source of the Murad the Ala Dagh rises above the snow-line, and it appears to be an isolated mass. Much farther to the west, and at nearly equal distances from the northern and southern border of the table-land, are two large mountain-masses, of which the eastern is called Bingol Tagh, and the western Dujik Tagh. The declivities of tho last-mentioned range approach the banks of the Frat above its confluence with the Murad. Tho two mountain-masses are probably separated from each other by a wide depression, and both rise above the snow-line.

Those parts of the region which are always covered with snow do not appear to cover a considerable space, but from their declivities mountain-streams descend, which are always copiously supplied with water. This circumstance, united to the great quantity of snow which falls during the winter months, makes this table-land one of the best-watered regions in Asia; and the whole surface, with the exception of tho most elevated parts, may be turned to useful purposes. The largest part however is unfit for cultivation, as tracts of considerable extent surrounding the highest grounds are so elevated that the summers are too short and too cold to bring corn to maturity. But as they are the whole year round clothed with excellent grass, they are used as pasture-ground, especially as sheep-walks. The number of sheep must indeed be great if there is no exaggeration in the statement that one million and a half of sheep are sent annually from this and the adjacent countries to Constantinople and Smyrna. They arrive at the place of their destination after a journey of eighteen months, and one-third of them are said to perish on the road. Large flocks are also sent to Diarbekr, Mosul, Aleppo, and Damascus, and even as far as Beirut on the shores of the Mediterranean. The value of this region as a pasture-ground is certainly increased by the total want of trees and even bushes, which peculiarity must be regarded as a characteristic of this as of many other table-lands on the globe. It is only in the most southern districts of the region, on the lower declivities of the mountains which enclose the valley in which the Murad river runs, that forests occur, and even there they consist only of underwood, especially willows and dwarf oak.

But a considerable portion of this region is fit for agriculture. The rivers do not always run in narrow valleys, but frequently traverse depressions, which on account of their extent may be called plains, as they are frequently thirty and even forty miles long, and from ten to twelve miles wide. Such are on the banks of the Frat, the plains of Erzerum, and Erzingan, and on those of the Murad, the plains of Mush and Kharpat, and a number of smaller plains. Near the banks of the rivers these plains are usually swampy, but in general they possess a considerable degree of fertility, except some of the higher grounds, which only yield abundant crops in wet seasons. These plains differ greatly in elevation, and consequently in climate and productions.

The Plain of Erzerum and some smaller districts in its vicinity are nearly 6000 feet above the sea-level. The winters, which are cold and long, commence in the beginning of November and continue to April. Snow sometimes falls in the commencement of June, and the corn is gathered in September. But during the summer months the heat is excessive and the weather very dry. At some places it is then found necessary to irrigate the fields. All the grains of Northern Europe grow very well, and yield rich crops, especially wheat and barley, but only a few of the hardier fruit trees are planted, and the grapes are very bad. All the domestic animals are very numerous, and the sheep of uncommon size. The plains of Erzingan, Mush, and Kharpat, are about 2000 feet lower. Though the winter here lasts four months, the climate is much more favourable to the growth of many plants and trees. The corn is ripe in the month of July, and the orchards and plantations of trees are numerous. Grapes and melons are exported to a considerable extent, and the fruit of the mulberry-trees is held in great esteem. These advantages, united to the extensive pasture-grounds on the higher portions of the table-land, have rendered these plains the abode of a numerous population. This region is politically divided into two pashalicks, those of Erzerum and Mush, and contains several populous places. The most important of them are the following:—

Erzerum. [Erzerum, P. C., vol. x., p. 8.]

Erzingan, on the Frat, is built on an extensive well cultivated plain, on which there are about one hundred villages, and is inhabited by 3000 families, or about 18,000 individuals. This place suffered greatly by an earthquake in 1667.

Egan is in a rather narrow valley, between steep mountain masses rising to 4000 feet above the Frat, whose declivities, however, to a considerable height are covered with orchards and plantations. It contains 2700 families, and some of the numerous villages in its vicinity from 400 to 500 families. The valley is too narrow to admit of cultivation on a large scale, and the population, which is great, lives almost entirely on the fruit of the white mulberry-trees, which here, as in some parts of Afghanistan, is dried and used as bread.

Kebban Maaden, on the Euphrates, a mile and a half below the place where the Frat and the Murad rivers unite, is built in a ravine enclosed by bare mountain masses. It owes its existence to the silver-mines in its vicinity, but they are not very productive. The population consists of between 400 and 500 families, all of them engaged in mining.

Mush, on the Murad river, in a well cultivated plain, has 8000 inhabitants, who are partly engaged in manufacturing iron utensils, carpets, stockings, and linen-cloth. It has some commerce with Erzerum, Bitlis, and Diarbekr.

Palú is built on a steep hill rising 473 feet above the level of the Murad river, which washes its base. It contains about 1000 families, some of which are engaged in weaving coarse cotton-cloth, for which there are 200 looms, and others in dyeing and tanning. This town is surrounded by extensive orchards. About twenty-four miles east of Palú, and about two miles from the southern banks of the Murad river, are the iron-mines of Sivan Maaden, where the mineral is very abundant, and the ore contains 75 per cent. of iron of good quality. The Turks began to work the mines some years ago.

Kharput is built on a cliff rising 1000 feet above the adjacent plain, and contained in 1835 about 9000 individuals. The surrounding country is very fertile, and considered the the most populous portion of the table-land.

II. The *Hilly Region of Mesopotamia*, or the *Subalpine Region of Mount Taurus*, lies to the south of the Kharzan Tagh, from which range it extends southward to the great caravan-road which runs from Bir-eh-jik on the Euphrates, to Mosul on the Tigris, past Urfah, or Orfah, Mardin, and Nisibin. This caravan-road lies along the base of the Hilly Region. This region lies between 38° 30′ and 37° N. lat., and between 38° and 43° E. long., and extends about a hundred miles from north to south, and two hundred and fifty from east to west, so that its area may be roughly estimated at 25,000 square miles, or equal in extent to the table-land of the Frat and Murad.

This country may be considered a continuation of the table-land of the Frat and Murad, or rather as a lower terrace of it. The northern districts are about 2500 feet above the sea-level, from which elevation it gradually descends to about 1000 feet, or somewhat more, where it is contiguous to the Great Desert Plain of Mesopotamia along the caravan-road. Only the most eastern part of this road between Tel Rumalah and Mosul is at a lower level, and runs through the Great Desert Plain.

The highest part of this region is that which on the west borders on the banks of the Euphrates between Izogln and Gerger, where the river forms its three hundred cataracts, and on the east on the upper course of the Tigris between its source and the town of Diarbekr, which is nearly 2500 feet above the sea: the sources of the Tigris are nearly 5000 feet. The level of the surface of the Euphrates near the confluence of the Frat and Murad is upwards of 2500 feet, and at Gerger probably less than 1800 feet. But the rocky mountain-masses which rise abruptly from the water's edge, at many places perpendicularly, generally attain near the river an elevation of between 2000 and 3000 feet, and a greater height at some distance from it. The highest portion of this tract must therefore be more than 5000 feet, and it may be 6000 feet. It does not, however, appear that any portion of it rises so far above the general level of the masses as to form conspicuous summits. This tract is little known. In the depressions are small villages surrounded by walnut-trees, and a little cultivation, but the inhabitants derive their subsistence chiefly from their cattle and sheep.

East of this mountain tract lies the Plain of Diarbekr, or of the Upper Tigris, which extends from some miles west of the town of Diarbekr to some distance east of the town of Sert, about 120 miles in length, and from the Kharzan Tagh on the north to the Karaja Daglieri on the south, from 40 to 50 miles; on the east it is shut up by the most elevated part of the mountains of Kurdistan. It is a most valuable part of Western Asia, especially that portion of it which lies on the southern declivity and at the base of the Kharzan Tagh. The declivity of this range is not so steep as that which descends to the banks of the Murad, and the slope is in many places interrupted by terraces from two to three miles in width. These terraces are generally used as pasture-grounds; but they are cut by wide valleys, which descend from the summit of the range to the plain below, and in which the waters collected on the top, which for many months of the year is covered with snow, find their way to the lower country. Rich crops of wheat and barley are obtained everywhere, and in some places, where irrigation can be practised, rice is grown. The sides of the hills which enclose the valleys, and the valleys themselves, are partly covered with orchards and plantations, consisting of walnuts, figs, vines, pomegranates, mulberries, and the fruit-trees of Northern Europe. In some places cotton, melons, and plantains are grown to some extent. The steeper portions of the mountains are chiefly covered with woods, in which two kinds of oak abound, one of which yields gallnuts, and the other a kind of manna, which is much used in the country. In some parts the steep declivities of the hills have been transformed into terraces, which are planted with fruit-trees and irrigated.

The Plain of Diarbekr itself is less fertile, and not cultivated with such care as these valleys. Its surface may at the lower part be about 1700 to 1800 feet above the sea-level. There are many tracts which are quite level, and others have an undulating surface; a few are hilly. The rivers, especially the Tigris, run in beds deeply depressed below the general level of the country, which renders it difficult and expensive to use the waters for irrigation, and as the summers are hot and dry, only those tracts can be cultivated which have a better soil. The others are only used as pasture-ground during the wet season, and until the grass is dried up by the heat. In some parts the surface is bare of mould and consists of naked rocks. There are no trees on this plain except mulberries and poplars, which are planted in some places. Corn and barley are grown, and some cotton, and also maize. In the vicinity of the town of Diarbekr cultivation is carried on with more vigour: flax is also grown.

A few miles from the southern banks of the Tigris, where the river runs from west to east, the plain is bordered by rocky masses, which rise with rather a steep ascent to 2000 feet above the general level of the plain. Though they appear to form a range, these masses constitute only the outer border of a table-land which occupies the whole country between the Euphrates and Tigris, north of 37° N. lat. and compels the Tigris to run eastward and the Euphrates west; near 38° N. lat. These two rivers are hardly thirty miles apart; but sixty miles farther south, between Rumkalah on the Euphrates and Jezirah Ibn Omar on the Tigris, they are more than two hundred and twenty miles from each other. The highest part of this table-land runs from north-west to south-east, beginning at no great distance north-east of the town of Severeck and terminating with the hill on which the town of Mardin is built. This ridge it appears is properly called Karaja Daghieri. This region has no watercourses, though a considerable quantity of snow appears to fall during the winter months. This must chiefly be attributed to the limestone, of which, according to Ainsworth, the upper surface of the country is composed, and which quickly absorbs all the water. Where this is the case the country generally presents bare rocks, or only a very scanty vegetation during the wet season. But there are some parts which are covered with basalt and trap, and these tracts have a soil fit for cultivation, or at least good pasture-ground. The whole country is imperfectly known, especially the portion contiguous to the Tigris, which has been visited by European travellers only in the vicinity of the river. Where the bed of the river is narrowed by the mountain-masses advancing to the water's edge on the east from the mountains of Kurdistan, and on the west by the Karaja Daghieri, the surface of the table-land is mostly broken by valleys and ridges, interspersed here and there with elevated plains. The valleys are well cultivated, and produce wheat, rice, cotton, tobacco, cucumbers, and melons; some of them have good vineyards. The ridges are well covered with oak, pine, holly, elm, and several bushes. The plains afford good pasture-grounds, and are also partly cultivated. Farther inland the country appears to be more uneven, as the inhabitants are able to defy the Turkish government and to maintain their independence; but according to the accounts of the natives there are many fertile valleys in it. If their accounts deserve credit, the eastern districts are much more fertile than the western, where the want of moisture in the summer is so great that nearly the whole is a desert, with the exception of some depressions, whose surface is formed of trap or basalt, and where a few villages occur with some cultivation surrounding them. In approaching the banks of the Euphrates where the mountain-masses have sunk down to 1200 or even 800 feet above the level of the river, the edge of the masses is split and indented, and numerous small valleys are found between the high ridges. In these valleys some corn is cultivated, but the largest part of them is covered with orchards, consisting of olives, pomegranates, mulberries, pears, peaches, and quinces; all of them have also excellent vine plantations. In some parts cotton is cultivated.

The country through which the caravan-road between Bir-eh-jik and Mosul runs, has great variety of surface and soil. Between Bir-eh-jik and Urfah it is hilly, and contains many cultivated tracts. Farther east, as far as Mardin, cultivated and wooded tracts, mostly situated in depressions, or valleys alternate with plains, which in some cases afford pasture, and in others are quite sterile. This tract is very uneven, and the ridges running south and north rise to high hills, generally of a conical shape. These ridges continue to Nisihin, but are less frequent. Between them run some watercourses, which are used for irrigation, and soon lost in the desert country which lies farther south. East of Nisihin cultivation ceases; but as in this part there are numerous watercourses, the adjacent country has pasture even during the summer months. After having passed Tel Rumaláh the road leaves the Hilly Region of Mesopotamia and enters the Desert.

This region has a more temperate climate than the table-land of the Frat and Murad, on account of its less elevation, the mountain-ranges which surround it on the east, north, and west, and its more southern situation. But the climate is much colder than that of Europe in the same parallel, because it lies much farther from the sea, and does not receive the warm western winds prevalent on the Mediterranean, as the elevated chain of Mounts Lebanon and Antilebanon prevent them penetrating so far eastward. The thermometer has been observed to descend as low as 12° of Fahrenheit. In January and February a great quantity of snow falls. The spring hardly exceeds six weeks, and in May the dry season begins, in which hardly any rain falls to the end of October, or the commencement of November. The thermometer rises to 90°, and all grass and minor vegetation dries up. Pasture is then only found in the vicinity of the pools and cisterns, which are common in many places of the table-land. Nature becomes reanimated in the month of November, when the Nile clouds appear, which proceed from Mount Lebanon eastward, and bring to the table-land very heavy rains, which about the beginning of the year are changed into snow.

If the Plain of Diarbekr is excepted, agriculture is limited to some tracts of moderate extent, to the numerous but narrow and short valleys, and a few plains and depressions which have a fruitful soil. The cerealia which are grown are wheat, beans, barley, rice (in very few places), lentiles, *cicer arietinum*, *Lathyrus sativus*, *vicia nissoliana*, *phaseolus maximus*, durrba (*holcus sorghum*), and *medicago sativa*. Other vegetables are several kinds of cucumbers, melons, *solanum melengena*, *hibiscus esculentus*, and pumpkins. The orchards and plantations contain olives, white and black mulberries, pomegranates, figs, cherries, Armenian plums (*prunus armeniaca*), three other kinds of plums, apples, pears, quinces, cornelian cherries, almonds, walnuts, hazel-nuts, chesnuts, and cembra kernels (the fruit of *pinus cembra*). Tobacco, sesamum (*sesamum orientale*), castor-oil (*rhicinus communis*), hemp, flax, saflor (*carthamus tinctorius*), cotton, and *trigonella foenum graecum*, are also cultivated. Among the wild plants are capers (*capparis spinosa*), mustard (*sinapis orientalis*), liquorice (*glycyrrhiza glabra*), asparagus, and *arum colocasia*—the leaves of the last are used as paper.

Sheep, cattle, and goats constitute the wealth of the nomadic tribes. There are two kinds of sheep, the Tartarian, with the fat tail, which often weighs fifteen pounds, and the Arabian, whose tail is not much thicker than that of our sheep. Horses are numerous, but not so good as in the table-land of the Frat and Murad, or on the desert plain: asses are also kept in great numbers. It does not appear that camels are bred, but they are used on the caravan road.

The most common wild animals are wild boars, deer of two or three different kinds, wolves, foxes, hyænas, jackals, bears, polecats, martens, marmots, hamsters (*cricetus vulgaris*), squirrels, porcupines, and hares. There are several kinds of vultures, falcons, and owls; ravens, crows, jackdaws, thrushes, beccafigues, and other smaller birds. Fish abound in both rivers, the Euphrates and the Tigris, and in several of their confluents. There are also several kinds of turtles, snakes, and lizards.

The Hilly Region of Mesopotamia constitutes the pashalik of Diarbekr; but the most south-eastern districts are sometimes placed under the pasha of Mosul. The most remarkable places are situated either in the Plain of Diarbekr or along the caravan road between Bir-ch-jik and Mosul. In the Plain of Diarbekr are

Diarbekr. [Diarbekr, P. C., vol. viii., p. 477.]

North of Diarbekr, on the southern declivity of the Kharzan Tagh, are very rich mines of copper, in whose vicinity are two towns, one of which is called Arghana (or Argunna) Maaden, and the other Maaden Kapur. Arghana Maaden is built round the summit of a high hill, 2887 feet above the sea-level, and contains according to some statements 1200, and according to others 600 houses. The declivities of the hill are partly cultivated with wheat and cotton, and partly planted with orchards and vines. The proper mining town, Maaden Kapur, is about 14 or 15 miles distant from Arghana, in a district destitute of vegetation, and contains about 4000 inhabitants, all of whom are employed in the mines. The produce of these mines formerly amounted to 400 tons, but in modern times they are not worked to such an extent, and the annual produce is only estimated at 75 tons. But even this is of great importance to the adjacent countries, for all the copper utensils which are used in the Asiatic provinces of the Turkish empire, and mostly also those used in Persia, are made of this copper. It is taken to Tokat and Erzerum, where it is manufactured, and to Trebizond, whence the metal is sent to Constantinople.

Farther east, but also on the southern declivity of the

Kharzan Tagh, is the town of Ilijeh, which contains 1000 families, and where some cotton-stuffs are manufactured: in the neighbourhood maize is cultivated.

At the eastern extremity of the Plain of Diarbekr, within the Kharzan Tagh, in a very alpine country, is the town of Bitlis, 5000 feet above the sea-level, which contains 12,000 inhabitants, and carries on an active commerce with the adjacent countries and with Persia. It exports wool, tobacco, gallnuts, and gum tragacanth, which are the produce of the country. From Persia it imports cotton for the manufactures of the town, which appear to be numerous; it has also several dyeing-houses and distilleries.

Sert is built near the eastern termination of the Plain of Diarbekr, not far from the base of the mountains of Kurdistan, 2750 feet above the sea-level. It contains about 5000 inhabitants, many of whom are engaged in dyeing red the cotton-stuffs of Bitlis and Ilijeh.

Along the caravan-road are the towns of Urfáh or Orfáh, Mardin, and Nisibin. Urfáh (Orfa, the antient Edessa), the most western, is at the base of a hill, and is a well-built large place, which is frequently compared with Damascus. It is surrounded by high and strong walls, seven miles in circuit, and has between 40,000 and 50,000 inhabitants. It is not said that any branch of industry is carried on. The most remarkable of its numerous mosques is the grand mosque, which in its exterior and interior exhibits a considerable degree of magnificence. With this building are united several medresses, where a number of young men are instructed in the Koran, divinity, and the law.

Mardin, which is nearly at equal distance from Bir-eh-jik and Mosul, is built on the summit of a steep limestone hill, which may be considered as the termination of the Kharaja Dághlieri; it is 2300 feet above the sea-level, and about 1000 feet above the plain lying south of it. The population is differently stated between 10,000 and 15,000 individuals.

Nisibin (the antient Nisibis), farther east, had sunk down to the condition of a miserable village, but in modern times the Turks have begun to rebuild the town.

The town of Suverek or Severek lies on the direct road between Urfah and Diarbekr, in a depression in the midst of the table-land. In the surrounding country wheat is raised to a considerable extent, and orchards are numerous. The place contains 2000 families.

The only place, except Diarbekr, built on the banks of the Tigris which requires notice is Jezirah Ibn Omar (the Island of the son of Omar), which is built on an island in the river. It has long been the seat of a rebellious chief of the Kurds, and contains a population of about 1000.

III. The third region, called the *Desert of Mesopotamia*, extends from the great caravan-road leading from Bir-eh-jik to Mosul to the Median Wall, or from 37° N. lat. to 33° 30′ N. lat., and between 38° and 44° E. long. At its northern extremity it is nearly 300 miles wide; but as the Euphrates and Tigris approach nearer to one another in their course to the south, the country grows narrower, and at its southern extremity it is hardly fifty miles wide. The length from north-west to south-east may be about 250 miles, and the average width about 150 miles. This gives an area of 37,500 square miles, or about 10,000 square miles more than Ireland.

This country has been called a desert, not on account of the sterility of the soil, but because till very recently we have been entirely unacquainted with its productive powers. That portion which has lately been seen by European travellers is far from being a desert, and has given rise to the opinion that in Mesopotamia there does not exist any tract of country of considerable extent which is covered with sand and utterly sterile, though a large part of it is covered with horizontal layers of sandstone, which only during a small part of the year are clothed with grass and plants. But, on the other hand, there are some districts which exhibit a considerable degree of fertility.

The level of this region at its northern extremity and in the vicinity of Mardin, is between 1300 and 1400 feet above the sea, but it decreases as it approaches the rivers; Mosul on the Tigris is only about 400, and Bir-eh-jik on the Euphrates 650 feet above the sea-level. The course of the rivers and streams shows that it descends towards the south. At its southern extremity near the Median Wall it probably does not exceed 200 feet above the sea.

The country is a plain, but there are a few isolated ridges of high hills, which however do not cover a great extent of country. The best known of these ridges are the Jebel Makhul on the banks of the Tigris, between 35° 30′ and 35° N. lat.; the Sinjar Hills, south of Nisibin, between 41° and 42° E. long., and north of 36° N. lat., and the Abd-al-aziz Hills, between 39° and 40° E. long. and near 36° 30′ N. lat. The precise situation of the last-mentioned range has not been determined.

The most fertile portion of this region is in the north-western corner, between the Abd-al-aziz Hills and the Euphrates: it is drained by the river Belik, which runs about a hundred miles, and falls into the Euphrates at Racca. This region comprehends the districts which are known by the names of Saruj and Harran. The fact of the fertility of this tract has only lately come to our knowledge in the last war between the Turks and Egyptians, when the army of the Turks drew provisions from this country. On this occasion Mr. Ainsworth was informed that in Saruj alone were more than forty large villages, inhabited by agriculturists, and that twenty of them cultivated rice. The country is considered as the granary of Syria, and no part of the last-mentioned province can vie with it in fertility and agricultural productions. Harran, which lies to the east of Saruj, is stated to contain a large portion of alluvial land, and to be equally fertile. The degree of fertility of the Abd-al-aziz Hills is not known, nor their extent and direction.

We are totally unacquainted with the tract between these hills and the Sinjar Hills, except that nearly all the upper branches of the Khahur river rise in this tract, and this leads to the presumption that this tract is well watered, and that it contains a fair proportion of land fit for cultivation. This is also stated to be the case with the valley in which the Khabur river runs southward and south-westward until it reaches the Euphrates, near the castle of Rehabeh, after a course of probably two hundred and fifty miles.

The country between the caravan-road and the Sinjar Hills is nearly a level plain, which even at the end of the dry season is mostly covered with coarse grass and prickly plants. In some places there are tracts of marshy ground, with long reeds, and interspersed with many large pools of sweet water; but at some places the soft soil is impregnated with salt. There are in this part many conical hills from 80 to 150 feet in height; they appear to be artificial. The portion of this tract which is under cultivation is small.

The Sinjar Hills run east and west with a slight inclination to the south. They extend in length about fifty miles, and in breadth from seven to nine miles. The highest part of the hills is near the eastern extremity, where they rise about 1500 feet above the plain. This is an agricultural district. Considerable quantities of wheat, barley, and cotton are raised in the lower and more level parts, and the sides of the hills are covered with plantations of fig-trees and vines, which yield articles of export. A portion of the hills is covered with oak trees, the acorns of which afford a plentiful supply of food to the numerous wild boars which frequent the hills. The number of the inhabitants, who are Yezidis, is stated to exceed 6000.

The plain between the Sinjar Hills and the Tigris has an undulating surface, and is for the most part barren, and covered with coarse scanty grass and thorny shrubs; there are large tracts of barren marshy soil, strongly impregnated with saline matter. The most common vegetable production is an oat-grass, which at many places covers tracts of several miles in extent, to the exclusion of all other plants, except a few flowers. Cultivation is only carried on in some of the beds of temporary watercourses, and between some low ridges of rocks, where wheat and barley are cultivated. Some tracts are covered with wormwood. In the vicinity of the Tigris the cultivated tracts are more extensive, not on the higher grounds, which rise with a rather steep ascent about 200 feet above the level of the river, but in the bottom of the Tigris. This river flows here in a valley from eight to ten miles wide: the projecting headlands of the higher country form large embayments called *hawis*, which have a fertile alluvial soil, overgrown in their natural state with grass and small tamarisks, but where cultivated giving abundant crops of grain or rice. In proceeding from Mosul southward the cultivated tracts decrease in number, as the agricultural inhabitants are too much subject to the predatory incursions of the Shammar Arabs who are in possession of the uncultivated interior of this part of Mesopotamia.

The Jebel Makhul extends about forty miles along the banks of the Tigris, and at a very short distance from the banks. It must be considered as the continuation of the Jebel Hamri, in Kurdistan, which near 35° comes close up to the banks of the Tigris from the south-east. The Jebel Makhul may rise about 600 feet above the level of the river: it consists mostly of two ridges, and is composed of one mass of transparent gypsum. In its present state it is a waste. At its western base is a large tract of country with a sandy soil, which contains a great number of bitter wells that are frequently visited by the nomadic tribes of the Arabs. The banks of the Tigris between the Jebel Makhul and the town of Tekrit are uninhabited on account of the neighbourhood of these tribes. Between Tekrit and the Median Wall the alluvial tract on the banks of the Tigris grows much wider, and appears to have been formerly a well cultivated country, which was irrigated from a large canal which still exists under the name of Ishaki, and extends from the town of Tekrit to Bagdad; a great number of smaller canals of irrigation are connected with it. But at present the canal rarely contains water, as the whole work has gone to decay from want of attention; and this tract, which has an exceedingly fertile soil, is without inhabitants, and almost without cultivation, except a few isolated spots.

The higher ground west of this alluvial tract, as far as the River Tharthar, has an undulating surface, consisting mostly of long ridges, and depressions between them, not unlike the waves of the sea. In the valleys between the higher grounds the soil is moist even at the end of the dry season, so as to afford pasture-ground nearly the whole year round. But the best pasture-ground is in the valley of the river Tharthar. This river is said to rise at the base of the Sinjar Hills. It runs parallel to the Tigris and about twenty miles from its banks. In May it was found to be between fifteen and twenty feet wide, and from five to seven feet deep. Its course may perhaps amount to one hundred and fifty miles. The water is brackish in summer, but not unpleasant to drink. The bottom in which this river runs is sometimes a mile wide, but in other places narrowed by the projecting headlands of the higher grounds to two or three hundred yards. It does not appear to be cultivated, but on the western bank are the extensive ruins of Al Hadhr (the antient Hatra), which must have been erected in a country which was well cultivated. The Tharthar falls into a salt lake, somewhat north of 34° N. lat. This lake is called El Milh, or the Lake of Ashlik; its extent is not known. The country west of the Tharthar river, as far as the banks of the Euphrates, is entirely unknown. It is said that at some places rock-salt is found in this desert.

The country contiguous to the banks of the Euphrates is much better cultivated than that which skirts the Tigris. Between Bir-eh-jik and Balis the Euphrates runs in a narrow bed between very high rocks; there is no bottom on the banks of the river, and the adjacent country is sterile and uncultivated. But between Balis and Racca the high grounds present themselves as low and rounded hills, and they are from one mile to six miles distant from the banks of the river. The bottom in these parts is an alluvium. On the banks of the river are tamarisk-bushes. A great part of the low plain is occupied by swamps, and the more elevated tracts between the swamps are either overgrown with tamarisk-bushes or used as pasture-ground. There is hardly any cultivation. In these parts the bed of the river is wider, and there are several islands in it. A few date-trees are planted.

At the mouth of the Khabur river are some extensive woods, composed of high trees, especially tamarisks and poplars. Lower down the low and level flats increase in extent, and here also cultivation is much more attended to, but still by far the greater part of the bottom is swampy, or only used as pasture. The number of islands increases as we proceed farther south; they are partly bare and partly well wooded with tamarisks. Before reaching Annah cultivation begins to be more general. Round this place a large tract is well cultivated; corn, cotton, French beans, and sesamum are raised to a great extent; the plantations of dates are extensive, and the numerous orchards yield oranges, lemons, pomegranates, figs, and olives. The olive-tree is not met with farther south; but the other trees and branches of agriculture are greatly attended to in the bottom of the Euphrates as far down as Hit. The banks of the river present a continual plantation of date-trees; and between them and the low, rounded, gently sloping hills at the back, the bottom is, with the exception of some swampy ground, in a high state of cultivation, and full of villages. The great fertility of this tract is mainly to be ascribed to the system of irrigation which has been introduced. A great number of canals traverse the river bottom in its width, extending from 200 to 2000 yards from the banks, and the water, raised by machines, is distributed over the adjacent lands. The numerous islands which occur in this part of the course of the Euphrates are mostly cultivated, and on some of them towns are built.

Opposite the town of Hit the bottom is only a mile wide, and nearly without vegetation, as the surface is mostly composed of gravel, intermixed with flint and pieces of chalk. There are only a few date-trees, poplars, and tamarisks; and at a few places are isolated fields of wheat, barley, or sesamum. Below this place the high grounds disappear entirely, and the whole country is very little elevated above the level of the river. The soil of this tract is extremely soft, and as the banks of the Euphrates are very low, it is annually subject to inundations, which leave behind them large pools and lagunes, the water of which is generally salt. There are no longer any canals, nor any cultivation. The whole tract is in possession of nomadic tribes, who find here during the dry season abundant pasture for their buffaloes and horses. The number of islands in the river decreases, and they are no longer cultivable; their soft soil consists of sand and mud. Such is the country between Hit and the Median Wall.

The Median Wall runs from the banks of the Euphrates to those of the Tigris. Its southern extremity is said to be on the Euphrates, a few hours above Felujah; but at this point it has not yet been recognised by European travellers. Its northern extremity is found somewhat north of 34° N. lat.; so that it runs in a straight line from N.N.E.½E. to S.S.W. ½W. It is an embankment or wall, 25 long paces thick, with towers or buttresses on its western face at every 55 paces; and on the same side it has a deep ditch, 27 paces broad. Near the Tigris it is built of the small pebbles of the country, imbedded in cement of lime of great tenacity. It is from 35 to 40 feet in height. The natives say that in places far inland it is built of bricks, and in some parts worn down level with the desert. According to their tradition it was built by Nimrúd (Nimrod) to keep off the people of Nínuwah (Nineveh), with whom he had an implacable feud; and they call it Sidd Nimrúd, or Chalú (embankment). We know nothing of the antiquity of this wall, except that it is mentioned as existing B.C. 401, when the Ten Thousand Greeks were commencing their retreat from the field of Cunaxa. Xenophon (*Anab.* ii. 4) describes it as built of baked bricks lying in asphalt, as 20 feet wide and 100 feet high: 'the length was said to be 20 parasangs (600 Greek stadia); and it is not far distant from Babylon.'

Our knowledge of the climate of this region is limited to a few general notices. The heat in summer is very great, and no rain falls up to the middle of November. During November and December the rain falls in frequent and heavy showers, but is not continual. In January and February there is a good deal of frost, and after the spring has commenced in March there are also occasional rains, but not so heavy as in December. The rains cease in the month of May, when the heat becomes soon so powerful as to dry up the pasture of the more elevated grounds, and to compel the nomadic tribes to descend with their herds to the banks of the Tigris and Euphrates, and to the valleys of the Tharthar and Khabur.

This region is divided between the pashaliks of Mosul and Bagdad. No remarkable places are found, except the towns built on the banks of the two rivers which enclose the region. On those of the Tigris are Mosul [P. C., vol. xv., p. 447] and Tekrit, which is built on a cliff, and occupies the eastern part of the site of an antient town, the ruins of which are very extensive.

The largest towns on the Euphrates are in the fertile tract which extends from Annah to Hit. Annah (the antient Anatho), which is partly built on the western bank, and partly on an island of the Euphrates, contains 1800 houses, and is considered the capital of the Arabic tribes inhabiting the country west of the river. Farther down lies Hedisah, on an island in the river, in the midst of date plantations, and contains more than 400 houses. El Uz is also a considerable place, and like Annah partly built on an island. Jibbah, another town built on an island, contains 500 houses, and is a thriving place. Hit (the Is of Herodotus, i. 179) contains bitumen springs, which are mentioned by Herodotus. It is built round a hill, and has good houses of stone. In the vicinity there is very little cultivation, and the inhabitants derive their subsistence from making salt, preparing bitumen, manufacturing woollen-stuffs, and building boats. The number of bitumen springs in the neighbourhood of this place is very great, and the produce of a single spring is sufficient to meet the demand, though it is used in these parts as fuel. A great number of river-boats of different sizes and forms are made here. They consist of wicker-work, made of branches from one and a half to two inches in thickness. The interstices are filled up with bark or straw, and then the whole is caulked with bitumen. In such boats the bitumen, salt, and prepared lime are taken to Hilla, Bassora, and even to Bagdad: in going to the last-mentioned place the boats pass through the canal of Saklάwiyah. The mode of navigating the river resembles that practised above two thousand years ago. (Herodotus, i. 194.)

IV. The plain of Babylonia, or of Irak Arabi, extends from the Median Wall (34° N. lat.) to the confluence of the Euphrates and Tigris at Kornah (31° N. lat.), and between 44° and 47° E. long. In length it does not much exceed two hundred miles, and in breadth it varies considerably. Between Felujah and Bagdad it is not more than forty miles wide, but lower down it widens to a hundred miles. Eighty miles may be the average width. This gives to this region an area of 16,000 square miles, or less than two-thirds the extent of Ireland.

This is the Babylonia which is described by Herodotus (i. 193) as a fertile tract, and as the seat of an immense population. At present this country is a desert. But when we consider the immense space over which the ruins of Babylon are scattered, and the large tracts in the interior of the country which are covered with continuous heaps of ruins, indicating the sites of antient towns and at short distances from each other, of the existence of which towns nevertheless not the slightest indications occur in the antient writers or the Arabian writers of the middle ages, we must come to the conclusion that this region was for centuries before the records of history the seat of a people who had attained a high degree of civilization, and that the famous city of Babylon was only the last of the numerous cities which successively were built there and fell into ruins. Its civilization probably goes as far back as that of Hindustan. Its destruction is chiefly to be ascribed to its situation between the two elevated table-lands of Iran in Persia, and of Nejd in Arabia, which are not adapted for arable cultivation to any great extent, but must remain the dominion of nomadic tribes, whose character and habits make them the scourges of cultivated countries, and the destroyers of civilization.

Babylonia attained its high degree of cultivation by a system of irrigation. The whole region was traversed by numerous larger and smaller canals running in every direction, by which abundance of water for irrigation was supplied to every spot. This circumstance, united to a summer heat which is not inferior to that between the tropics, enabled the soil, which is by no means of a superior description, to yield fifty or sixty fold the seed. The principal canals for irrigation extend across the whole country from the Euphrates to the Tigris. They occur chiefly in the northern and southern districts, and this is evidently to be attributed to the different level of the two rivers in these parts. It is certain that north of 32° the level of the Euphrates is considerably higher than that of the Tigris, and the water in the canals runs with a moderately strong current from west to east and falls into the Tigris. In the southern districts the contrary takes place: the level of the Tigris is higher than that of the Euphrates; and consequently the water in the canals runs from the Tigris to the Euphrates, from north to south.

The construction of these canals goes back to the remotest ages, but they have been made so substantial, that at present, after many centuries of neglect, a great number of them still impart a degree of fertility to the adjacent fields, and two of them have actually been navigated by steam-vessels; it is probable that several others which are known to exist would serve the same purpose. The most northern of these canals is the Saklάwiyah. It begins on the Euphrates about five miles north of the Castle of Felujah, and not far south of the place where, according to the accounts of the natives, the Median Wall terminates on the banks of this river, and reaches the Tigris below Bagdad. Though the direct distance between the two terminations of the canal is not more than 45 miles, its length is 70 miles, because for two-thirds of its course near the Euphrates there are many bends; the last third runs nearly in a straight line, and is frequently fifty yards wide. But where its course is not direct the canal is very narrow, so that the steam-boat navigated it with difficulty. This circumstance, the quickness of the current, which runs four miles an hour, and the lowness of the banks, which never rise above the level of the adjacent country, and are frequently lower, appear to prove that this part of the Saklάwiyah is a portion of a running stream and not a canal. Near the Euphrates the banks are thickly dotted with bushes of liquorice, which grow to the height of ten feet, and have roots of considerable thickness; these roots give consistence to the soft soil of which the banks are composed. Farther on the country adjacent to the canal presents a boundless prairie, on which numerous herds of cattle pasture, and among them are the black tents of the nomadic Arabs. By this canal the wicker-boats of Hit bring the produce of the country contiguous to that place to Bagdad, and it has twice been navigated by steam-boats. Before the Saklάwiyah reaches the Tigris it falls into a large lake called the Hor, which lies west of the town of Bagdad; a canal about five miles long called Mosadc, carries the waters of the Hor into the Tigris. It is also navigable.

The Saklάwiyah is considered to be the Isa canal of Abulfeda, who mentions three other canals farther south, which cross the whole width of Babylonia, and these canals still exist. They are called, from north to south, the Nahr Abu Gharib, the Nahr Melik, and Nahr Dhiyah. We have no particular account of these canals. These four canals leave the Euphrates between 33° 30′ and 30° N. lat. The mouths of some other canals are seen farther south, as far as the ruins of Babylon, but it is not known how far they extend inland.

The principal canal in the southern districts of the plain of Babylonia is the Shat el Hiyeh, which carries the waters of the Tigris to the Euphrates. It leaves the Tigris opposite Kut el Amara, a miserable village on the eastern bank of the river, nearly a hundred miles below Bagdad in a straight line, and 178 miles measured along the windings of the Tigris. The Shat el Hiyeh runs more than a hundred miles southward, and enters the Euphrates nearly opposite Arje or Arshe, about fifty miles above the confluence of the two great rivers, by two great branches, of which the western is called the But-je-Heïrat, and the eastern Sayid Nawain; their mouths are about five miles apart. The tide ascends the Euphrates as far as Arje. This canal is dry in summer, but during eight months it is navigable, and in winter it is 150 feet wide and rather more than two fathoms deep. In this period of the year it was navigated by a steam-boat during the late Euphrates expedition; but only the western branch is navigable, the country adjacent to which has many agricultural settlements, and a considerable traffic is carried on by it. At no great distance north of the western mouth of the Shat el Hiyeh is that of another large canal called the Shat el Kar. It runs also from north to south, but it is not known where it originates, and whether its northern extremity is connected with the Nahr Dhiyah. It was crossed by Fraser at a considerable distance above its mouth, where it was from 30 to 40 feet wide, and knee-deep in summer, but in winter it is fordable only in a few places. Like the Shat el Hiyeh, it is navigated by the river boats, which are made at Hit.

The banks of the Euphrates, from the place where the Saklάwiyah canal branches off, to the ruins of Babylon and the town of Hillah, are of moderate height. The country adjacent to them is of indifferent fertility, and is mostly overgrown with grass, thistles, and mimosas. Cultivation is limited to a few spots, and as the pasture-grounds are also indifferent, the number of cattle, sheep, and goats is not great. It appears to be little inhabited, and only from time to time a grove of datetrees is seen. Below Hillah the country improves greatly; a large portion of it is under cultivation, and the plantations of dates are more numerous. It is a populous country: between Hillah and Diwaniyeh a number of large villages are observed, the population of which was estimated by a traveller at 10,000 individuals.

A short distance below Diwaniyeh begin the marshes of the Euphrates, which lower down are called the marshes of Lemlun or Lamlun. They extend from Diwaniyeh to El Karayin or Grahim Inlet, a distance of upwards of 80 miles in a straight line, and they vary in width from 6 to 20 miles. This tract is the most productive and most populous on the banks of the Euphrates, and is inhabited by an Arab tribe called the Kasahel, who are estimated at half a million, which however is probably an exaggeration. The river runs between low banks, from which the country on both sides rises imperceptibly towards the interior, where it extends in level flats, between which are many extensive depressions which are swampy all the year round. The soil of this tract consists of a firm tenacious clay of a dark blue colour, in which numerous shells are imbedded. The soil is very fertile when irrigated, and the means of irrigation are abundant. The Euphrates divides into numerous branches, so as to convert a large tract of the marshes into islands. The marshes are also traversed by two large canals, one on each side of the river. That on the

Mesopotamia side is called the canal of Yusuf (Joseph). It begins about half an hour above Diwaniyeh and terminates at Grahim Inlet. At its upper entrance it is seventy paces wide, and its course lies nearly parallel to the Euphrates, at a distance of about 2 or 3 miles from its northern branch. The canal of the Arabian side is called the canal of Old Lamlun. It branches off from the Euphrates about 19 miles below Diwaniyeh, and rejoins it a short distance above the mouth of the Yusuf canal. The two canals are connected with the Euphrates by numerous other canals of smaller dimensions, and other canals carry the means of irrigation to those parts of the marshes which are more distant from the river. The numerous population derive their subsistence from their fields of rice, which extend over all the higher grounds, which are dry in summer, from their herds of buffaloes, which find abundant pasture in the more marshy tract, and from their plantations of dates, which cover the banks of the numerous canals. They have also a few plantations of fig-trees. During the inundations the whole surface of these marshes is under water, with the exception of those places which are enclosed by embankments, and some more elevated tracts on which the villages are built. The villages also are frequently inundated, and when this happens, the inhabitants convert the roofs of their reed-built huts into boats, or place their families on buffaloes, and in this way reach a more elevated spot. As it is very difficult to enter their country with any force, they are nearly independent, and rarely pay regard to the orders of the Pasha of Bagdad. The Euphrates in their country contracts very much in width, so as to be at some places not 200 feet across, and the Kasahel Arabs levy a very arbitrary toll on all the river boats which navigate between the lower and middle course of the river.

The marshy swamps terminate at Grahim Inlet, and with them the large canals for irrigation: farther downward only short narrow cuts are met with, which serve to irrigate the tracts adjacent to the banks of the river, and do not advance far inland. The banks are much more elevated, though not high, and in most places overgrown with bushes. This country inhabited by the Montefik Arabians, exhibits a mixture of cultivation and pastoral occupation: the inhabitants have begun to cultivate the ground, but they have not quite got rid of the habits of a nomadic life. The country is covered with villages and tents mixed together. As the country is rather fertile, it is well inhabited, but not so populous as the marshes of Lamlun. The date plantations are as numerous and extensive as at any place higher up the river, but less care is bestowed upon them and on the cultivation of rice and wheat. Those inhabitants who still adhere to a nomadic life have large herds and flocks of horses, camels, buffaloes, sheep, and goats. The tract of ground between the mouth of the two canals Shat el Kar and Shat el Hiych is swampy and well wooded, but little inhabited. But below the last-mentioned watercourse the country rather improves; the banks of the river present almost a continuous forest of date-trees, between which the villages and hamlets are so numerous that they almost touch one another: on approaching the place where the two rivers unite, the banks of the rivers sink lower, and large tracts are only swamps overgrown with reeds, but in many places extensive fields still occur, on which wheat, rice, and barley are grown. The uncultivated grounds are used as pastures for the numerous herds of buffaloes. From ten to twelve miles from the confluence of the rivers, the waters of the Tigris are so abundant that the country is converted into a swamp, which during part of the year is covered with water many feet deep, and in the dry season it is cut up by numerous watercourses. This district is nearly uninhabited.

The Euphrates fertilizes the low country which extends on both of its banks below the town of Diwaniyeh, as the Nile does the Delta of Egypt, but in a different way. The sediment which the Nile leaves on the fields, contributes as much to the fertility of Egypt as the moisture with which its soil is saturated during the inundations. The fertilizing power of this sediment is ascribed by Rüppel to the detritus which, during the rains, is collected in the mountains of Abyssinia in a volcanic region of great extent. The Euphrates does not pass through such a region, and the detritus which it brings down is formed by the abrasion of chalk, lime, and gypsum, which form a rather hard clay. This soil is not fertile itself, but becomes so when irrigated. This advantage is partly obtained by the inundations, and partly by machines of different descriptions, or by handwork. The water in the Euphrates is lowest from the middle of November to the end of the year. It then begins to rise slowly, and continues to rise to the middle of January. This rise is probably to be attributed to the great quantity of rain which falls in November and December in the countries watered by the Murad and Frat, and in the Hilly Region of Mesopotamia. No difference in the level of the water is observed between the middle of January and the vernal equinox, when the great rise begins, which continues to the end of May: the river attains its highest level between the 21st and 28th of that month. It is then found that opposite the town of Annah it is from 11 to 12 feet above the lowest level, and farther down to the marshes of Lamlun from 15 to 18 feet. Were this great volume of water permitted to rush down on the low country, it would entirely submerge it, and convert it into an immense swamp. To prevent this the great canals of Babylonia have been made, as they all occur above Hillah, or the place where the Euphrates enters the low country. The canals carry the superabundant water into the Tigris, and also give to the adjacent country the means of irrigation. They appear still in part to serve these purposes, but in a much less degree than in antient times. It is said that these canals do not always contain water, but that all of them, even the Saklâwiyeh, are either dry or nearly so during three or four months. As these canals at present are not kept in good order, they cannot carry away the great volume of water, and a larger quantity descends to the low country, and breaks through the embankments, which are not kept in good repair: this circumstance probably has converted a great part of the marshes of Lamlun and of the low country farther down into swamps. The great rise of the Euphrates is owing to the immense quantity of snow with which the table-land of the Frat and Murad is covered in the winter, which begins to melt as the sun approaches the equator. At the end of April or in the beginning of May the melting of the snow ceases, and shortly afterwards the waters of the Euphrates have attained their highest level. From the end of May to November they are continually but slowly on the decrease.

The Tigris also inundates the adjacent countries; but these inundations are more destructive than useful, on account of the great irregularity with which the inundations occur, and their difference in different years. On the 10th of April the waters of this river, at Bagdad, began to rise very quickly, and in twenty-four hours they had risen 27 feet above their common level. They rose still higher, and converted the whole country between Bagdad and Bassora into an immense lake, more than 300 miles in length. The damage and loss of life caused by this inundation were much less on the banks of the Tigris than on those of the Euphrates, which are well inhabited as far as the confluence of the two rivers, whilst those of the Tigris are nearly without inhabitants. In other years its rise is comparatively small. This irregularity in the inundations of the Tigris is chiefly to be ascribed to the numerous large rivers which originate in the mountains of Kurdistan, and join the Tigris in its middle course; while the Euphrates, after the junction of its two principal branches, the Frat and Murad, is hardly joined by any river of consequence. The affluents of the Tigris rise in the mountains of Kurdistan, which for many months being covered with deep snow, bring down an immense volume of water when the snow melts. The Zab Ala, or Greater Zab, at that time brings down a volume superior to that of the Tigris above the point of union. The other affluents, the Zab Asfal, or Lesser Zab, the Adhem, and the Diyalah, are also large rivers. The Tigris begins to rise in November, owing to the great rains which then fall in its upper basin. It rises and falls at intervals until the supply of water from the mountainous countries is stopped by the frost. In the middle of March begins the great rise, which continues to the end of May. After that period its waters alternately rise and fall during June, when they begin to decrease quickly, owing to the great rapidity of the current. Between August and November the volume of water has decreased so much that only vessels drawing four feet can navigate the river, and even such vessels encounter great difficulties. The Tigris and its great affluents flow in beds which consist of hard rocks, and a small quantity of detritus is brought down by them. It does not raise its bed by a deposit, but, on the contrary, scours it out deeper. This is probably the reason why the canals for irrigation are at present without water during the greater part of the year. Even the Shat Eidha, an antient bed of the Tigris in the plain of Bagdad, has very little water in it.

The country along the banks of the Tigris, from the northern extremity of the Median Wall to its confluence with the Euphrates, is nearly a desert, except in the immediate neighbourhood of Bagdad, which is not supplied with provisions from the lands in its vicinity, but from that part of Kurdistan which lies farther north. Bagdad is indeed surrounded with extensive gardens and some fields, but they extend only a few miles from the walls, and are surrounded by an uncultivated country. North of the town the plain is traversed by the great canal called the Ishahi, which extends from the neighbourhood of Tekrit to the Sakláwiyah canal, but is without water. There are also many other canals of smaller dimensions in the same state. The Shat Eidha probably has a small quantity of water all the year round, and in its vicinity are a few large villages, surrounded by orchards and plantations. The remainder of this tract is pasture-ground for the herds of the nomadic tribes during the summer. South of Bagdad there is still less cultivation. The country is quite flat, and in most parts a grassy prairie, well watered; in others, covered with extensive swamps. A few small cultivated spots appear at great intervals. Herds of buffaloes however, and the black tents of the nomadic Arabians, are common. There are hardly two or three villages which have a permanent population. As we approach the confluence of the Tigris and Euphrates, nothing is seen but stagnant water, swamps, and morasses, in which single families have settled, who live on the milk of their buffaloes and the little rice that they can raise.

The interior of the Plain of Babylonia is very imperfectly known. It appears to be considerably elevated above the tract adjacent to the rivers. The northern part, or that which lies north of the parallel of the ruins of Babylon, has an undulating surface. The soil is composed of sand and pebbles, and in most parts overgrown with coarse grass, mimosas, and thistles. The water is generally brackish. Between the higher grounds are swamps, which probably owe their origin to the inundations of the Sakláwiyah and other canals. Farther south the surface is less uneven, and the soil consists of clay covered with mud, intermixed with flint and small fragments of gypsum. In the middle is a row of sand-hills, which appear to cover a considerable space. In many parts efflorescences of nitré and other salts occur, which in some places form nearly a white crust on the ground. On the banks of some of the canals, especially on those of the Shat el Kar and Shat el Hiyeh, the number of settlements is considerable, and some of them are surrounded by fields of rice and other grain.

In the country just described occur the numerous groups of ruins which have been already mentioned. Many of them are seen by those who navigate the Euphrates in passing through the marshes of Lamlun. They appear to lie in a line, which begins at Al Hymer in the north [Babylon, P. C., vol. iii., p. 236], and extends from north-west to south-east, terminating at the lower course of the Shat el Hiyeh. Though the country has only been visited by two or three Europeans, we are already acquainted with nine or ten places where ruins cover a large tract of country. They form such masses that in the level country they are frequently taken for natural hills, until a closer examination shows that they contain a great number of pieces of glass, pottery, and bricks, like those found in the ruins of Babylon itself. In some of them fragments of columns have been found.

With respect to the climate of this region the reader is referred to Bagdad [P. C., vol. iii., p. 270], the remarks in which article may in some measure be applied to the whole region. Its productions are enumerated in the Pashalik of Bagdad [P. C., vol. iii., p. 268]. Besides the town of Bagdad, a few places occur on the banks of the Euphrates which require notice.

Hillah is a fortified place with about 25,000 inhabitants, Arabs, Persians, Turks, Jews, Armenians, and Indians, in the midst of a number of canals, which are partly filled up. It carries on a considerable commerce with all the towns on the Euphrates, mostly in river-barges of 50 to 80 tons. The imports consist especially of rice, dates, fish, oil, coffee, cotton-stuffs, and Indian goods, part of which are re-exported to Hit and Annah.

Diwaniyeh, lower down, a considerable place, with 1500 houses, is enclosed by a wall. Numerous river-barges are ployed in carrying the produce of the rich country in its vicinity to other places.

Suk el Sheyukh, the capital of the Montefik Arabians, contains from 6000 to 7000 families, whose habitations are dispersed among the large plantations of dates which cover the country. It is the principal if not the only market which is visited by the nomadic tribes of Nejd in Arabia. They bring to this place cattle, horses, wool, and gum, and take in return lead, fire-arms, ores of different kinds, and culinary utensils. From this place the British settlements in Hindustan are supplied with horses.

Mesopotamia is inhabited by nations of different origin. Owing to its position between two table-lands inhabited by nomadic nations, it has frequently been conquered by its neighbours, and it appears that they have expelled the original population, for the greater part of the country is inhabited by people whose ancestors have settled there within the period of recorded history. Those nations which claim to be aboriginal are the Armenians and the Yezídis. The Armenians are dispersed over the table-land of the Frat and Murad, and the Hilly Region of Mesopotamia. The first-named region they share with the Turks and Kurds; and it appears that until lately these three nations were almost equal in numbers in that country, but since the last war between the Turks and Russians many Armenians have left their country and gone to settle in Georgia. In the Hilly Region of Mesopotamia the number of Armenians is small in comparison with the Turks and Kurds. They are an industrious people, who occupy themselves with agriculture, the mechanical arts, and especially with commerce, by means of which they acquire wealth, and get into favour with the ruling nation, the Turks. They are Christians of the Greek church. [Armenia, P. C., vol. ii., p. 362.]

The Yezídis are a small nation, who exclusively inhabit the Sinjar hills, and also isolated tracts in the eastern districts of the hilly region of Mesopotamia and in Kurdistan. Though they are said to derive their name from Yezíd, the son of Móawiyah, the destroyer of the race of Ali, they are evidently different from the other nations of the country. They are of a middling size, and have a clear complexion, with regular features and black eyes and hair; their limbs are spare, muscular, and well proportioned. The hair is worn long and the beard and whiskers kept close shorn, but they are prohibited from cutting or dressing the mustachios. Their religion is a strange mixture of the worship of the devil with the doctrines of the Magi, Mohammedans, and Christians. They consider the devil as the chief agent in executing the will of God, and reverence Moses, Christ, and Mohammed, believing them more or less perfect incarnations of Satan. They adore the sun as symbolical of Jesus Christ. They have no fixed place for prayer or worship, but occasionally visit the Christian churches and monasteries, and present offerings there on recovery from sickness or escaping from danger. They are brave, hospitable, and sober, faithful to their promise, and much attached to their native soil, but cruel and vindictive: they consider their proper means of support to be robbery and theft, and they treat with great barbarity any unfortunate Mohammedans who fall into their power, especially Persians. They are industrious in cultivating the soil and managing their orchards and plantations.

The Kurds also may be partly considered as an aboriginal people. It is probable that when the Armenians generally adopted agriculture, those parts of their country which are unfit for cultivation, owing to the rigour of the climate, remained or passed into the possession of the Kurds, who had spread over these mountains from their own country. Where such tracts unfit for cultivation are extensive, the Kurds have adhered to their nomadic life, and are almost independent of the ruling nation. Where however agricultural and pastoral tracts of country are intermixed, they have partly acquired the habits of cultivators of the ground, but they still maintain an inclination to a roving life and to predatory excursions. They take great care of their cattle and sheep.

The inhabitants of Turkish origin are numerous in the table-land of the Frat and Murad, and in the Hilly Region of Mesopotamia, but a comparatively small number is found in the two southern regions. They doubtless settled in these countries at the different periods when Mesopotamia was conquered by the nations who inhabit the table-land of Iran, where nomadic tribes of Turkish origin have always been met with. In Mesopotamia they are agriculturists, and carry on different trades in towns and villages. It does not appear that any of the Turkish tribes in Mesopotamia still adhere to a nomadic life, as is the case with the Turkomans in Asia Minor. The Osmanli are only soldiers or employed by government as civil officers.

As northern Mesopotamia has derived a considerable part of its present population from the table-land of Iran, the southern regions, with the exception of a comparatively small portion, are occupied by tribes which have descended from the table-land of Nejd in Arabia; and this immigration, as it would appear, is from time to time renewed. Many of these Arab tribes have changed their mode of life, which appears always to have been the case when the immigrating tribes were not powerful enough to occupy large tracts of pastoral ground. In such case they selected a tract fit for cultivation, where they settled and became cultivators. There is a considerable number of small Arabic tribes in the desert plain of Mesopotamia, and they always cultivate only a small tract of ground. The more powerful tribes took possession of extensive regions, and even where the country was fit for cultivation they converted it into pasture-grounds for their horses, camels, and sheep. Some of them have preserved their nomadic habits to the present time; this is especially the case with the powerful tribe of the Shammar, which is in possession of the countries adjacent to the Tigris river from Mosul to Bagdad and nearly of the whole of the Great Desert. It is only in the vicinity of the Euphrates that a portion of an equally powerful tribe, the Aneizah, is found, but the principal seat of the last-named tribe is in the desert which extends from the Euphrates to Damascus. The cultivable tracts of the desert are in possession of some smaller Arab tribes, who are tributary to the Shammar. Other Arab tribes have been compelled by the physical nature of the country occupied by them to change their mode of life. This is most conspicuously the case with the tribe of Kasahel, which inhabits the marshes of Lamlun. This region does not afford pasture for camels, horses, or sheep; it is however fit for buffaloes, for the cultivation of rice, and plantations of date-trees. The inhabitants of the desert have thus been compelled to adopt the habits of the occupiers of swamps, but they have preserved their activity and their spirit of independence. The numerous tribe of the Montefik occupy along the banks of the Tigris the whole country between Bagdad and Korna, and on the Euphrates that tract which extends from the marshes of Lamlun to the confluence of the two rivers. At the back of the marshes some smaller tribes are settled. That portion of the tribe of Montefik which is settled on the Tigris lives almost entirely on the produce of their herds of buffaloes, cultivating occasionally a small spot of rice-ground. On the Euphrates the habits of the Montefik are much more agricultural: the date-plantations and rice-fields constitute their principal wealth, but the richer classes have not yet entirely got rid of their nomadic inclinations, as they still prefer to pass their time with their herds of horses and sheep in the interior of the country, whilst the poorer portion of them cultivate their rice-fields and manage the date-plantations. Travellers however observe that both the fields and plantations do not exhibit that careful cultivation which is observed in other parts of Asia where the habits of the people are entirely agricultural.

It would be an almost endless task to enumerate the political changes to which Mesopotamia has been subject since it was named in history as the birth-place of Abraham. There is no country on the face of the globe in which these changes have been so frequent and so great. From the sway of the kings of Babylonia Mesopotamia passed successively to that of the Assyrians and Medians, and then it was subjected by the Persians under the command of Cyrus. After the battle of Issus it fell into the power of the Macedonians, and after the death of Alexander his generals Antigonus and Seleucus successively got possession of it. Seleucus founded the kingdom of Syria, of which Mesopotamia formed a portion, until the countries belonging to the Syrian kingdom were divided between the Romans and Parthians. During many centuries Mesopotamia was the theatre of the wars in which these two nations contended for superiority, until the Parthians were supplanted by the Persian dynasty of the Sassanides, when Mesopotamia was disputed between them and the Greek emperor of Constantinople. But at last the Arabians appeared, and their caliphs established the seat of their wide-spreading empire in Mesopotamia. Since the destruction of the kingdom of Babylonia, the country had not enjoyed so much prosperity as under the caliphs; but after these princes had lost their power, Mesopotamia fell into the hands of the Turkish princes, the Seljuks and Atabecks. About the beginning of the twelfth century a portion of it was conquered by the Crusaders, who however did not keep it long, and after the country had been laid waste by the continual wars of the Mohammedan princes, it was invaded by the Mongols, who however soon left it, and then Mesopotamia again returned to a distracted state, until the Osmanlis, who had got a firm footing in Asia Minor, began to extend their conquests over this part of Asia. Their progress was for a time interrupted by the famous Timur, but after his death the Osmanlis again acquired the ascendancy, and subjected the whole of Mesopotamia to their dominion in the beginning of the sixteenth century. Since that time no political change of importance has taken place.

(Ker Porter's *Travels in Ancient Babylonia;* Fraser's *Travels in Koordistan and Mesopotamia;* Kinneir's *Journey through Asia Minor, Armenia, and Koordistan;* Buckingham's *Travels in Mesopotamia;* Rich's *Narrative of a Journey to the Site of Babylon;* Keppel's *Personal Narrative of Travels in Babylonia, Assyria,* &c.; Southgate's *Narrative of a Tour through Armenia;* Ainsworth's *Travels and Researches in Assyria,* &c.; Chesney's *Report on the Steam Navigation to India;* Forbes's *Visit to the Sinjar Hills,* in 'London Geographical Journal,' vol. ix.; Ross's *Notes on two Journeys from Bagdad to the Ruins of Al Hadhr,* in 'London Geographical Journal,' vol. ix.; Lynch, *Note on a Part of the River Tigris between Bagdad and Samarrah,* in 'London Geographical Journal,' vol. ix.; Chesney's *General Statement of the Labours and Proceedings of the Expedition to the Euphrates,* in 'London Geographical Journal,' vol. vii.; Brant's *Journey through a Part of Armenia and Asia Minor,* in 'London Geographical Journal,' vol. vi.; Ainsworth's *Journey from Angora, by Kaïsariyah, Malatiyah, and Gergen Kal'eh-si, to Bir or Birehjik,* in 'London Geographical Journal, vol. x.; Ainsworth's *Notes on a Journey from Kaisariyah by Malatiyah to Bir or Birehjik,* in 'London Geographical Journal,' vol. x.; Brant's *Notes of a Journey through a Part of Kurdistan,* in 'London Geographical Journal,' vol. x.; Suter's *Notes on a Journey from Erz-Rúm to Trebizond, by way of Shebb-kháneh,* &c., in 'London Geographical Journal,' vol. x.; Viscount Pollington's *Notes on a Journey from Erz-Rúm, by Músh, &c., to Aleppo,* in 'London Geographical Journal,' vol. x.; and Ritter's *Erdkunde von Asien,* vol. x. and xi.)

MESPILUS, a genus of plants belonging to the natural order Rosaceæ, and to the suborder Pomeæ. [POMEÆ, P. C. S.] It has the calyx 5-cleft, the segments foliaceous, the petals nearly orbicular; the disk large, full of honey; the styles 2-5 glabrous; the pome turbinate, open, 5-celled; the endocarp bony. The species are trees, natives of Europe, and in a wild state are furnished with spines, which all disappear on cultivation. The flowers are large, nearly sessile, and white.

M. Germanica, the common Medlar, has lanceolate undivided leaves, downy beneath, and solitary flowers. This plant is a native of Europe and Siberia. It is found in Great Britain in hedges and thickets in Surrey, Sussex, and Cheshire. It is cultivated on account of its fruit, which is eaten in a state of decay. Its taste and flavour are peculiar, and greatly esteemed by some persons. De Candolle describes three wild varieties of this species of medlar. The following are the garden or cultivated varieties:—

1. Blake's large medlar.
2. The Dutch, common, large Dutch, broad-leaved Dutch, or large German medlar. It bears the largest fruit of any of the cultivated medlars.
3. Stoneless or French medlar, has small obovate fruit, not much esteemed.
4. Nottingham, common, small-fruited, or narrow-leaved Dutch medlar. It has an obovate middle-sized fruit, and is the best of all the medlars.

M. Smithii, Smith's Medlar, has oblong elliptic serrated leaves, pubescent on the nerves beneath, the flowers usually solitary. The native country of this plant is unknown, but it seems to have the characters of a true species. It has white flowers, which are one-half smaller than those of the common medlar. The stipules of the sterile branches are large and foliaceous.

The medlar may be propagated by seeds or by layers, or by grafting upon seedling stocks of their own species or any kind of Pomaceæ. Forsyth remarks that the kinds of Mespilus do better by grafting on their own stocks. The soil best adapted to the growth of the medlar is a loamy rich earth, rather moist than dry, but not on a moist bottom. It may be grown either as a standard or an espalier. The general horticultural treatment should be similar to that of the apple-tree. For a further account of the pomaceous genera of Rosaceæ, see POMEÆ, P. C. S.

(Don, *Gardener's Dictionary;* Babington, *Manual of British Botany;* Loudon, *Arboretum et Fruticetum Brit.*)

MESSENGER. [BANKRUPT, P. C.]

MESSENGERS AT ARMS are the officers who execute the writs issuing from the supreme courts in Scotland. The duty of executing the king's writs and injunctions appears to have rested with the Lyon King at arms, aided by the heralds or other assistants. To this day the Court of the Lord Lyon has authority in the admission of messengers at arms, in the impugnment of their conduct, and in their dismissal for misconduct. Each messenger must find security for the proper and legal performance of his official duties. Messengers require to perform their functions with great precision, as they are not only amenable to questions regarding the liberty of the subject, but have often to perform acts, on be legal accuracy of which the title to landed property may afterwards depend.

METAMORPHOSIS, VEGETABLE. [Vegetables, Metamorphosis of, P. C. S.]

METEOROLOGY. [Electricity, Atmospheric, P. C. S.]

METO'PTOMA, a genus of fossils (allied to Patella?), proposed by Professor Phillips. From the mountain limestone of the north of England.

METRODO'RUS, a distinguished antient painter and philosopher of Athens, born about two centuries before the Christian æra. After the defeat of Perseus by Paulus Æmilius, in Greece, B.C. 168, the Roman general ordered the Athenians to send him their most able painter to perpetuate his triumph, and their most distinguished philosopher to educate his sons. The Athenians paid Metrodorus the extraordinary honour of declaring to Paulus Æmilius that he was both their greatest painter and their most distinguished philosopher; and the Roman general is said to have been perfectly satisfied with their choice.

As Metrodorus was chosen to paint the triumph of Paulus Æmilius, and to educate his sons, and gave him satisfaction in both respects, we must infer that he did paint his triumph, though there is no actual mention of the picture. It must have been an undertaking of great magnitude, and indeed, if adequately represented, a very extraordinary performance, for in the procession of this triumph, which is partly described by Plutarch, there were two hundred and fifty waggons containing Greek works of art: the spectacle lasted the entire day.

(Pliny, *Hist. Nat.* xxxv. 40; Plutarch, *Paulus Æmilius*, 32.)

METRO'POLIS. [Colony, P. C., p. 359.]

METROPOLITAN. [Archbishop, P. C.]

METROPOLITAN STAGE-CARRIAGE. Before proceeding to give a brief notice of the law relating to hackney and stage carriages in London, we may quote, from two interesting papers on the 'Vehicular Statistics of London,' in 'Chambers's Edinburgh Journal' for 1845 (Nos. 76 and 78, New Series), some statements relative to such of the public vehicles of the metropolis as are not embraced in the article Hackney-Coach, P. C. S. These papers, we may observe, are founded on official though partly unpublished data.

The distinction between hackney and stage carriages is pointed out under Hackney-Coach; and the origin of that class of stage-carriages, which has almost entirely superseded the old stage-coaches in the streets of London, is noticed under Omnibus, P. C., p. 437. 'Fifteen years ago,' observes the writer of the papers above referred to, writing in 1845, 'a few very slow and unpunctual stages were the only means of transit provided for the citizens to convey them to their suburban residences.' 'A little earlier,' he adds, 'only one stage plied from Paddington to the Bank, along a road which an omnibus now passes every three minutes in the day; and this single vehicle, going in the morning and returning at night, was not always full. Its fares were two shillings inside, and eighteen-pence outside.' The old stage-coaches could only carry four, or at most six, inside passengers; and when an attempt was made, about the year 1800, to introduce a more commodious kind of vehicle, resembling an omnibus, the project failed, in consequence of a general prejudice against the hearse-like appearance of the carriage. The long-bodied carriage then tried was drawn by four horses, and had six wheels (Knight's 'London,' vol. i. p. 32.) When reintroduced from Paris, the omnibus had four wheels, but was much longer and heavier than at present, and was drawn by three horses abreast, an arrangement which, while advantageous as being the best mode of applying the power of the horses in drawing, was soon abandoned, it being found that the middle horse was distressed by the perspiration and the irregular stepping of those on each side. The first successful omnibus in London was started by a coach-builder named Shillibeer, in July, 1829, to run between Greenwich and Charing-Cross, at fares considerably less than those of the old short stages; in addition to which advantage, the greater part of the passengers were sheltered from the weather. By the judicious arrangement of making the same charge for inside and outside places, Shillibeer soon obtained extensive patronage, and began to break down the petty feeling of exclusiveness which formerly distinguished inside from outside passengers. Success in the first experiment led Shillibeer to establish omnibuses between Paddington and the Bank. After opposing the innovation most violently for a time, the old coach-proprietors followed his example, started omnibuses of their own, and by combined opposition succeeded in driving him entirely off the road; not however before the new system of travelling was fully established. It is to be regretted that the person to whose enterprise London is indebted for so great a boon, though thus prevented from reaping his reward, should never, so far as the writer is aware, have received a testimonial for his important services.

In the course of the contest between Shillibeer and the old proprietors, and of the subsequent quarrels and rivalries among themselves, the omnibus system fell into disgrace in consequence of the furious driving, want of punctuality, and general ruffianly conduct of the men employed as drivers and conductors, or, as they were popularly called, 'cads.' These evils led to the establishment, in 1836, of a joint-stock association called the 'London Conveyance Company,' which proposed to establish omnibuses along the principal lines of traffic, starting at short and regular intervals, and conducted by men of sober and respectable character, who were strictly forbidden to race, and bound to punctuality and civility. The result of this experiment was so successful, that on the lines which yet remained in private hands the proprietors found it to their interest to settle their differences, and to form themselves into associations of similar character. In the course of a few years the association system was almost universally adopted, and now, while on many lines of road the omnibuses belong to several different individuals, there is hardly an instance in which these individuals are not united in some compact which prevents competition, and secures community of interest among all the carriages running the same road, or rather among all running to and from the same termini. On the Paddington road, after a competition for some time between the London Conveyance Company and the association formed by the old proprietors, the two bodies united to 'work the roads' for their mutual advantage. Paddington is the suburban terminus of two very important lines of road, each of which has also a common City terminus at the Bank of England. One of these lines follows the course of the City Road and New Road, by Islington, Pentonville, and other northern suburbs of London; while the other takes a more direct course through the heart of the metropolis, by Holborn and Oxford Street. For working the last-mentioned line the London Conveyance Company have, according to the papers referred to at the commencement of this article, eighty-two omnibuses, and not less than a thousand horses. Each of the omnibuses performs, upon an average, six journeys (that is, double journeys) per day, and therefore requires at least ten horses to work it, independent of casualties. These horses are selected for strength and activity, and an experienced veterinary surgeon, with a staff of assistants and farriers, besides upwards of eighty horse-keepers or grooms, are employed to attend to them. These are independent of eighty-two drivers, and as many conductors, so that nearly three hundred persons are employed by the Company, for the service of this one line of road. The journeys are performed at intervals of from one and a half to three minutes, according to the time of day; and as each omnibus makes six double journeys, of about nine miles each, the total number of journeys run daily is 492, and the number of miles run daily is about 4428. 'Supposing,' observes our authority, 'we take as an average ten passengers for each trip, the gross receipts of the London Conveyance Company must, if that guess be an approximation to the truth, amount to 246*l.* per diem, or 89,790*l.* per year.' These statements may serve to convey some idea of the great extent of the omnibus traffic of London, and of the number of persons dependent upon it; especially when it is remembered that the eighty-two omnibuses to which they refer constitute the working stock of only one single route. The total number of omnibuses running to and from the suburb of Paddington alone is said to be nearly 200. The total number of stage-carriages plying in and from London during the year ending January 4, 1845, according to information obtained from the licensing office, was 1472, of which it is calculated that at least 1400 were omnibuses. By a rough calculation, the writer to whom we are indebted for the collection of the above facts, computes that about 2000*l*. are spent daily in omnibus fares, making a total of 730,000*l*. per annum. The number of licensed drivers in May, 1844, was 1740, and of licensed conductors, 1854; but of these about 300 took out licences in both capacities, and are therefore counted twice. By adding these numbers to those quoted under HACKNEY-COACH, our authority computes (without, we may observe, deducting the 300 cases of double licensing) that 8592 individuals were, in 1844, licensed as drivers and conductors of, or 'watermen' to attend to, the various public carriages used in the metropolis; that in all 3922 vehicles were in use, and that 'the cash annually circulated by all the metropolitan hired carriages exceeds 1,500,000*l*.' It is gratifying, as an evidence of the improving character of the class of men employed, to find that of the above large number only forty-two were refused new licences on account of misconduct.

The length of journey run varies from about four up to twelve or thirteen miles; but by far the greater part of the London omnibuses run a total distance, from end to end of their journey, of less than eight miles. With such the usual charge is sixpence per passenger, whether for the whole or a part of the journey; but a very large portion of their receipts arises from 'short' passengers, or such as are picked up and set down by the way. Omnibus proprietors are much exposed to peculation on the part of their servants, and various mechanical contrivances called 'tell-tales' have been tried to protect their interests by registering the number of passengers carried. None of these have come into general use; but in connection with the association system a method of checking the conductors, by a kind of secret police, has been adopted. When it is found that the returns made by one conductor fall short of the expected sum, spies are set to watch him by taking their places as passengers, and reporting at headquarters the numbers taken up, as a check upon him; and so systematically is this service performed, that any attempt at deception is pretty sure to be detected, and followed by suspension or dismissal. The power of applying such a check is one of the many advantages of the association system, in which, as commonly worked, each individual proprietor contributes a certain number of *turns-out* (a *turn-out* being the technical name for an omnibus with its complement of horses and men) to a common stock, which is worked, so far as regards the time of starting, speed, and other regulations, for the common benefit. The receipts of each omnibus are then paid into a common fund, from which each proprietor receives a portion proportionate to the number of *turns-out* contributed and maintained, without regard to the actual receipts of the omnibuses owned, by him.

The laws which relate to hackney-carriages and metropolitan stage-carriages are chiefly comprised in two acts of Parliament: 1 & 2 Wm. IV. c. 22, which came into operation January 5th, 1832, entitled 'An Act to amend the Laws relating to Hackney-Carriages, and to Waggons, Carts, and Drays, and to place the Collection of the Duties on Hackney-Carriages and on Hawkers and Pedlars in England under the Commissioners of Stamps;' and 6 & 7 Vict. c. 86 (22nd August, 1843), entitled 'An Act for regulating Hackney and Stage Carriages in and near London.'

In the former act are contained the greater part of the enactments which relate to hackney-carriages; in the latter, those which more especially apply to metropolitan stage-carriages (omnibuses).

The limits of hackney-carriages (hackney-coaches and cabriolets) are five miles from the General Post-office, London; and drivers of hackney-carriages are compellable to drive five miles from the place where hired or from the General Post-office; but if any hackney-carriage shall be discharged at any place beyond the limits of the metropolis (that is, beyond a circle of which the radius is three miles from the General Post-office), after eight in the evening and before five in the morning, back-fare may be demanded to the nearest part of the said limits or to any standing-place beyond the limits where the carriage may have been hired, at the option of the hirer.

The fares of hackney-carriages are fixed by the act 1 & 2 Wm. IV. c. 22. For every hackney-carriage drawn by two horses, for any distance not exceeding one mile, 1*s*.; for any distance exceeding one mile, at the rate of 6*d*. for every half-mile and for every fractional part of half a mile over and above any number of half-miles completed. By time, the fare is, for not exceeding thirty minutes, 1*s*.; not exceeding forty-five minutes, 1*s*. 6*d*.; not exceeding one hour, 2*s*.; and for any further time after the rate of 6*d*. for every fifteen minutes completed, and 6*d*. for any fractional part of fifteen minutes. The fares for hackney-carriages drawn by one horse (cabriolets) are one-third less, so that for the first mile they are 8*d*., for a mile and a half, 1*s*., and so on.

Every hackney-carriage and metropolitan stage-carriage is licensed by a registrar, deputy-registrar, or other officer appointed by one of Her Majesty's principal Secretaries of State; and every driver of a hackney-coach, and every driver and conductor of a metropolitan stage-carriage, and every waterman, at the time of granting the licence receives a metal ticket, which every such driver, conductor, or waterman is to wear on his breast in such manner that all the writing thereon may be distinctly visible. Watermen are the assistants of drivers of hackney-carriages and of metropolitan stage-carriages stationed at certain places to supply the horses with water, &c., and they also receive a licence. A stamp-duty of 5*s*. is charged on every licence, and 5*l*. is paid for it, and 10*s*. a week during the continuance of it. Plates are to be affixed to hackney-carriages with the name and abode of the proprietor and number of the licence; and 'Metropolitan Stage-Carriage,' or such other words as the registrar shall direct, are to be painted on omnibuses. Proprietors of metropolitan stage-carriages fix their own fares, but those fares are to be distinctly painted on or in the carriage, as well as the number of persons for whom the carriage is licensed.

Hackney-carriages standing in the street, though not on any stand, to be deemed plying for hire. Drivers may ply on Sundays, and, if plying, are compellable to drive when hired. Agreement to pay more than legal fare not binding, but driver may agree to drive any distance at discretion for a stated sum, and must not charge more than that sum, though less than legal fare. Deposit to be paid for carriage kept waiting, and driver must take the deposit and wait.

The act 6 & 7 Vict. c. 86, repeals a previous act (1 & 2 Vict. c. 79), and extends the enactments not specifically repealed of the 1 & 2 Wm. IV. c. 22, to the 6 & 7 Vict. c. 86. Other provisions of the acts relate chiefly to the restoration of property left in carriages, to furious driving, intoxication, insulting language, loitering, and other acts of misbehaviour; to proceedings of proprietors, drivers, and conductors, as to licences, payment of duties, contracts with each other; and to modes of granting summonses, powers of magistrates, punishments, penalties, &c.

METROSIDEROS (from μήτρα, the heart of a tree, and σίδηρος, iron), a genus of plants belonging to the natural order Myrtaceæ. It is distinguished from allied genera by the tube of the calyx not being angular, adhering to the ovarium, the limb 6-cleft; the stamens 20-30, free, very long, and exserted; the style filiform, and stigma simple; the capsule 2- or 3-celled, the cells many-seeded; the seeds wingless. The species are trees or shrubs, with opposite or alternate leaves, with the flowers pedicellate, not adnate to the branches, as they are in the genera Melaleuca and Callistemon. The last genus, with Angophora, has been recently separated from Metrosideros.

M. vera, true Iron-wood, has opposite ovate-lanceolate acuminated quite glabrous leaves seated on short petioles; the cymes axillary, pedunculate, many-flowered. It is a native of Java and Amboyna, among rocks. The Chinese and Japanese value the wood of this tree, which they apply to many purposes, as the making of rudders, anchors, &c. for their ships and boats. The bark is used in Japan as a remedy in mucous discharges, diarrhœa, and dysentery. It is usually mixed with some aromatic, as penang, cloves, or nutmeg.

M. polymorpha has opposite coriaceous leaves, of various forms, glabrous on both surfaces, but covered with a little silky tomentum beneath; the peduncles 3- or many-flowered, terminal and axillary, corymbose; the calyxes and branchlets glabrous or clothed with silky tomentum. This species is a tree, and grows in the Sandwich Islands, and is said to be the plant from which are made the clubs and other weapons employed in warfare by the South Sea Islanders. 'The Aki or Lignum Vitæ of New Zealand, the Rata and the Pohutu Kawa of the same country, are all hard-wooded trees belonging to the genus Metrosideros.' (Lindley.)

Several other species of Metrosideros have been described, natives of New Holland and the South Sea Islands. *M. lucida*, a beautiful tree, occurs as far south as Lord Auckland's Islands, in lat. 50½° south. The *M. buxifolia* of Allan Cunningham is the New Zealand plant called *Aki*, and is a rambling shrub, adhering to trees, and climbing by means of its lateral roots to the summits of the loftiest trees in the forests of Wangaroa and the Bay of Islands. In cultivation these plants may be grown in a mixture of loam, peat, and sand. They may be propagated by seeds or cuttings. Ripe cuttings will root in sand under a hand-glass.

(Don, *Gardener's Dictionary;* Lindley, *Vegetable Kingdom;* Burnett, *Outlines of Botany.*)

METZ, CONRAD MARTIN, a celebrated German engraver of Bonn, where he was born in 1755. He studied under Bartolozzi, in London, and remained altogether about twenty years in England. He published in 1790 a set of thirty-three engravings, including the title, after George the Third's collection of drawings by Parmegiano; and in 1791 a set of sixty-three plates in a similar style, after the designs by Polidoro da Caravaggio, in the possession of Sir A. Hume, Bart. He engraved many other imitations of drawings by the old masters. In 1801 Metz went to Rome, and commenced a series of engravings after the Last Judgment in the Sistine Chapel, by Michael Angelo. It is engraved in chalk manner in fifteen separate sheets, with an outline of the whole. Metz died at Rome in 1827, aged seventy-two. Dr. Nagler enumerates upwards of two hundred of his engravings in his *Künstler-Lexicon.*

METZU, GABRIEL, one of the most celebrated of the Dutch painters, was born at Leyden in 1615. It is not known under what master he studied, but he obtained a great reputation at Amsterdam while still young. Like Mieris and Terburg, Metzu belongs to the higher class of *genre painters.* He painted what are called conversation pieces; and often a lady at her toilet, or in her boudoir, with all the usual accessories; his scenes are occasionally taken from humble life, but generally from the middle classes of society. He excelled in light and shade, drawing, and colour, and his execution is always extremely careful; his pictures, though very small, are always finished with the minutest attention to detail. Metzu perhaps attained perfection in his style, and carried painting as a mere imitative art to its highest degree of excellence: the tone of his pictures is complete nature, every tint is perfectly true, and every object is accordingly in its proper place, for his drawing and linear perspective were equal to his light and shade, and colour. Beyond this he did not go; his works exhibit nothing choice or extraordinary either in subject or arrangement; and the faithful representation of familiar life appears to have been the end of his art, not for the sake of the scenes, but for the imitation's sake. He was essentially a materialist in art, and this is the distinguishing characteristic of the Dutch painters generally. He painted a few portraits; there is one of Admiral van Tromp in the Louvre. Some of his works realize very high prices; many of them have been engraved. Metzu died, according to D'Argenville, in 1658, in consequence of undergoing an operation for the stone: there is however a picture of a poulterer in the Gallery of Dresden, by him, dated 1662; the date therefore of his death is uncertain.

MEUM (from μείων, smaller), a genus of plants belonging to the natural order Umbelliferæ and to the tribe Seselineæ. It has an obsolete calyx; entire elliptical petals, acute at both ends, with an incurved point; the fruit elliptical, terete, or slightly dorsally compressed; the carpels with five sharp somewhat winged ridges; the interstices and commissures with many vittæ. There are two species of this genus.

M. Athamanticum, Common Bald-Money, has bipinnate leaves with multipartite leaflets, the segments thread-shaped, acute. This is a highly aromatic plant, with numerous white and yellow flowers. It is a native of Europe, in dry mountain pastures, and is found in England and the mountains of Scotland. The roots, seeds, and every part of the plant are aromatic, and are used in the countries where it grows as stomachics and carminatives. This and the other species, *M. Mutellina,* the Swiss Bald-Money, which is a native of the subalpine pastures of Europe, enters into the composition of the compound called Venice treacle.

(Babington, *Manual of British Botany;* Lindley, *Vegetable Kingdom.*)

MEYER, HEINRICH, a German designer and painter, and distinguished writer on art, known in Germany in his life time as 'Goethe-Meyer,' from his close intimacy with the great writer. For forty years Meyer was Goethe's consulting and confirming oracle in all opinions on art, and was even the author of many portions, especially of the critical parts, of Goethe's publications on art, as 'Kunst und Alterthum,' 'Winckelmann und sein Jahrhundert,' 'Propyläen,' 'Farbenlehre,' &c.

Meyer was born in 1759 at Zürich, and he was for some years the pupil of J. C. Füssly there. About 1786 he went to Rome, where he made the acquaintance of Goethe. In 1787 he was at Naples, lived there in the same house with Tischbein, and became acquainted also with Herder, then travelling in the suite of Amalia, Duchess of Weimar. In 1792 he visited, for some time, Weimar, and in 1797 established himself for the remainder of his life there. He became a great favourite with the court at Weimar, was intimate with all the distinguished literary men of the place, and held, from 1807, the office of director of the academy there, and enjoyed the titular rank of Hofrath. From 1794 until his death in 1832 Meyer was chiefly engaged on literary compositions relating to the history and theory of art, but chiefly the history of Greek and Roman art. He was the principal editor of the complete edition of the works of Winckelmann, which were published in 8 vols. at Dresden between 1808 and 1820 inclusive, and was the author of the greater part of the numerous notes by which they are illustrated. These notes be afterwards arranged and connected into a consecutive history of Greek art, under the title 'Geschichte der Bildenden Künste bei den Griechen,' 2 vols. 8vo., Dresden, 1824. A third volume, being the continuation of the history of Greek art in Rome, was edited by Dr. F. W. Riemer, after the death of Meyer, under the title 'Geschichte der Bildenden Künste bei den Griechen und Römern,' 1 vol. 8vo., Dresden, 1836. This work, though agreeably written, and containing a good general account of the progress and the remaining works of antient art, has failed to satisfy those interested in the subject, and has obtained little popular or general notice. In the first place its form is against it: the text and the author's remarks are separated, the latter being at the end of the volumes. The text is little more than a chronological catalogue of names and works; and the notes at the end of the volumes, besides being troublesome to refer to, as disconnected with their subject, do not clear up the obscurities, or reconcile the apparent contradictions of antient authors. Reflections are rare, and when they occur they are neither profound nor illustrative, nor does he in any case indulge in æsthetical remarks, or attempt to deduce or investigate theories. The work is also surpassed by other German works on the same subjects, though it is the only special work in the language that examines the progress of the two arts of painting and sculpture, throughout their whole course, from the earliest times until the decline of the Roman empire.

As a painter Meyer produced little. His works consist chiefly of water-colour and other drawings from antique remains, or from the works of the great Italian painters. His principal work is an allegory of human life, represented by children, as a painted frieze, in the palace at Weimar.

(Nagler, *Künstler-Lexicon.*)

MICHAEL, SAINT, the largest and most important of the Azores, or Western Islands, lies a little south of 38° N. lat., between 25° and 26° W. long. It is about 45 miles long, and from 6 to 9 miles wide; the area is about 220 square miles.

Nearly the whole of the island exhibits unequivocal signs of volcanic agency, and presents a great variety of surface. The greatest elevation occurs near its eastern extremity, which is formed by a mountain-mass terminating in several summits, the highest of which, the Pico da Vara, attains 3560 feet above the sea-level. Two other peaks rise respectively to 2927 and 2455 feet. The shores of this tract are very high, and in some places rise to more than 1200 feet. This part of the island has no traces of volcanic agency; is well watered and produces abundance of grain of all sorts, and the mountains are covered with woods. Contiguous to this tract on the west is a region of very uneven surface, but of less elevation. It comprehends the Valley of the Furnaces or Hot Wells. The large depression of the valley is partly occupied by a lake one mile long and half a mile broad. This lake is 995 feet above the sea-level, but the peaks which enclose the valley rise to between 1500 and 2300 feet. This division is abundantly watered by frequent showers in summer, and more continuous falls of rain at other seasons. As the soil consists of scoria, lava, and other volcanic matter, which has not been decomposed, the country has a barren aspect, but where cultivated it produces excellent fruit. In the centre of the island the country rises higher, and becomes mountainous. The Sierra da Agoa de Pao, which is 3060 feet above the sea, contains a great number of separate volcanic cones of great elevation, varying between 1800 and 2600 feet. They are chiefly composed of pumice and scoria. From want of cohesive power in the matter which composes these cones, the heavy rains cut deep gorges in their sides and frequently cause landslips. The lower part of this tract contains numerous vineyards, orchards, and orange plantations. Between the two largest places of the island, Ponte Delgada, on the southern coast, and Ribeira Grande, on the northern, lies the lowest part of the whole. The shores are here low, and rise almost imperceptibly towards the interior, where an irregular line of hills and craters occurs, beginning, on the east, with the Pico do Fogo, 1031 feet above the sea, and terminating on the west with the Sierra Gorda, 1574 feet. The soil of this tract is in general very fertile, but there are extensive patches of scoria and vitreous lava, which are only fit for vineyards. There are no hot springs or other signs of subterraneous heat, and the whole of this district is deficient in water, in consequence of its inferior elevation. The most western part of St. Michael's appears to have been more subject to volcanic changes than any other. It contains in its centre a valley of an elliptical form, called the Sete Citades, which is three miles long from south-east to north-west, and two miles and a half broad from south-west to north-east. The ridge which bounds it is of nearly equal height throughout, except where it runs into peaks. On the south-east is a short chain, two miles long, terminating in the Pico de Carvao, which is 2632 feet above the sea. The greater part of the interior of this valley is occupied by two lakes. In this tract are two hot springs which rise up in the sea below high-water mark. The soil varies much in character, being in some parts a yellow argillaceous earth, well suited for cultivation and of great fertility, in others a mixture of pumice and scoria, or a vitreous intractable lava which defies the efforts of the husbandman. Hot springs are frequent, except in the eastern districts and the country between Delgada and Ribeira Grande.

Although the climate is variable both as to heat and humidity, it is very temperate, and the changes do not materially affect health or comfort. In summer, clouds generally float in the atmosphere and mitigate the sun's heat; in winter, there are few days when heat is not felt, and during the whole year there is not one day in which agricultural labour may not be carried on.

Table of the Temperature of Air.

	Maxim.	Minim.	Mean.	Daily Range.
October	75°	58½°	66·6°	6°
November	71	50½	63·3	7
December	70	48½	59·1	7
January	69	48½	59	5½
February	69	48	58	6½
March	72	48½	60	6½
April	72	50	62	6½
May	75½	56	65·3	5½
June	78½	61	68·9	5½
July	82½	63½	73·1	5½
August	82½	65	74·4	5
September	80	64½	73	5½

The mean temperature in winter is 62° and in summer 69·5°. The extremes of the whole year are 46° and 84°, in winter 46° and 76°, and in summer 46° and 84°, in February 46° and 72°, and in August 64° and 84°. A much greater proportion of vapour exists in the air in all seasons than in England. The mean annual quantity of rain is 30 inches near the level of the sea, and the maximum 42 inches, while it is probably not less than 50 inches on the mountains. The prevailing winds are from the north-east and north-west. Northerly and easterly winds prevail over those from other points of the compass in the ratio of 37 to 26, which indicates that the island is not situated in that part of the Atlantic where westerly winds generally prevail.

The principal occupation of the inhabitants is the cultivation of the ground. The island contains 147,200 acres, of which 2100 are planted with orange-trees and 2400 acres with vines. The arable land amounts to 40,100 acres, and the remaining 102,600 acres are occupied by mountains, lakes, rivers, roads, and dwellings. The grains which are most extensively cultivated are wheat, Indian corn, and beans. Yams and bananas succeed in several places on the southern coast. Several kinds of vegetables are grown, but the common people cultivate only cabbages and potatoes to any extent. As two-thirds of the island are not cultivated, the pasture-grounds on the more rugged portions of the island are extensive. All the domestic animals of Southern Europe are kept, but the breeds are indifferent. Of wild quadrupeds only rabbits, ferrets, and weasels are noticed, with rats and mice. There are many kinds of birds, mostly those of small size; fish is rather abundant along the shores.

The inhabitants, who are Portuguese, are an industrious people; but nearly the whole of them, amounting to 80,000 individuals, are employed in agricultural labour. With the exception of the common mechanical trades, the manufacturing industry is limited to some coarse woollen stuffs, especially druggets, and to a coarse kind of red pottery, which is made at Villa Franca.

The capital of the island, Ponte Delgada, is built on the southern shore. It has an unsafe harbour, for when the wind turns to the south all the vessels in the road are obliged to slip their anchor, and they can only return after the wind has changed to another quarter. The town is surrounded by extensive orchards and orange plantations, and is rather a pleasant place, in which many English families have settled: the population is upwards of 20,000, and it is the largest town in the Azores. Alagoa, farther east, has a small port and 4000 inhabitants; and Villa Franca, still farther east, 5000 inhabitants. In the vicinity of these places are extensive plantations of oranges and vineyards. On the northern coast is the town of Ribeira Grande, with 12,000 inhabitants. It has no harbour, being hemmed in by reefs of rocks, which run out some distance from the shore. It is irregularly built, the houses being scattered over rocky uneven ground, and forming narrow irregular streets along the coast. It has some manufactures of coarse woollen cloth and common linen.

The foreign commerce was formerly confined to Portugal, but at present the island is visited by English, American, and Brazilian vessels. The number of English vessels which annually visit St. Michael's is about two hundred, and about the same number sail between St. Michael's and Portugal. The American and Brazilian vessels are few. The English take only oranges, of which about 90,000 boxes are annually exported. The other agricultural productions, especially corn and maize, are carried to Portugal. The Americans take only gold and silver coin in return for their imports. The importation from England consists of several kinds of textile fabrics, iron goods, and corn; those from Brazil, of hides and colonial produce; the Americans bring timber and whale-oil, and the Portuguese liquors, textile fabrics, colonial produce, silver coin, soap, and hats.

This island was discovered in 1444 by Cabral, and was settled in the following year. Since that period it has remained in possession of the Portuguese.

(Boid's *Description of the Azores, or Western Islands*; Hunt's *Description of the Island of St. Michael*, in *London Geogr. Journal*, vol. xv.)

MICHIGAN, since the article in P. C. was written, has become a State. A sketch of the new constitution and other particulars are given under UNITED STATES OF NORTH AMERICA, P. C. S.

MICIPSA. [JUGURTHA, P. C.; NUMIDIA, P. C.]

MICON (Μίκων or Μύκων), a distinguished Greek painter and sculptor, was the son of Phanochus of Athens, and was one of the most celebrated of the Greek painters for painting horses. He lived about the middle of the fifth century before Christ, and was the contemporary of Phidias and Polygnotus.

The history of Micon is less known than that of many others of the eminent artists of antient Greece. He was however one of the painters chosen by the Athenians to perpetuate their great victories in the Colonnades of the Ceramicus, which was enlarged or rebuilt by Cimon after his victories over the Persians; and he was also appointed to paint the walls of the temple of Theseus at Athens; an honourable distinction, indicating the highest eminence in his art.

Micon painted the battle of the Amazons and the Athenians under Theseus, in the gallery of the Ceramicus, which was called subsequently, in consequence of this and other pictures, the variegated gallery, or the Poecile (ἡ ποικίλη Στοά). He appears also to have assisted Panaenus in the picture of the battle of Marathon, in the same gallery, for it is said that he was fined 30 minae, or half a talent, for painting the Barbarians larger than the Greeks, in that picture.

In the temple of Theseus he painted another battle of the Amazons and Athenians; and opposite to it the battle of the Centaurs and the Lapithae. A third wall also was painted by Micon in this temple, but the picture was so much defaced through age, that Pausanias could not discover the subject of it. Micon also painted, together with Polygnotus, the temple of the Dioscuri; he painted there the return of the Argonauts to Thessaly with Medea and Æsteropea and Antinoe, the daughters of Pelias; they were so called according to this picture, on which their names were inscribed. This circumstance is noticed by Pausanias, who remarks also that the best part of these paintings was Acastus and his horses. It is observable that all Micon's pictures were of such subjects as admit of the introduction of horses, and some of them were the best subjects that could be chosen for the display of the painter's skill in painting these animals, as the battles of the Amazons and the Centaurs. Micon, as already mentioned, was one of the most celebrated of the Greek painters in this respect, yet he was not altogether perfect in his horses, for he gave some of them lashes to their under eyelids, which horses have not. His horses were objected to on this account by Simon, an Athenian well skilled in such matters, and who, according to Pliny, was the first writer on Equitation: a statue by a sculptor of the name of Demetrius was erected to Simon's memory at Athens. This nicety of criticism tends rather to establish Micon's reputation than otherwise, as this was the only error detected by so able a critic. According to another account, it was a fault that was found with some of the horses of Apelles. Great excellence however, in the drawing of the horse, is not at all inconsistent with the state of the art at the time that Micon lived, for we have actual remains of that very period in the beautiful horses of the frieze of the Parthenon, now in the British Museum, executed under the superintendence of Phidias, who was the uncle of Panaenus, with whom Micon worked in the Poecile.

A figure in one of Micon's battles of a certain Butes was the origin of an Athenian proverb: Butes was painted concealed or crushed by a stone, and all that appeared of him was his head and eyes, which seemed to the Athenians so very expeditious a method of painting a warrior, especially one it was necessary to give a name to, that 'Micon painted Butes,' and 'quicker than Butes,'—θᾶττον ἢ Βούτης—became sayings for expressing anything that was quickly done. Varro speaks of the style of Micon as crude and unfinished when compared with the works of Apelles and later artists. This is very probable, and the same might be said of many of the works of Michelangelo and Raphael compared with those of almost any of the scholars of the Carracci; yet the difference is a mere matter of execution, and is not at all essential, nor does it in the least interfere with the higher qualities of art, as form, expression, or composition.

Micon was also a sculptor: be executed, according to Pausanias, the statue of Callias, the Athenian pancratiast, at Olympia.

Micon appears to have been not an uncommon name among Greek artists. The father of Onatas of Aegina was Micon; and Pliny mentions Timarete, herself a painter, as the daughter of a painter of the name of Micon.

There was also a Syracusan sculptor of the name of Micon; be was the son of Niceratus, and made the two statues of Hiero II., which were placed by the sons of Hiero at Olympia.

(Pliny, *Hist. Nat.*, xxxiv. 19; xxxv. 35; Varro, *Lingua Latina*, viii.; Pausanias, i. 15-18; vi. 6; viii. 11; Aelian, *Hist. Animal.*, iv. 50; Sopator, *Rhet. Græc.*, p. 340, ed. Ald.; Böttiger, *Ideen zur Archäologie der Mahlerei;* Sillig, *Catalogus Artificum.*)

MICROMETER. [Divided Eye-Glass Micrometer, P. C. S.]

MIEREVELT, MICHIEL JANZEN, a celebrated Dutch portrait painter, was born at Delft in 1567, not in 1568, as in the first edition of Van Mander. His father was a goldsmith. Mierevelt was a very precocious boy; at eight years of age he could write better than any schoolmaster in Delft; at twelve be could engrave, and at fourteen he was a good painter, having studied for about two years under Antony Bloklandt at Utrecht.

Mierevelt painted almost exclusively portraits, and chiefly heads, but be attained great celebrity, even beyond the limits of his own country, and he could not be persuaded to leave it. The Duke Albert of Nassau, in consideration of his abilities, granted him the privilege of carrying on his Mennonite worship without molestation; and Charles I. of England invited him in 1625 to visit England, an invitation which Mierevelt declined because the plague was at that time in London. He died at Delft in 1641.

Mierevelt's portraits, though extremely numerous—Houbraken computes them at 5000—are generally well drawn and very elaborately finished. Many of them are engraved by various masters, and there are a few etchings by his own hand. He had two sons, who were likewise excellent portrait painters, Pieter Michielsz and Jan Michielsz; the elder was born in 1595, and died aged only twenty-eight in 1623: the younger also died young.

The following verses are under Mierevelt's portrait in the first edition of Van Mander, which was published during his lifetime:—

Pingendo au vivum, quo non praestantior alter;
Delphicus hinc Zeuxis dicitur esse novus.
Principibus magnis fuit invitatus: at ipsum
Ante alias urbes Patria culta tenet.

(Van Mander, *Het Leven der Schilders*, &c., ed. 1764; Houbraken, *Groote Schouburg der Nederlantsche Konstschilders*, &c.)

MIGLIARA, GIOVANNI, a very distinguished modern Italian artist, who invested architectural painting with a species of interest which it had not before possessed even in the ablest hands. He was born at Alessandria in Piedmont, October 15th, 1785, of poor parents, who placed him with Luigi Zuccoli of Milan, to learn wood-engraving; but on discovering his strong and peculiar talent, Zuccoli sent him to study architecture and perspective, under Albertolli and Levati, at the academy of the Brera. So prepared, he next studied scene-painting under Galiari, and practised that branch of art—for which Milan was then celebrated beyond any other place in Europe—about eight years, 1802-10, sharing in the fame reaped by Galiari, Perego, Landriani, and Sanquirico. This eminently successful career, one moreover which be pursued with such devotedness, was all at once arrested by a long and dangerous illness, occasioned partly by over-exertion, and partly by a pulmonary attack in consequence of cold caught while working in a damp place. This perhaps eventually proved a great advantage both to himself and to art, inasmuch as it compelled him to relinquish painting for the stage, and led him to produce works that are now treasured up for admiration in galleries. At the time however his illness was a serious calamity, for his family were reduced to very great distress. Owing to the care of a most affectionate wife, he recovered, and no sooner did he begin to do so, and was able to sit up in bed, than he employed himself in making pictures on a small scale of the various scenes—amounting to about a hundred—which he had painted for the theatres. Produced through necessity, as the only means of earning subsistence for himself and family, these subjects not only found purchasers, but there became even a demand for them. Thus encouraged he determined thenceforth to paint architectural scenery 'in small,' and also to combine the dramatist with the scene-painter, peopling his canvas not with mere figures as accessories, but with episodical groups of actors, either illustrating popular and local manners, or recording some historic incident; and among his numerous pieces of the latter class may be mentioned his Ildegonda, Adelaide dying in a *souterrain* of the Trappists, the Condemnation of a Templar, the Duchesse de la Vallière, and Charles V. at a Convent. In depicting the personages and manners of familiar and every-day life, he displayed a vein of strong humour; and his convent-kitchens and refectories, and incidents taken from Porta's dialect poems, rendered him an especial favourite with the public. Independently of the figures and stories—the great attraction for the many with which he baited his productions—he converted architectural painting itself, from mere actual portraiture of buildings into real picture, by the united mastery of perspective, chiaroscuro, and colouring. His pictures give the impression and sentiment of the edifices themselves, and are stamped by illusive yet anything but prosaic reality. Such was the reputation he acquired, that not only the King of Sardinia bestowed upon him the Order of Merit, but his native city Alessandria struck a medal in honour of him, in 1829. Honoured and prosperous in his profession while only in the meridian of life, be might, not unreasonably, look forward for years of uninterrupted happiness, when he was carried off very suddenly—in about half an hour after being seized by it—by an attack of his former pulmonary complaint, April 18th, 1837. He was followed to the tomb by the academicians, artists, and others to the number of upwards of three hundred; and his last work, his unfinished Interior of the Basilica of San Marco, was borne in the procession. His daughter Teolinda practises as an artist, in subjects of the same kind as her father.

(Giuseppe Sacchi, in Tipaldo's *Biografia; Westminster Rev.* vol. 35.)

MIKA'NIA, a genus of plants belonging to the natural order Compositæ, to the suborder Tubulifloræ, to the tribe Eupatoriaceæ, and the subtribe Adenostyleæ. It has a 4-flowered head, a naked narrow receptacle, 4 involucral leaves, with a bractlet added at the base or below it; the tube of the corolla short, with the throat dilated and somewhat campanulate; the anthers somewhat protruded; the achenium angular; the pappus in 1 row, rough and hairy.

M. officinalis has an erect, smooth, nearly simple stem, with leaves decussating somewhat triangular-ovate, cordate with a great sinus, toothed at the sides, entire towards the point, drooping; the panicles corymbose and terminal. This plant is a native of Brazil, where it is called *Coraçoa de Jesu.* It is a handsome plant. The leaves contain a bitter principle and an aromatic oil, and are used in the same way and for the same diseases as the Cascarilla and Cinchona barks. They are said to be an especially valuahle remedy in remitting fevers and in atonic dyspepsia. They are administered in the form of extract or decoction.

M. Guaco, Guaco plant, has an herbaceous twining stem; the branches round, sulcate, hairy; the leaves stalked, ovate, somewhat acuminate, shortly narrowed at the base, remotely toothed, netted, roughish above, hairy beneath; the corymbs axillary, stalked, opposite; the heads somewhat ternate sessile; the bractlets linear, shorter than the involucre; the involucral scales linear-oblong, obtuse, downy; the achenia smooth. This is one of the plants called *Guaco* in South America, and is used both internally and externally as a remedy against the bites of poisonous serpents. This plant is cultivated by the Indians for the purpose of being used. It is easily known from other plants by the large indigo blue spots that mark the under surface of its rough leaves. It is probable that the spotted character of the leaves of this and plants similarly employed, as the Calladium helleborifolium and a species of Aristolochia, have led to their use in the bites of poisonous snakes. 'The mode of using this remedy,' says Poeppig, 'is very simple: the wound is somewhat distended, and the fresh-pressed juice is dropped into it; the surrounding parts being repeatedly covered with the pressed leaves; and the juice is also taken hy the mouth. The tincture, made with common brandy, is also much celebrated, and recommended to travellers as a secure and portable means of cure. In Guayaquil little cakes are formed out of the fresh-bruised plants, which, when dried in the sun, retain their activity a long time. The effect of the Guaco is not in all cases alike quick and decided; but observations, both in Maranon and Ega, prove that after twenty-four hours' use the swelling had ceased, the pain vanished, and, with the exception of little ulcers, the cure had been effected. In Vurimaguas, and especially about Muniches, every year several persons are bitten by snakes; but the Guaco had acted so efficiently that in the memory of man only two children were known to have died of such wounds.' Although Poeppig has given so favourable an account of this remedy, he says in another place that 'the excision and cauterisation of the wound immediately after it is received is undoubtedly the safest plan.' Besides the guaco there are several other plants used in South America, some of which are called guaco, as the Herpestes colubrina, Dorstenia tubicina, Aristolochia cynanchifolia, &c. The guaco has been tried in this country as a remedy in hydrophobia, but without success. The Urali, or snake-poison of the Indians of British Guiana, is a compound, and contains in it strychnia. [STRYCHNOS, P. C.]

M. opifera is a smooth climbing plant, with an angular stem; it has stalked, cordate, acuminate, repand-toothed or nearly entire leaves, when full grown rather blunt; the heads stalked in corymbose panicles; the involucral scales ohlong, rather acute; the bractlets lanceolate; involucre rather shorter. This plant is a native of Brazil, where it is called *Eroa da Cobia.* It is also employed against the bites of snakes, and is said to effect a cure by its powerful diuretic action. An account is given of this plant by Gomez in the Memoirs of the Royal Academy of Lisbon for 1812, where it is described as the Eupatorium crenatum.

The genus Mikania is closely allied to Eupatorium, and they belong to a group of plants in the order Compositæ, the most remarkable for their activity. Dr. Lindley states, in his 'Vegetahle Kingdom,' that the famous styptic *Matico* is the produce of Eupatorium glutinosum, and not of Artanthe elongata, as has been usually supposed. Of this plant Mr. Hartwig says, in a communication to Dr. Lindley, 'Matico is the vernacular name applied by the inhabitants of Quito to Eupatorium glutinosum, or the Chussalonga in the Quichua language. It forms a shrub 3-5 feet high, and is common in the higher parts of the Quitinian Andes, where its properties were discovered some years back by a soldier called Mateo, better known under his nick-name Matico (little Matthew), who when wounded in action applied accidentally the leaves of some shrub to his wound, which had the immediate effect of stopping the bleeding. This shrub happened to be the Chussalonga, which has since been called, in honour of its discoverer, Matico. That it is the true Matico of the inhabitants of Quito and Riobomba I have not the slightest doubt; both leaves and specimens have been gathered hy myself, and upon comparing the latter with Kunth's description I found them to agree exactly with his Eupatorium glutinosum.' The Matico has been used in Europe, and is said to be an exceedingly efficient styptic, and of great value in stopping the bleeding from small wounds.

(Poeppig, *Reise in Chile, Peru*, &c.; Lindley, *Vegetable Kingdom*; Lindley, *Flora Medica.*)

MILITARY PUNISHMENTS. We have little knowledge of the manner in which offences against military discipline were punished hy the Greeks; but it appears that, for sedition or mutiny, the commander of an army had the power of causing the ringleaders to he seized and instantly put to death. Agamemnon, in the 'Iliad,' threatens such as may desert, that they shall die; and Alexander the Great, when a mutiny took place partly in consequence of the jealousy excited by the favour which he showed to the Persians, caused thirteen of his Macedonians to be executed without a trial. (Arrian, *Anab.*, vii. 8.) The military law of Athens prescribed the punishment of death for the crime of desertion while on service; yet occasionally, for this serious offence, the party was only imprisoned or sentenced to pay a fine. Whatever might be the power of an Athenian commander over his soldiers in the field, it is probahle that he would he very careful to act with a due regard to law; since, at the termination of a campaign, a man who might consider himself unjustly treated could compel his officer to answer for his conduct before a trihunal of his countrymen. Among the Lacedæmonians, cowards and deserters were either put to death or puhlicly disgraced: offenders who did not suffer the extreme penalty were made, when at home, to wear a party-coloured dress, and were ohliged to suhmit in silence to any insult which the meanest citizen might choose to offer. Disgrace also fell upon the soldier who, in action, had the misfortune to lose his shield.

The Romans punished crimes committed by the soldiery with great severity. For the gravest offences soldiers were beheaded or crucified; and under the Pagan emperors some, probahly such as professed the Christian religion, were burnt alive or exposed to wild beasts. On the occurrence of a mutiny, every tenth, twentieth, or hundredth man was sometimes chosen by lot, but generally only the ringleaders were selected for punishment. Deserters and seditious persons were frequently, after being scourged, sold for slaves; and occasionally the offender was made to lose his right hand, or was bled nearly to death.

If a soldier absented himself from the spot assigned to him for the night-watch, or if he was found asleep at his post, he was the next day hrought before the tribune, who having heard the evidence, on the fact being proved, sentenced him to suffer the hastinado. It appears from Polybius (vi. Ex. 2) that the tribune having gently touched the offender with his staff as a signal, the persons appointed to inflict the chastisement fell upon him and struck him repeatedly with sticks or stones, frequently with such violence as to cause his death: the culprit was allowed to escape hy flight if ahle; but in this case he was never permitted to return to his country, or, if he did return, no person dared to afford him shelter or relief.

Punishments of a like nature, hut less severe, were inflicted upon a soldier who was guilty of theft, or of giving false testimony either in his own favour or against a comrade. For certain hreaches of discipline the offender suffered a temporary deprivation of his pay, the forfeiture of his arms, or degradation from his rank. Sometimes he was sentenced to remain outside of the camp exposed to the chance of being taken hy the enemy, or he was made to stand for a certain time in an unmilitary dress before the prætorium. In some cases a culprit was sentenced to perform hard labour, to exchange into a corps of inferior rank, or to be entirely dismissed from the service with disgrace. Punishment was also inflicted on a soldier for cowardice or for losing his arms. A centurion guilty of a breach of discipline was deprived of the staff (a vine branch) which he carried as an emblem of authority.

A dictator could sentence to death any offender against military regulations; and the consuls had the power of exercising summary jurisdiction in capital cases. Punishments were ordered by the legionary trihunes, and by the præfects of the allies, with the concurrence of a council.

Among the nations of modern Europe the punishments for military offences were, till lately, no less severe than they were among the Romans. Besides the infliction of a certain number of lashes with cords, soldiers convicted of theft, marauding, or any other breach of discipline which was not punishable with death, were sentenced to run the gauntelope as it was called. For the execution of this sentence the regiment was drawn up in a double line; and each man being furnished with a small stick, generally of osier (except the grenadiers, who used their belts instead of the sticks), the culprit, naked to the waist, was either marched slowly or allowed to run as fast as he could, according to circumstances, from the head to the rear extremity between the two lines, each man striking him as he passed along. In certain cases the offender was afterwards expelled from the regiment, and sometimes also from the town or district with a charge never to appear there again under pain of death. The punishment of the knout, in the Russian army, consists in the naked back of the offender being struck with a leathern belt.

Cavalry soldiers were frequently punished by the *picket*, as it was called; this consisted in the man being made to hang by his hands from a beam during a certain time, a stake with its upper end made sharp being planted in the ground under him; so that, when from weariness he could no longer keep himself up, his foot was pierced by the stake: this kind of punishment has been long since abolished.

It has happened formerly that soldiers, being goaded to madness by the severities exercised on them, either from caprice or from a mistaken opinion that strictness in the minutest details of discipline is as necessary as in points of the highest importance, have murdered the officers, whom they considered as tyrants, and have afterwards, apparently without regret, suffered death for the crime.

Confinement in a dark room during a certain number of hours was, and still is, a frequent punishment for being absent without leave from parade, either on account of drunkenness or from any other cause; and soldiers so offending were formerly made to stand or rather to revolve in a cage or pillory which continually turned on its axis.

Besides the punishments of death and transportation, which, for great crimes, are within the scope of military law, in the British army, breaches of discipline are visited by flagellation, temporary imprisonment, extra drills, extra guards, and the performance of fatigue duties; but the punishments which consist in confinement to barracks and laborious employments, continued during long periods at the discretion of commanders of regiments, have been abolished by an express order from the present commander-in-chief.

While an army is in the field it is evident that breaches of discipline should be punished with extraordinary severity, and that the punishment should follow almost immediately on detection. It might be presumed that acts of treachery will seldom be committed; but unfortunately desertions to the enemy frequently take place; the more usual crime is however that of quitting the ranks for the purpose of plundering the country, a circumstance which is generally accompanied by gross acts of violence, often murders, committed on the defenceless people; and no doubt can exist that soldiers guilty of such crimes should be shot or hanged on the spot. Even when the crime is less heinous, the well-being and perhaps the safety of the army may be perilled in consequence of the spirit of resentment induced in the inhabitants of the country by injuries inflicted on them: such disorders should therefore be repressed by making signal examples of the offenders. It may be said also that the vice of drunkenness in soldiers deserves, in general, the heaviest punishment: the miscarriage of an enterprise, and defeat, with the loss of numbers of gallant men in an action, may be the fatal consequences of a failure, from inebriety, in the delivery of a report or order. That the trial and, on conviction, the punishment of an offender should be if possible immediate is also evident: the army may change its position or cantonments, when, if any delay takes place, it may be impossible for the necessary witnesses to arrive, or these may in the mean time be removed by the accidents of war. A long interval between the commission of a crime and its punishment diminishes the fear of the latter by opening to the culprit another chance of escape; it moreover diminishes the effect of the punishment as a warning: the impression produced by the crime wears off, and the punishment assumes, in some measure, the appearance of an act of cruelty.

The circumstances of an army in a time of peace and in a time of war, or rather when in the presence of an enemy, are very different: in the former case soldiers have no opportunity to commit treason or to pillage a country; and since the generality of the men who then enter the army are such as have a fair moral character, great crimes among them are as unfrequent as they are among an equal number of men in any other condition of life: the punishments for such offences as may then be committed may therefore with propriety be of the same nature and degree as those which would be adjudged for corresponding offences by the ordinary courts of justice. Imprisonment for a time, employment in laborious tasks, but particularly a forfeiture of pay and pension, where the offender is without a family depending on him for support, might, probably with advantage, be made the punishment for military offences.

The usual sentence now for breaches of discipline is that a certain number of lashes be inflicted with cords on the naked back of the offender; this kind of punishment is both cruel and disgusting, and, which is worse, it leaves on the skin during life the marks of disgrace which, if discovered by any accident, cannot fail to produce a prejudice against the individual, how well soever he may have conducted himself subsequently to the infliction. It falls, moreover, with unequal effect on different persons according to tho state of their health, or of their nervous systems at the time; and not unfrequently, according to the will of the person who administers or who superintends the punishment. It may be added that many of the soldiers who are drawn up to witness it, can neither avoid sympathizing with the culprit nor becoming dissatisfied with a service in which they are exposed to such disgrace and suffering.

The disadvantages under which, during his whole life, an individual may labour who has once suffered the punishment of being flogged, are strikingly related in General Sir Charles Napier's 'Remarks on Military Law,' p. 153, &c. This distinguished officer observes that such punishment, when inflicted only in a degree suited to the crime, and when circumstances prevent a different kind of punishment from being used, may occasionally be effectual; but he gives cogent reasons for considering it to be both wise and humane that the number of lashes which a court-martial was formerly allowed to prescribe is now diminished, and for abolishing the punishment entirely in times of peace.

Sir Charles Napier states that forty years before the time at which he wrote (1837), he frequently saw from 600 to 1000 lashes inflicted in consequence of sentences of merely regimental courts-martial; and in those days a man who had suffered a part of the punishment was often brought from an hospital when the wounds were barely healed, to receive the remainder. At present even a general court-martial cannot sentence a man to receive more than 200 lashes. The offence of inducing a soldier to desert, which in 1792 was visited with 1000 lashes, is, according to the present military law, punishable only by 'fine or imprisonment, or both, as the court shall adjudge.'

With respect to the effects of the law in its actual state, it may be observed that the discipline of the British army, during the time that it served in Spain and France, is acknowledged to have been more perfect than it had been in former times. Sir Charles Napier recommends, however, that the use of the lash be only gradually abolished; the milder punishments being substituted as often as possible. The practice of giving rewards for good behaviour, now so happily introduced in the military service, and the instruction obtained at the regimental schools, will in time, it is hoped, operate a beneficial change in the characters of such men as have not, from nature or from early education, a just sense of moral rectitude and of the obligations all are under of punctually and faithfully discharging the duties they owe to their country. It is indeed probable that such means will entirely supersede the necessity of a punishment which degrades a human being, by placing him below the level of a brute.

MILITARY TENURES. [Feudal System, P. C.]

MI'LIUM, a genus of grasses belonging to the tribe Agrostideæ. It has membranous glumes, nearly equal, unarmed; the paleæ 2, nearly equal, unarmed, about as long as the glumes, and hardening on the fruit; the spikelets convex on the back, or slightly dorsally compressed. There is but one British species of this genus, *M. effusum*. It has a diffuse panicle, with acute paleæ, a smooth stem, and linear-lanceolate leaves. It has a stem 3 or 4 feet in height, and is found in damp shady woods.

(Babington, *Manual of British Botany*.)

MILL, MILLWORK. [Wheels, P. C., p. 310; Windmill, P. C., p. 445; Windsails, P. C., p. 450; Coupling P. C. S., p. 433; Gearing, P. C. S., p. 643.]

MILLINGEN, JAMES, a very eminent English archæologist, was born in London, on the 18th of January, 1774. His father, who was a Dutch merchant, placed him at an early age at Westminster School; the boy showed a great partiality to everything connected with antient coins, having frequent opportunities of seeing a good collection in the house of one of his father's friends. His principal study in his leisure hours was the science of war, and he was anxious to enter the army in the engineer department; but as he was suffering from asthma, his father determined to send him from Westminster to one of the universities. However, the French revolution, which broke out at the time, changed his plans, for Millingen's father, an enthusiastic admirer of liberty, which seemed to dawn upon Europe, and to have chosen France as its favoured abode, went to reside at Paris, where his son James was received as a clerk in a banking-house. But as his new pursuits were not to his taste, he devoted all his leisure hours in the study of such works as Vaillant, Beauvois, Pinkerton, and Polybius, and his savings were spent in the purchase of antient coins, of models of cannon, pontoons, and other *matériel* of war, until after some time he obtained an employment better suited to his pursuits, and was appointed to the mint. In this capacity he became acquainted with several men of distinction and archæologists, among whom we may notice the Abbé Barthélémi, brother of the well-known author of the 'Voyage du Jeune Anacharsis en Grèce,' the geographer Barbié du Bocage, Walckenaer, D'Aumont, and others. The happy days which he spent in such company, however, were not of long duration, for when the National Convention ordered the confinement of every British subject until the peace, the young archæologist was arrested in the dead of night, and conveyed to prison. His father, being a Dutchman, escaped incarceration, but he was ordered to quit Paris under the surveillance of the police. In the Prison des Ecossais James Millingen became acquainted with Charles Este and Sir Robert Smith, who after their liberation established a banking-house at Paris, in which James Millingen became a partner. Shortly afterwards an event occurred which opened to Millingen a wide field of speculation. Some labourers, who were working in a field near Abbeville, discovered a Roman entrenchment, and dug up several earthen vessels filled with gold coins of Roman emperors down to Septimius, Severus, Caracalla, and Geta. Most of them were in a most excellent state of preservation, and some of them were extremely scarce. Millingen purchased them at the value of their weight, and soon after disposed of them in France and England to great advantage. From various circumstances the house in which Millingen was a partner failed, and he was thus thrown upon his own resources. His perfect knowledge of coins and the relics of antient art had in the meantime made his name known throughout Europe, and he would now have returned to England, but his asthmatic constitution rendered it necessary for him to reside in a southern climate, where he enjoyed comparative good health. During the last twenty-four years of his life he resided in Italy; at first in Rome and Naples, but latterly his permanent abode was Florence. He made occasional visits to Paris and London, where his arrival was always hailed by archæologists, as he was always the bearer of some precious relic of antient art. In 1845 he resolved to return to England, with a view of settling in London, when he was attacked by a severe catarrhal affection. At first he thought little of his illness, and wrote several letters even the day before his death, but on the 1st of October he died without a struggle, at the age of seventy-two, more from the effect of exhaustion than of disease.

What Millingen has done for practical archæology is of the highest importance, for there scarcely ever was a man of such experience, tact, and critical sagacity in antiquarian matters. The amount of knowledge which he possessed was a treasure which will not soon be found in one person. He was of the most studious habits, and most abstemious in his living; he was liberal in his opinions, and a perfect gentleman in his behaviour; but he was unfortunate in his domestic relations, for his wife and daughter both embraced the Roman Catholic religion (to which he was very hostile), which led to the separation from his wife and daughter. Both are still alive, as well as two sons. The following is a list of Millingen's works: 1, 'Recueil de quelques Médailles Grecques inédites,' Rome, 1812, 4to.; 2, 'Peintures Antiques inédites de Vases Grecs,' Rome, 1813, large folio, with sixty-three plates; 3, 'Medallic History of Napoleon,' London, 1819, 4to.; to which a supplement was published in 1822, with seventy-four plates. The same work was also published by the author in French. 4, 'Antient Coins of Greek Cities and Kings,' London, 1821, 4to., with figures; 5, 'Ancient unedited Monuments of Grecian Art,' London, 1822 and 1826, 2 vols. 4to.; 6, 'Remarks on the State of Learning and the Fine Arts in Great Britain,' London, 1831, 8vo.; 7, 'Sylloge of Antient Unedited Coins,' London, 1837, 4to. with figures; 8, 'Considérations sur la Numismatique de l'Ancienne Italie,' and a supplement, Florence, 1841 and 1844, with two plates. Besides these greater works, there are a considerable number of essays on antiquarian subjects by Millingen, in the *Annali* and the *Bulletino* of the Archæological Institute of Rome, and in the 'Transactions' of the Royal Society of Literature of London.

(*Classical Museum*, part xi. p. 91, &c.)

MINERALOGY. It will be seen by the number of substances now added under this head, that mineralogy has made considerable progress of late years. To the new substances which have been discovered, and which are now described, are added some which had before accidentally escaped insertion. In various treatises on mineralogy there will be found descriptions of some bodies which we have omitted to notice, and in these cases it is to be considered that the substances did not appear to possess the novelty ascribed to them, or had been previously described under other names. We mention this as a general rule, though we are not without apprehension that minerals may by mistake have been omitted which ought to have been inserted.

ABRAZITE. [PHILLIPSITE, P. C.]

ACHMITE. [EUCHYSIDERITE, P. C.]

AESCHINITE. [TITANIUM, P. C.]

AGALMATOLITE. [ZEOLITES, P. C.]

ALBITE. [CLEAVLANDITE.]

ALLOPHANE occurs reniform, botryoidal, globular, and massive. No cleavage. Colour blue, green, brown. Fracture conchoidal. Hardness 3·0 nearly. Lustre vitreous; transparent, translucent. Specific gravity 1·852 to 1·859. Found at Saalfeld in Thuringia, at Schneeberg in Saxony, and other places. Analysis, by Stromeyer:—Silica, 21·922; alumina, 32·202; lime, 0·730; sulphate of lime, 0·517; carbonate of copper, 3·058; hydrate of iron, 2·270; water, 41·301.

ALUMINA, SULPHATE OF, occurs in crystalline efflorescent masses. Colour white, occasionally yellowish. Translucent. Lustre silky. Taste similar to that of alum. Very soft. Specific gravity 1·66. Found at Araya near Cumana, and near Calama in Bolivia. Analysis:—Sulphuric acid, 36·4; alumina, 16; water, 46·6; peroxide of iron, 0·4. Dr. Thomson's analysis gives 2·26 per cent. of soda.

ALUMINITE (*Websterite, Subsulphate of Alumina*) occurs in reniform masses and botryoidal concretions. Colour white or yellowish white. Streak white. Fracture earthy. Soft, friable. Dull. Translucent occasionally, but more frequently opaque. Specific gravity 1·7. Found at New Haven, Sussex, Epernay in France, and at Halle in Prussia. Analysis:—Sulphuric acid, 23·27; alumina, 29·87; water, 46·76.

ALUMOCALCITE occurs massive. Colour white, inclining to blue. Streak white. Fracture conchoidal. Soft, may be crushed between the fingers. Adheres strongly to the tongue. Specific gravity 2·174. Found in the clefts of ironstone veins at Eybenstock in the Erzgebirge. Analysis, by Kersten:—Silica, 86·60; alumina, 2·25; lime, 6·25; water, 4·0.

AMBLYGONITE occurs massive and in rhombic prisms. Colour greenish white. Cleavage parallel to the sides of the prism. Fracture uneven. Hardness 6·0. Translucent or transparent in thin laminæ. Specific gravity 3·04. Found at Chursdorf near Penig in Saxony, and at Arendal, Norway. Analysis, by Berzelius:—Phosphoric acid, 54·12; alumina, 38·96; lithia, 6·92.

AMPHIBOLE. [AUGITE, P. C.]

AMPHIGENE. [LEUCITE, P. C.]

ANALCIME. [ZEOLITES, P. C.]

ANATASE. [TITANIUM, P. C.]

ANDALUSITE occurs crystallized. Primary form a right rhombic prism. Fracture uneven, conchoidal. Colour flesh-red to brownish and greyish red. Hardness 7·5. Lustre vitreous. Transparent to opaque. Specific gravity 3·104. Found in France, Spain, and North America. Analysis of a specimen from America:—Silica, 39·09; alumina, 58·56; protoxide of manganese, 0·53; lime, 0·21; water, 0·99.

ANHYDRITE (*Anhydrous Sulphate of Lime*) occurs massive and crystallized. Primary form a right rhombic prism. Cleavage very distinct parallel to the terminal planes and their two diagonals; parallel to the lateral planes indistinct.

Fracture uneven. Colour white, bluish, violet or reddish. Streak greyish white. Lustre vitreous, pearly on the cleavage surfaces. Hardness 3·0 to 3·5. Transparent, translucent. Refraction double. Specific gravity 2·5 to 2·9. Massive varieties amorphous, nodular, reniform. Found at Halle in the Tyrol, Bex in Switzerland, and in the salt-mines of Upper Austria and Salzburg, &c. Analysis of a specimen from Sulz:—Sulphuric acid, 57; lime, 42; silica, 2.

ANKERITE occurs crystallized. Primary form a rhomboid. Cleavage parallel to the primary planes. Colour white, sometimes yellowish or brownish from an admixture of oxide of iron. Fracture uneven. Hardness 3·5 to 4. Lustre vitreous. Translucent. Specific gravity 2·95 to 3·1. Found at Salzburg and in the Alps, &c. Analysis, by Berthier:—Carbonate of lime, 51·1; carbonate of magnesia, 25·7; carbonate of iron, 20·0; carbonate of manganese, 3·0 = 99·8.

ANORTHITE occurs crystallized. Primary form a doubly oblique prism. Colour white. Streak white. Fracture conchoidal. Hardness 6·0. Lustre vitreous, inclining to pearly on the cleavage faces. Translucent to transparent. Specific gravity 2·65. Found at Monte Somma. Analysis, by Rose: Silica, 44·9; alumina, 34·46; lime, 15·68; magnesia, 5·25; oxide of iron, 0·74.

ANTHOPHYLLITE occurs in crystalline masses with a fibrous columnar structure. Cleavage parallel to the lateral planes of a rhombic prism, and to both its diagonals. Colour brown and yellowish brown. Streak white. Fracture uneven. Hardness 5·0 to 5·5. Lustre pearly and inclining to metallic. Translucent, transparent on the edges. Specific gravity 3·0 to 3·3. Found at Kongsberg and Modum in Norway, and in the United States, &c. Analysis, by Gmelin: Silica, 56; protoxide of iron, 13; magnesia, 23; protoxide of manganese, 4; lime, 2; alumina, 3.

ANTRIMOLITE. [ZEOLITES, P. C.]

ARFWEDSONITE occurs amorphous. Cleavage parallel to the lateral planes and both the diagonals of a rhombic prism. Colour black. Fracture uneven. Hardness 6·0. Lustre vitreous. Opaque. Specific gravity 3·4 to 3·5. Found in Norway and Greenland. Analysis, by Dr. Thomson: Silica, 50·508; peroxide of iron, 35·144; sesqui-oxide of manganese, 8·920; alumina, 2·488; lime, 1·560; water, 0·960.

ATACAMITE (*Oxichloride of Copper, Muriate of Copper*) occurs massive, pulverulent, and crystallized. Primary form a right rhombic prism. Colour green of various shades, but chiefly emerald green. Streak lighter. Fracture uneven. Hardness 3·0 to 3·5. Lustre vitreous. Transparent to opaque. Specific gravity 4·4. Found at Remolenos in Chile; the pulverulent variety at Atacama in Peru. Massive variety reniform, with a fibrous structure. Analysis, by Proust: Muriatic acid, 10·6; oxide of copper, 76·6; water, 12·8.

AURICHALCITE occurs amorphous, sometimes granular, or in radiating masses. Colour green. Slightly transparent. Hardness but slight. Found at Loktewsk in Altai. Analysis, by Bottger: Oxide of copper, 28·19; oxide of zinc, 45·84; carbonic acid, 16·06; water, 9·93.

AUTOMALITE. [GAHNITE, P. C.]

BABINGTONITE occurs crystallized. Primary form a doubly oblique prism. Colour black or greenish black. Fracture uneven. Hardness 5·5 to 6·0. Lustre vitreous. Faintly translucent. Specific gravity 3·5. Found at Arendal in Norway, the Shetland Isles, and United States at Charlestown, Mass. Analysis, by Arppe, of a specimen from Arendal: Silica, 54·4; protoxide of iron, 21·3; lime, 19·6; magnesia, 2·2; protoxide of manganese, 1·8; alumina, 0·3; volatile matter, 0·9.

BALTIMORITE is composed of longitudinal fibres adhering to each other. Lustre silky. Opaque, but in thin pieces translucent on the edges. Hardness less than that of calcareous spar. Found at Baltimore, U. S. Analysis, by Dr. Thomson: Silica, 40·95; magnesia, 34·70; protoxide of iron, 10·05; alumina, 1·50; water, 12·60.

BARSOWITE occurs massive and in granular distinct concretions. Colour snow-white. Fracture splintery or imperfectly foliated. Hardness 5·5. Lustre of the compact dull; of the granular varieties feebly pearly. Translucent on the edges. Specific gravity 2·740. Occurs at Barsowskoj, in the Ural Mountains. Analysis: Silica, 49·08; alumina, 32·76; lime, 18·16.

BARYTOSTRONTIANITE. [STRONTIUM, P. C.]

BERTHIERITE (*Haidingerite*) occurs in masses confusedly lamellar, or composed of indistinct elongated prisms. Cleavage parallel to the axis of the prism. Colour dark steel grey, inclining to brown. Lustre metallic. Found at Chazelles in Auvergne, and at Braunsdorf, near Freyberg, Saxony. Analysis, by Berthier: Antimony, 52·0; sulphur, 30·3; iron, 16; zinc, 0·3.

BERZELINE occurs massive. Colour silver-white. Streak shining. Lustre metallic. Soft, and admits of being smoothed down and polished, assuming then the colour of tin. When exposed to the air, undergoes decomposition and becomes black, and frequently occurs of this colour in dendritic forms and thin seams. It is found at Smaland in Sweden. Analysis, by Berzelius: Selenium, 40; copper, 64 = 104.

BERZELITE. [LEAD, P. C.]

BERZELITE. [MAGNESIAN PHARMACOLITE.]

BOLSONITE. [PICROSMINE.]

BONSDORFFITE. [ZEOLITES, P. C.]

BORACITE occurs crystallized. Primary form a cube. Cleavage parallel to the planes of the octahedron, imperfect. Colour yellowish, greyish or greenish white; streak white. Fracture uneven or imperfectly conchoidal. Hardness 7·0. Lustre vitreous. Transparent, translucent. Specific gravity 2·56 to 3·0. Found at Segeberg near Kiel in Holstein, Luneburg in Brunswick, and near Tarapaca in Peru. Analysis, by Arfwedson: Boracic acid, 69·70; magnesia, 30·30.

BOTRYOGENE (*Red Sulphate of Iron*) occurs crystallized, the crystals being usually aggregated in globular, reniform, and botryoidal masses. Primary form an oblique rhombic prism. Colour deep hyacinth-red and ochre-yellow; streak yellow. Hardness 2·25 to 2·5. Lustre vitreous. Translucent. Taste slightly astringent. Specific gravity 2·039. Found in the great copper-mine of Fahlun in Sweden. Analysis: Sulphuric acid, 32·55; peroxide of iron, 23·86; protoxide of iron, 10·71; water, 32·85.

BOULANGERITE (*Sulphuret of Lead and Antimony*) occurs massive. Colour bluish grey. Fracture exhibits a crystalline structure. Lustre metallic. Specific gravity 5·97. Found at Molières in France and at Nertschinsk. Analysis of the ore from Molières, by Boulanger: Lead, 53·9; antimony, 25·5; sulphur, 18·5; iron, 1·2; copper, 0·9.

BOURNONITE, compound of the sulphurets of lead, antimony, and copper. Occurs massive and crystallized. Primary form a right rhombic prism. Cleavage parallel to the primary planes and to both the diagonals of the prism. Colour steel or blackish grey; streak similar. Fracture uneven, conchoidal. Hardness 2·5 to 3·0. Lustre metallic. Opaque. Specific gravity 5·79 to 5·83. Found in Cornwall, Clausthal, Pfaffenberg, Mexico, and Peru. Analysis, by Hatchett, of the mineral from Cornwall: Sulphur, 17; lead, 42·62; antimony, 24·23; copper, 12·80; iron, 1·20.

BRAUNITE. [MANGANESE, P. C.]

BREISLAKITE occurs crystallized in delicate capillary crystals of a reddish-brown or chesnut-brown colour, bent and grouped like wool. Fibres flexible. Lustre metallic. Found at Vesuvius and Capo di Bove, near Rome, forming woolly coatings in the cavities of lavas. Analysis:—It contains silica, alumina, and oxide of iron, but in proportions which have not been determined.

BREUNNERITE (*Carbonate of Magnesia and Iron*) occurs crystallized. Primary form an obtuse rhomboid. Cleavage perfect, parallel to the primary planes. Colour yellow of different shades, and black; streak white. Fracture flat conchoidal. Hardness 4·0 to 4·5. Lustre vitreous, sometimes inclining to pearly. Transparent, translucent. Specific gravity 3·0 to 3·2. Found at Zillerthal in Salzbourg and other places in the Tyrol. Analysis, by Stromeyer: Carbonate of magnesia, 86·05; carbonate of iron, 13·82; carbonate of manganese, 0·69.

BREWSTERITE. [ZEOLITES, P. C.]

BROCHANTITE (*Sulphate of Copper and Water*) occurs crystallized. Primary form a right rhombic prism. Cleavage obtained with difficulty in the direction of the lateral faces of the primary form. Colour emerald-green. Fracture uneven. Hardness 3·5 to 4·0. Lustre vitreous. Translucent, transparent. Specific gravity 3·78 to 3·87. Found in Siberia. Analysis, by Magnus: Sulphuric acid, 17·43; oxide of copper, 66·93; oxide of tin, 3·14; oxide of lead, 1·04; water, 11·91.

BRONGNIARTIN. [GLAUBERITE, P. C.]

BRONZITE occurs in massive aggregations of columnar crystals. Cleavage parallel to the lateral planes and both diagonals of a rhombic prism. Colour brown, ash-grey, or dark green; streak lighter. Fracture uneven. Hardness between 4·0 and 5·0. Lustre vitreous. Pseudo-metallic on cleavage planes. Translucent in thin laminæ. Opaque in mass. Specific gravity 3·3. Found in Upper Styria, the Harz, in Bayreuth, the Tyrol, the Lizard district of Cornwall,

&c. Analysis, by Kohler: Silica, 57·19; magnesia, 32·57; lime, 1·29; protoxide of iron, 7·46.

BROOKITE. [TITANIUM, P.C.]

BRUCITE. [MACLUREITE, P.C.]

BUCKLANDITE occurs crystallized. Primary form an oblique rhombic prism. Cleavage not observable. Colour nearly black. Fracture uneven. Harder than augite. Lustre vitreous. Opaque. Specific gravity 3·94. Found near Arendal in Norway, and at Laach on the Rhine. It does not appear to have been analyzed.

BUNTKUPFERERZ. [COPPER, *Purple*, P. C.]

BUSTAMITE occurs in irregularly disposed prismatic crystals, having a somewhat fibrous structure, and a pale grey, greenish, or reddish colour. Nearly opaque. Hardness 6·5 to 7·0. Lustre somewhat silky. Specific gravity 3·1 to 3·23. Found at Real de Minas in Mexico. Analysis, by Dumas: Silica, 48·90; protoxide of manganese, 36·06; lime, 14·57; protoxide of iron, 0·81.

CACHOLONG. [OPAL, P. C.]

CADMIUM, *Sulphuret of*. [GREENOCKITE.]

CALEDONITE occurs crystallized. Primary form a right rhombic prism. Cleavage parallel to the primary planes, and to the short diagonal of the prism. Colour blue and greenish blue; streak bluish or greenish white. Fracture uneven. Hardness 2·5 to 3·0. Lustre resinous. Transparent, translucent. Specific gravity 6·4. Found at Lead Hills in Scotland. Analysis, by Brooke: Carbonate of lead, 32·8; carbonate of copper, 11·4; sulphate of lead, 55·8.

CARBUNCLE. [GARNET, P. C.]

CARINTHITE. [LEAD, P. C.]

CHABASIE. [ZEOLITES, P. C.]

CHALCOLITE. [URANIUM, P. C.]

CHIASTOLITE. [MACLE, P. C.]

CHILDRENITE occurs crystallized. Primary form a right rhombic prism. Cleavage in planes parallel to the axis. Colour yellow, brownish yellow: streak white. Fracture uneven. Hardness 4·5 to 5·0. Lustre vitreous or inclining to resinous. Transparent, translucent. Found near Tavistock, Devonshire, and at Crinnis, Cornwall. Analysis: Wollaston has shown it to be composed of phosphoric acid, alumina, and iron, but the proportions have not been determined.

CHLORITE. [TALC, P. C.]

CHLOROPAL occurs massive, amorphous. Fracture conchoidal and splintery. Colour green, sometimes reddish brown. Structure compact, sometimes earthy. Hardness 3·0 to 4·0. Lustre of the compact, dull resinous. Opaque. Specific gravity 1·7 to 2·0. Found near Unghwar in Hungary. Analysis, by Brandes: Silica, 46·0; oxide of iron, 33·3; magnesia, 2·0; alumina, 1·0; manganese, a trace; water, 18·0.

CHLOROPHYLLITE (*Hydrous Iolite*) occurs crystallized in six-sided prisms, the edges of which are usually replaced by so many planes that the crystals appear almost cylindrical. Cleavage surfaces brilliant. Cross fracture conchoidal. Hardness 2 to 5. Colour green, greenish brown or dark olive-brown. Translucent. Specific gravity 2·705. Found in the neighbourhood of Abo, Finland, and also at Unity, N. H., in the United States. Analysis, by Bonsdorff, of the mineral from Abo: Silica, 45·05; alumina, 30·05; magnesia, 9·00; protoxide of iron, 5·30; water, 10·60.

CHONIKRITE occurs rounded in masses. Is not cleavable. Fracture uneven and imperfectly conchoidal. Colour white, with shades of yellow and grey. Hardness between 2·0 and 4·0. Lustre glimmering or dull. Translucent, often only on the edges. Found at Elba. Analysis, by Von Kobell: Silica, 35·69; alumina, 17·12; magnesia, 22·50; lime, 12·00; protoxide of iron, 1·46; water, 9·00.

CHRYSOCOLLA occurs massive. Sometimes in pseudomorphous crystals, botryoidal and reniform. No cleavage observable. Colour bluish and blackish-green; streak green. Fracture earthy or conchoidal. Hardness 2·0 to 3·0. Lustre vitreo-resinous. Translucent. Opaque. Specific gravity 2·031. Found in Cornwall, in the Bannat, Tyrol, Hungary, &c., &c. Analysis, by Kobell: Silica, 36·54; oxide of copper, 40·00; water, 20·20; iron, 1·00. It is more than probable, as shown by analysis, that calcedony and quartz, merely coloured by carbonate of copper, have been considered as chrysocolla.

CINNAMON STONE. [GARNET, P.C.]

CLEAVLANDITE (*Albite*) occurs massive and crystallized. Primary form a doubly oblique prism. Cleavage parallel to the primary planes. Colour commonly white, sometimes grey, greenish, bluish, or red; streak white. Fracture uneven. Hardness 6·0. Lustre pearly on the cleavage planes, vitreous in other directions. Transparent, translucent. Specific gravity 2·6 to 2·68. The massive varieties have a laminar structure. Found in Norway, Sweden, Dauphiny, St. Gothard, Scotland, and accompanying felspar in most of its numerous localities; from this it differs chiefly in containing soda instead of potash. Analysis, by Stromeyer: Silica, 70·68; alumina, 19·20; soda, 9·06; lime, 0·23.

CLINTONITE (*Seybertite, Xanthophyllite? Holmesite*) occurs crystallized, and in imperfectly crystallized masses. Primary form an oblique rhombic prism. Cleavage imperfect. Colour copper-red, reddish brown, yellowish brown, and reddish white; streak yellowish grey. Hardness 4·5. Lustre metallic and metallic pearly. Translucent to opaque. In thin laminæ sometimes transparent. Specific gravity 3·098. Found at Amity, Orange Co., N. Y. Analysis, by Clemson: Silica, 17·0; alumina, 37·6; magnesia, 24·3; lime, 10·7; protoxide of iron, 5·0; water, 3·6.

CLUTHALITE occurs in large nodules in amygdaloid, constituting a congeries of imperfect crystals with rough surfaces. Colour flesh-red. Hardness 3·5. Brittle. Lustre vitreous. Opaque or translucent on the edges only. Specific gravity 2·166. Found in the Kilpatrick Hills, near Dumbarton. Analysis, by Dr. Thomson: Silica, 51·266; alumina, 23·560; peroxide of iron, 7·306; soda, 5·130; magnesia, 1·233; water, 10·553.

COCCOLITE. [PYROXENE, P. C.]

COMPTONITE. [ZEOLITES, P. C.]

CONDRODITE. [MACLUREITE, P. C.]

CONDURRITE occurs amorphous. Colour brownish black; streak black. Fracture smooth. Hardness, scratched by glass. Brittle. Opaque. Specific gravity 5·204. Found in Condorrow Mine, Cornwall. Analysis, by Faraday: Arsenious acid, 25·94; copper, 60·50; arsenic, 1·51; sulphur, 3·06; water, 8·99.

COQUIMBITE (*Sulphated Peroxide of Iron*) occurs in granular masses, some parts of which are crystallized. The crystals are regular hexahedral prisms, terminated by six-sided pyramids. Entirely soluble in water. Colour white, and also of various shades of brown, yellow, red, and sometimes even of a deep blue colour. Found in the southern part of Peru near Calama in Bolivia, and near Copiapo in Chili. Analysis, by Rose: Sulphuric acid, 43·55; peroxide of iron, 25·21; alumina, 0·78; lime, 0·14; magnesia, 0·21; silica, 0·37; water, 29·98.

COUZERANITE occurs crystallized. Primary form an oblique rhombic prism. Cleavable parallel with the shorter diagonal. Colour usually perfectly black, sometimes indigo-blue, rarely light grey. Fracture conchoidal. Hardness about 6·5. Lustre resinous, vitreous, and rather brilliant. Specific gravity 2·69. Found in the valleys of the Seix, which border upon Saint Girons. Analysis, by Dufrénoy: Silica, 52·37; alumina, 24·02; lime, 11·85; magnesia, 1·40; potash, 5·52; soda, 3·96.

CRICHTONITE. [TITANIUM, P. C.]

CRONSTEDTITE (*Hydrous Silicate of Iron*) occurs massive and crystallized. Primary form a rhomboid; in small, thin, hexagonal prisms, and in radiating groups. Cleavage perpendicular to the axis distinct. Colour black and brownish black; streak dull green. Hardness 2·0 to 2·5. Lustre vitreous. Opaque. Specific gravity 3·3 to 3·36. Found in Cornwall, Brazil, and Przibram in Bohemia. Analysis, by Steinmann: Silica, 22·45; oxide of iron, 58·85; oxide of manganese, 2·89; magnesia, 5·08; water, 10·70.

CUBE ORE. [PHARMAKOSIDERITE.]

CUMMINGTONITE. [AUGITE, P. C.]

CYMOPHANE. [CHRYSOBERYL, P. C.]

DANAITE (*Arsenical Sulphuret of Iron and Cobalt*) occurs crystallized. Primary form a right rhombic prism. Colour silver white, inclining to steel grey; streak dark greyish black. Fracture uneven. Brittle. Hardness 5·5 to 6·0. Lustre metallic. Specific gravity 6·127. Found at Franconia, N. H., at Jackson, N. H., and other places in the United States. Analysis, by Hayes: Sulphur, 17·86; arsenic, 41·44; iron, 32·94; cobalt, 6·45.

DANBURITE occurs crystallized. Primary form an oblique rhombic prism. Colour honey-yellow, becoming nearly white by decomposition; streak white. Hardness 7·5. Lustre vitreous. Translucent, transparent. Specific gravity 2·83. Found at Danbury, Ct. Analysis, by Shepard: Silica, 5·6; lime, 28·33; alumina, 1·70; yttria, 0·85; potash, soda, and loss, 5·12; water, 8.

DAVYNE occurs crystallized. Primary form a rhomboid. Cleavage parallel to the planes of the hexagonal prism. Colour white, sometimes yellowish brown; streak white.

Fracture conchoidal. Hardness 5·0 to 5·5. Lustre vitreous. Transparent, translucent, opaque. Specific gravity 2·4. Found in the more antient rocks of Vesuvius. Analysis, by Covelli: Silica, 42·97; alumina, 33·28; lime, 12·02; peroxide of iron, 1·25; water, 7·43; loss, 3·11.

Dermatine occurs in reniform masses, rarely globular, and in thin coatings or crusts. Colour dark olive green or liver brown. Streak yellow inclining to grey. Fracture conchoidal. Feels greasy, but does not adhere to the tongue. Hardness about 2·0. Lustre somewhat resinous. Specific gravity 2·136. Found in the serpentine quarry near Waldheim in Saxony. Analysis, by Ficinus: Silica, 35·800; magnesia, 23·700, protoxide of iron, 11·333; protoxide of manganese, 2·250; alumina, 0·416; lime, 0·833; water and carbonic acid, 25·200.

Diallage. [Augite, P. C.]

Diaspore occurs massive and crystallized. Primary form a doubly oblique prism. Colour slightly greenish grey and yellowish brown. Hardness 6·0 to 6·5. Slightly translucent. Specific gravity 3·43. Found at Kosoibrod in the Orenburg government of Asiatic Russia. Massive variety occurs in slightly curvilinear laminæ of a shining pearly lustre and greenish grey colour; also in cellular masses, constituted of slender crystals, which have a pearly lustre and intercept each other in every direction; of a brown hue externally, but perfectly transparent and colourless when reduced to thin laminæ. Analysis, by Hess: Alumina, 85·14; water, 14·56. The brown variety, analyzed by Children, gave—alumina, 76·06; water, 14·70; oxide of iron, 7·78; loss. 1·46.

Dichroite (*Iolite, Peliome, Steinheilite, Cordierite*) occurs massive and crystallized. Primary form a right rhombic prism, commonly crystallized in six- or twelve-sided prisms. Cleavage parallel to the lateral planes. Colour blue in direction of the axis, and yellowish grey perpendicular to it; sometimes dull yellowish in both directions. Streak white. Fracture uneven and somewhat conchoidal. Hardness 7·0 to 7·8. Lustre vitreous. Transparent, translucent. Specific gravity 2·56. Massive varieties amorphous. Structure indistinctly granular. Found at Cape de Gatte in Spain, in Greenland, at Bodenmais, in Bavaria, Norway, the United States, &c. Analysis, by Stromeyer: Silica, 50·24; alumina, 33·42; magnesia, 10·84; protoxide of iron, 4·00; protoxide of manganese, 0·68; water, 1·66.

Dreelite occurs crystallized. Primary form a rhomboid, without any modifications. Presents three cleavages parallel with the faces of the primary crystal. Colour and streak white. Hardness 3·25. Lustre pearly. Specific gravity, 3·2 to 3·4. Found at Nuisière, near Beaujeu, France. Analysis, by Dufrénoy: Sulphate of barytes, 61·731; sulphate of lime, 12·274; carbonate of lime, 8·050; lime, 1·521; silica, 9·712; alumina, 2·404; water, 2·308.

Dufrénité occurs in small radiated masses. Colour olive or dull green. Slightly translucent and extremely fusible. Specific gravity 3·227. Found at Anglar, near Limoges. Analysis: Phosphoric acid, 24·8; protoxide of iron, 51·0; peroxide of manganese, 9·0; water, 15.

Dysluite occurs crystallized in regular octohedrons. Cleavage rather imperfect, parallel with the faces of the octohedron. Colour yellowish brown or greyish brown. Fracture conchoidal. Hardness 4·5. Somewhat translucent, opaque. Lustre vitreous, inclining to resinous. Specific gravity 4·551. Found at Sterling, New Jersey. Analysis, by Dr. Thomson: Alumina, 30·490; oxide of zinc, 16·800; peroxide of iron, 41·934; protoxide of manganese, 7·600; silica, 2·966; moisture, 0·400.

Edelforsite occurs fibrous or feathery and massive. Colour white or greyish. Hardness 6·(?). Lustre shining. Transparent. Specific gravity 2·58. Found at Aedelfors in Smaland, Cziklowa in the Banate, and in Norway. Analysis: Silica, 61·85; lime, 38·15; with small quantities of magnesia, alumina, and iron. Another compound under this name has also been called the Aedelfors red zeolite. It agrees in composition with stilbite, except that it contains two per cent. less of water.

Ekebergite (*Sodaite*) does not occur crystallized, but in compact or finely fibrous masses, and occasionally in thin laminæ. Colour green, greyish, or brownish. Lustre vitreous or resinous. Transparent. Analysis, by Ekeberg: Silica, 4·6; alumina, 28·75; lime, 13·50; soda, 5·25; oxide of iron, 0·75; water, 2·25.

Elæolite (*Fettstein*) occurs in amorphous masses, with cleavages parallel to the lateral planes, and both diagonals of a rhombic prism. Fracture conchoidal. Colour dark green, bluish grey, or greyish or brownish red. Hardness 5·5 to 6·0. Lustre resinous, frequently opalescent when cut. Translucent. Specific gravity 2·54 to 2·62. It is found at Laurvig, Stavern, and Frederickswärn in Norway. Analysis, by Vauquelin: Silica, 44·00; alumina, 34·00; soda, 16·50; peroxide of iron, 4·00; lime, 0·12. Gmelin found also 4·733 per cent. of potash, and only 0·651 of peroxide of iron.

Electrum. [Gold, Alloys of, P. C.]

Epistilbite occurs massive with attached crystals. Primary form a right rhombic prism. Cleavage parallel to the short diagonal of the prism. Colour white. Streak white. Fracture uneven. Hardness 4·0 to 4·5. Lustre vitreous. Transparent, translucent. Specific gravity 2·20 to 2·25. Found on Faroe Islands and in Iceland. Analysis of Iceland mineral, by Rose: Silica, 58·59; alumina, 17·52; lime, 7·56; soda, 1·78; water, 14·98.

Epsomite (*Sulphate of Magnesia*) occurs massive, botryoidal, and reniform, on the surface of other bodies, and in solution in sea and mineral waters. Colour white. Streak white. Structure fibrous, sometimes earthy. Brittle. Taste bitter and saline. Found originally in a spring at Epsom. It forms a large bed near Arequipa in Peru, and is often in fine crystals and silky fibres.

Erinite (*Arseniate of Copper*) occurs in concentric and mammillated layers, between which other arseniates are found. The layers have rough surfaces and a fibrous structure. Colour brilliant emerald green inclining to grass green. Streak paler. Fracture uneven or imperfect conchoidal. Hardness 4·5 to 5·0. Lustre slightly resinous. Slightly translucent. Specific gravity 4·0 to 4·1. Found near Limerick. Analysis, by Turner: Arsenic acid, 33·78; oxide of copper, 59·44; alumina, 1·77; water, 5·01.

Erinite. [Zeolites, P. C.]

Erlanite occurs massive and amorphous. Fracture in some specimens foliated, in others splintery. Structure granular, compact. Colour light greenish grey. Streak white, shining. Hardness 6·25 to 7·0. Lustre feebly shining, or dull. Opaque. Specific gravity 3·0 to 3·1. Found near Erla in the Saxon Erzgebirge, forming a bed of 100 fathoms in thickness. Analysis, by Gmelin: Silica, 53·16; alumina, 14·03; lime, 14·39; magnesia, 5·2; soda, 2·61; oxide of iron, 7·14; oxide of manganese, 0·64; water, 0·60.

Euchroite (*Arseniate of Copper*) occurs crystallized. Primary form a right rhombic prism. Cleavage indistinct, Colour bright emerald green. Streak pale apple green. Fracture uneven. Hardness 3·5 to 4·0. Lustre vitreous. Refraction double. Transparent, translucent. Specific gravity 3·38 to 3·41. Found at Libethen in Hungary. Analysis, by Turner: Arsenic acid, 33·02; oxide of copper, 47·85; water, 18·80.

Euxenite occurs massive without any trace of cleavage. Colour brownish black. In thin splinters has a reddish brown translucence, lighter than the streak. Streak reddish brown. Fracture subconchoidal. Hardness, scratches thorite. Lustre metallic, greasy. Specific gravity 4·60. Found at Jölster, in Norway. Analysis, by Scheerer: Columbic acid, with some titanic acid, 49·66; titanic acid, 7·94; yttria, 25·09; protoxide of uranium, 6·34; protoxide of cerium, 2·18; oxide of lanthanium, 0·96; lime, 2·47; magnesia, 0·29; water, 3·97=98·90.

Fassaite. [Pyroxene, P. C.]

Faujasite occurs crystallized in the form of an octohedron with a square base. Colour white, sometimes brown. Fracture vitreous or uneven. Fragile. Lustre brilliant. Found at Kaisarstuhls in Breisgau. Analysis, by Damour: Silica, 49·36; alumina, 16·77; lime, 5·00; soda, 4·34; water, 22·49.

Fibrolite. [Kyanite, P. C.]

Forsterite occurs in small brilliant crystals. Primary form a right rhombic prism. Colour white. Hardness about 7·0. Lustre vitreous. Translucent. Found at Vesuvius, with pleonaste and pyroxene. Analysis, according to Children—contains silica and magnesia.

Gadolinite. [Yttrium, P. C.]

Gedrite occurs in crystalline masses, having a fibrous, radiated, or lamellar structure. Colour clove brown. Streak grey or yellowish. Lustre submetallic, feeble. Hardness not above 5·0. Rough. Specific gravity 3·26. Occurs in loose stones near Gèdre in the Pyrenees. It has some resemblance to anthophyllite and hypersthene. Analysis: Silica, 38·811; alumina, 9·309; protoxide of iron, 45·834; magnesia, 4·130; lime, 0·666; water, 2·301.

Geokronite (*Kilbrickenite?*) occurs amorphous without cleavage Fracture lamellar in one direction, and in the other granular and conchoidal. Colour lead grey. Streak the same. Hardness between mica and calcareous spar. Lustre metallic. Opaque. Specific gravity 5·88. Found in the silver-mine of Scala in Sweden, and in the province of Galicia in Spain. Analysis of the mineral from the Scala mine, by Svanberg: Lead, 66·452; antimony, 9·576; arsenic, 4·695; copper, 1·514; iron, 0·417; zinc, 0·111; sulphur, 16·262.

GIGANTHOLITE occurs crystallized in six- and twelve-sided prisms. Cleavage parallel to the six sides of the prism. Colour greenish to dark steel grey. Lustre between vitreous and waxy. Hardness about 3·5. Specific gravity 2·862 to 2·878. Found near Temmela in Finland. Analysis, by Wachtmeister: Silica, 46·27; alumina, 25·10; peroxide of iron, 15·60; magnesia, 3·80; protoxide of manganese, 0·89; potash, 2·70; soda, 1·20; fluorine a trace; water with ammonia, 6·00.

GILBERTITE occurs in plates lying irregularly together. Colour white with a shade of yellow. Hardness 2·75. Lustre silky. Translucent. Specific gravity 2·648. Found near St. Austell, Cornwall. Analysis, by Lehunt: Silica, 45·155; alumina, 40·110; lime, 40·170; magnesia, 1·900; protoxide of iron, 2·430; water, 4·250.

GLOTTALLITE occurs crystallized either in cubes or four-sided pyramids, which seem to be regular octohedrons. Colour white. Hardness 3·5. Brittle. Lustre vitreous. Strongly translucent. Specific gravity 2·181. Found probably near Port Glasgow. Analysis by Dr. Thomson: Silica, 37·014; lime, 23·297; alumina, 16·308; peroxide of iron, 0·500; water, 21·250 = 98·299.

GMELENITE. [ZEOLITES, P. C.]

GORLANDITE. [LEAD, *Ores of*, P. C.]

GRAPHITE. [PLUMBAGO, P. C.]

GREEN IRON EARTH (*Hypochlorite*) occurs in reniform, botryoidal, and globular masses. Colour green, passing into black and yellow. Lustre resinous and dull. Brittle. Found at Schneeberg in Saxony. Analysis by Schülar: Silica, 50·24; oxide of bismuth, 13·03; alumina, 14·65; oxide of iron, 10·54; phosphoric acid with traces of manganese, 9·62.

GREENOCKITE (*Sulphuret of Cadmium*) occurs crystallized in six-sided prisms, with six-sided pyramids. Hardness 2·75. Lustre vitreous, sometimes almost adamantine. Translucent to transparent. Specific gravity 4·842. Found at Bishoptown, Renfrewshire, and on the Cochno burn, on the north side of the Clyde. Analysis by Connell: Sulphur, 22·56; cadmium, 77·30.

GREENOVITE occurs in small amorphous crystalline masses. Primary form a doubly oblique prism. Colour deep rose-red. Hardness greater than that of fluor spar; does not scratch glass. Some of the faces are brilliant, others often dull and tarnished. Specific gravity 3·44. Found at St. Marcel in Piedmont. Analysis, by M. Delesse: Silica, 30·40; oxide of titanium, 42; lime, 24·30; protoxide of manganese, 3·80. M. Delesse observes that this mineral is analogous to sphene.

GURHOFIAN. [DOLOMITE, P. C.]

HAIDINGERITE. [BERTHIERITE.]

HAIDINGERITE. (*Arseniate of Lime.*) [PHARMACOLITE, P. C.]

HALLOYSITE. [LENZINITE.]

HARTITE occurs crystallized. Primary form an oblique rhombic prism. Cleavage imperfect. Colour white. Lustre somewhat greasy. Translucent. Hardness 1·0. Specific gravity 1·046. Found at Oberhart in Austria. Analysis, by Schrötter: Carbon, 87·473; hydrogen, 12·048.

HAUSMANNITE. [MANGANESE, *Ores of*, P. C.]

HAYESINE (*Borocalcite*) occurs in globular masses of a fibrous structure, having externally a brown colour; when broken these masses appear to be formed of snow-white delicate fibres, interwoven, curved, and knotted; the lustre is satin-like, and the fibres so soft as to crush readily between the fingers. It encloses fragments of argillaceous slate, with brilliant and perfect crystals of glauberite, which are sometimes penetrated by the fibres of this mineral. Found in the province of Tarapaca, Peru. Analysis: after drying at 150° Fahr., boracic acid, 46·111; lime, 18·889; water, 35·000.

HAYDENITE. (*Heulandite.*) [ZEOLITES, P. C.]

HARRINGTONITE. [ZEOLITES, P. C.]

HEDYPHAN. (*Gorlandite.*) [LEAD, *Ores of*, P. C.]

HERRERITE occurs in reniform masses. Cleavage in three directions, affording rhomboidal fragments with curved faces. Colour pistachio, emerald, and grass green. Streak yellowish grey. Hardness 4·0 to 4·5. Brittle. Lustre vitreous to pearly, and shining on fresh surfaces. Translucent. Specific gravity 4·3. Found at Albarradon in Mexico. Analysis, by Herrera: carbonic acid, 31·86; peroxide of nickel, 12·32; tellurium, 55·58. This mineral is probably a mixture rather than a definite compound.

HETZEPOZITE. [MANGANESE, *Ores of*, P. C.]

HEULANDITE. [ZEOLITES, P. C.]

HISINGERITE. [THRAULITE, P. C.]

HONEY-STONE. [MELLITE, P. C.]

HOPEITE. [ZINC, *Ores of*, P. C.]

HORN-STONE, FUSIBLE. [FELSPAR, P. C.]

HORN-STONE, INFUSIBLE. [QUARTZ, P. C.]

HUMBOLDTILITE. [SOMERVILLITE.]

HURAULITE. [MANGANESE, *Ores of*, P. C.]

HYDROBORACITE occurs in small needle crystals, which appear to be flat six-sided prisms. Colour white, with spots of red from silicated peroxide of iron. Hardness similar to that of gypsum. Translucent. Specific gravity 1·9. Found in a collection of Caucasian minerals. Analysis, by Hess: Boracic acid, 49·22; lime, 13·74; magnesia, 10·71; water, 26·33.

HYDROTALCITE occurs massive, investing steatite in foliated masses. Colour white. Streak the same, with a pearly lustre. Transparent. Flexible, with a soapy feel. Hardness 2. Found at Snarum. Analysis: Magnesia, 36·30; alumina, 12·00; peroxide of iron, 6·90; carbonic acid, 10·54; water, 32·66; insoluble residue, 1·20.

HYDROMAGNESITE. [MAGNESITE.]

HYPOCHLORITE. [GREEN IRON EARTH.]

HYDROPHITE, a variety of green serpentine containing vanadium, occurs amorphous. Fracture irregular. Colour mountain green. Soft. Specific gravity 2·65. Found at Taberg in Smaland. Analysis: Silica, 36·195; oxide of iron, 22·729; oxide of manganese, 1·66; magnesia, 21·082; vanadic acid, 0·115; water, 16·080.

ICELAND SPAR. [CALCSPAR, P. C.]

IDRIALIN. [HYDROGEN, *Carburets of*, P. C.]

ILMENITE. [TITANIUM, *Ores of*, P. C.]

IRON, OXALATE OF (*Humboldtite, Humboldtine*), occurs crystalline and massive. Primary form a right prism with square bases. Cleavage in the direction of the primary faces, indistinct. Fracture uneven, earthy. Colour brightish yellow. Hardness, scratches sulphate of lime, and is scratched by mica. Opaque, dull. Specific gravity 1·3. Massive variety small, flattish, reniform pieces. Structure fine earthy. Found at Koloseruk, near Bilin, in Bohemia. Analysis, by Rammelsberg: Oxalic acid, 42·69; protoxide of iron, 41·40; water, 15·91.

ISERINE. [TITANIUM, *Ores of*, P. C.]

JASPER. [QUARTZ, P. C.]

JOHANNITE. [URANIUM, *Ores of*, P. C.]

JOHNSTONITE. [LEAD, *Ores of*, P. C.]

KAMMERERITE occurs crystallized and massive. Common form of the crystal a six-sided prism. Cleavage perpendicular to the axis only. Cleavage places have a pearly lustre. Colour, that of some crystals, which by daylight is so dark that their red colour is scarcely perceptible, appears by candlelight quite red. Massive variety, usually composed of fine laminæ. Colours sometimes dark violet blue, sometimes yellowish or greenish, or greenish white. Translucent on the edges, particularly after immersion in water. Fracture compact, fine-grained, becoming splintery or leafy on the less compact varieties; flexible. Dull, or of a greasy lustre, often glistening. When scratched gives a light peach-blossom red or almost white streak. Hardness 2 to 2·5. Specific gravity 2·640. Found in the Ural mountains. Analysis, by Hartwell: Silica, 37·0; alumina, 14·2; magnesia, 31·5; lime, 1·5; oxide of chromium, 1·0; water 13·0.

KEROLITE occurs massive and reniform. Structure lamellar or compact. Colour white, yellow, or green. Streak white. Fracture conchoidal. Hardness 2·0 to 2·25. Lustre vitreous or resinous. Transparent, translucent. Specific gravity 2·0 to 2·2. Feels greasy, but does not adhere to the tongue. Found at Frankenstein in Silesia, and at Zöblitz in Saxony, and also in New York and New Jersey, United States. Analysis, by Pfaff: Silica, 37·95; alumina, 12·18; magnesia, 16·02; water, 31·00 = 97·15.

KIRWANITE occurs filling cavities in a kind of basaltic rock. Texture fibrous, fibres diverging from a centre and forming brushes. Colour dark olive green. Opaque. Hardness 2·0. Specific gravity 2·941. Found on the north-east coast of Ireland. Analysis, by R. D. Thomson: Silica 40·5; protoxide of iron, 23·91; lime, 19·78; alumina, 11·41; water, 4·35.

KNEBELITE. [MANGANESE, *Ores of*, P. C.]

KOBELLITE resembles sulphuret of antimony, but is more brilliant. Structure radiated, crystalline. Streak and powder black. Specific gravity 6·29 to 6·32. Found in the cobalt-mine at Hucna in Sweden. Analysis by Setterberg: Sulphuret of lead, 46·36; sulphuret of bismuth, 33·18; sulphuret of antimony, 12·70; sulphuret of iron, 4·72; sulphuret of copper, 1·08; gangue, 1·45 = 99·49.

KOLLYRITE (*Hydrous Silicate of Alumina*) occurs massive. Colour white. Fracture earthy. Nearly opaque. Lustre somewhat vitreous. Hardness 3·25. Specific gravity 2·06 to 2·11. Found at Schemnitz in Hungary, and in a lead-mine on the bank of the river Oo, in the Pyrenees. Analysis, by Berthier: Silica, 19; alumina, 44·5; water, 40·5.

KROKYDOLITE occurs asbestiform, fibrous, and compact. Colour lavender or indigo blue. Streak lavender blue or leek green. Lustre silky. Opaque. The fibrous variety is flexible and elastic. Found on the Orange River in Southern Africa. Analysis of the fibrous variety, by Stromeyer: Silica, 51·64; protoxide of iron, 34·38; soda, 7·11; magnesia, 2·62; oxide of manganese, 0·02; lime, 0·05; water, 4·01.

KUPFERINDIG (*Indigo Copper, Blue Copper*) occurs in spheroidal masses, presenting superficial indications of crystallization. Colour dark blue. Fracture uneven. Hardness about 2·0. Lustre faintly resinous. Opaque. Specific gravity 3·8. Found at Sangerhausen in Thuringia, and also in the volcanic rocks of Vesuvius, in black or greenish blue incrustations. Analysis, by Walchner: Sulphur 32·64; copper, 64·77; iron, 0·46; lead, 1·04.

KUPFERSCHAUM occurs crystallized. Primary form a right rhombic prism. Occurs in rhomboidal plates, which present perfect cleavage parallel to the faces of the rhomb; generally in small aggregated and diverging fibrous groups of a pale apple green or verdigris-green colour. Streak paler. Hardness 1·0 to 1·5. Lustre pearly on the faces of the rhomb. Translucent. Flexible in thin laminæ. Specific gravity 3·0 to 3·2. Found at Matlock in Derbyshire, in the Bannat, at Lebether in Hungary, in Siberia, the Tyrol, and at Saalfeld in Thuringia. Analysis, by Von Kobell: Arsenic acid, 25·01; oxide of copper, 43·88; carbonate of lime, 13·65; water, 17·46.

LANARKITE (*Sulphato-carbonate of Lead*) occurs in long slender crystals, single or aggregated into fibrous masses. Primary form an oblique rhombic prism. Colour greenish, yellowish, or greyish. Streak white. Hardness 2·0 to 2·5. Lustre nearly resinous, but pearly on the cleavage planes. Transparent, translucent. Specific gravity 6·8 to 7. Found at Lead Hills in Scotland. A massive variety has been met with in Siberia. Analysis, by Brooke: Sulphate of lead, 53·1; carbonate of lead, 46·9.

LATROBITE occurs crystallized and massive. Primary form a doubly oblique prism. Cleavage parallel to all the primary planes. Colour pale rose-red or pink. Fracture uneven. Hardness 5·0 to 6·0. Lustre vitreous. Tranlucent. Specific gravity 2·72 to 2·80. Found at Amitok Island, Labrador, and in Finland. Analysis, by Gmelin: Silica, 44·65; alumina, 36·81; lime, 8·29; potash, 6·58; oxide of manganese, 3·16.

LAVENDULAN occurs amorphous. Colour lavender blue. Streak paler blue. Lustre greasy, inclining to vitreous. Hardness 2·5 to 3·0. Occurs at Annaberg in Saxony, with cobalt and iron ores. Analysis: According to Plattner, it contains arsenic, and the oxides of cobalt, copper and nickel, and water.

LEHUNTITE. [ZEOLITES, P. C.]

LENZINITE (*Halloysite*) occurs in compact and earthy masses of varioussizes. *Compact:* Colour yellowish milk white. Streak shining. Fracture conchoidal. Hardness 1·5. Nearly dull. Transparent on the edges. Feels rather greasy. Specific gravity 2·10. In water separates with noise into small fragments. *Earthy:* Colour snow white. Streak shining. Fracture earthy. Soft. Slightly translucent. Opaque. Dull. Specific gravity 1·80. Found at Kall in Eifeld. Analysis: *Compact*—Silica, 37·5; alumina, 37·5; water, 25, with a trace of lime. *Earthy*—Silica, 39; alumina, 35·5; water, 25; with a trace of lime.

Halloysite appears to be a variety of the above, its colour being bluish and greyish white.

LEONHARDITE occurs crystallized. Primary form an oblique rhombic prism. Cleavage very perfect, parallel to the lateral planes. Colour white, yellowish, and more rarely brownish. Streak white. Fracture uneven. Frequently coated with brownish or black powder. Hardness 3·0 to 3·5. Lustre pearly, especially on perfect cleavage planes; on the fractured surface vitreous. Translucent on the edges. Specific gravity 2·25. Found near Wolfstein in Rhenish Bavaria. Analysis, by Dr. Delf: Silica, 56·128; alumina, 22·980; lime, 9·251; water and loss, 11·641.

LEUCHTENBERGITE occurs in large but not perfectly developed crystals in the form of the rhomboid. Colour yellowish in masses, but in thin laminæ white. Texture lamellar. Lustre pearly. Transparent in small crystals. Hardness between calcspar and selenite; is impressed by the nail. Feels greasy. Specific gravity 2·71. Found in the Schischminsk mines in the district of Slatonst. Analysis, by Komonen; Silica, 34·23; alumina, 16·31; magnesia, 35·6; peroxide of iron, 3·33; lime, 1·75; water, 8·68.

LEUCOPHANE occurs crystallized in four-sided prisms, but is seldom regularly crystallized. Cleavage imperfect in three directions. Colour pale dirty green and deep wine yellow. Transparent and colourless in thin fragments. Lustre vitreous on cleavage surface. Hardness 3·50 to 3·75. Specific gravity 2·974. Found at Langesundfiord in Norway. Analysis, by by Erdmann: Silica, 47·82; glucina, 11·51; lime, 25·00; fluorine, 6·17; sodium, 7·59; protoxide of manganese, 1·01; potassium, 0·26.

LIBETHENITE (*Phosphate of Copper*) occurs in small octohedral crystals and in radiated masses. Primary form a right rhombic prism. Colour dark green. Streak green. Fracture uneven. Hardness 4·0. Transparent, translucent. Lustre resinous. Specific gravity 3·6. Found at Libethen in Hungary. Analysis, by Berthier: Phosphoric acid, 28·7; oxide of copper, 63·9; water, 7·4.

LIGURITE. Primary form an oblique rhombic prism. Colour apple green. Streak greyish white. Fracture uneven. Hardness above 5·0. Lustre of the surface of fracture, between vitreous and resinous. Transparent, translucent. Specific gravity 3·49. Found on the banks of the Stura, in the Apennines of Liguria. Analysis, by Viviani: Silica, 57·45; alumina, 7·36; lime, 25·30; magnesia, 2·56; oxide of iron, 3·00; oxide of manganese, 0·5 = 96·17.

LIME, OXALATE OF, occurs crystallized. Primary form an oblique rhombic prism, and from one-tenth to one-fourth of an inch long. Colourless. Fracture conchoidal. Hardness rather less than calcspar. Very brittle. Lustre similar to that of sulphate of lead. Transparent to opaque. Specific gravity 1·833. Supposed to have come from Hungary. Analysis, by Sandell, showed its composition to be oxalate of lime with one equivalent of water.

LINARITE (*Cupreous Sulphate of Lead*) occurs crystallized. Primary form an oblique rhombic prism. Colour deep azure blue. Streak pale blue. Fracture uneven. Hardness 2·5 to 3·0. Lustre vitreous or adamantine. Transparent, translucent. Specific gravity 5·3 to 5·4. Found at Linares in Spain, and at Lead Hills, Scotland. Analysis, by Brooke: Sulphate of lead, 74·4; oxide of copper, 18·0; water, 4·7.

LINSENERZ. Primary form a right rhombic prism, occurs in octohedral crystals. Cleavage parallel to the primary planes. Colour light blue and occasionally dull green. Streak pale blue or green. Hardness 2·0 to 2·5. Lustre vitreous. Transparent, translucent. Specific gravity 2·926. Found near Redruth, Cornwall, and in Hungary. Analysis, by Dr. Thomson: Arsenic acid, 43·39; oxide of copper, 30·10; water, 26·69.

LITHOMARGE occurs massive. Spheroidal. Colour white, grey, red, yellow, blue. Streak shining. Structure compact. Soft. Dull. Opaque. Unctuous to the touch. Adheres to the tongue. Specific gravity 2·2 to 2·5. Found in Cornwall near Redruth, in Saxony and some other places in Europe. Friable lithomarge occurs in scaly, glimmering particles, which are phosphorescent in the dark. Found at Ehrenfriedensdorf in Saxony. Analysis, by Klaproth: Silica, 32·00; alumina, 26·50; oxide of iron, 21·00; chloride of sodium, 1·50; water, 17·00.

MAGNESIA ALUM occurs massive. Structure fibrous, also compact. Colour and streak snow white. Lustre shining. Found at Cape Verd, in Southern Africa, where it covers the floor of a grotto to the depth of six inches. Analysis, by Stromeyer: Sulphate of alumina, 38·398; sulphate of magnesia, 10·820; sulphate of manganese, 4·597; chloride of potassium, 0·205; water, 45·739.

MAGNESIA, HYDRATE OF. [SHEPARDITE.]

MAGNESIAN PHARMACOLITE occurs massive. Cleavage foliated in one direction. Colour dirty white or honey yellow. Hardness 5 to 6. Brittle. Lustre waxy. Specific gravity 2·52. Found at Längbanshyttan in Wermeland. Analysis, by Kuhn: Arsenic acid, 58·52; lime, 23·22; magnesia, 15·68; protoxide of manganese, 2·13; iron, a trace; loss by ignition, 0·30.

MAGNESITE (*Carbonate of Magnesia*) occurs in acicular crystals, massive, and in powder. Colour usually white, occasionally greyish and yellowish. The *massive varieties* are found amorphous, reniform, nodular, and stalactitic. Fracture splintery or flat conchoidal. Hardness exceeds that of calc-spar. Dull. Nearly opaque. Specific gravity 2·8. Found in several parts of Europe, as Styria, Moravia, Spain and Silesia, in India, and at Hoboken in New Jersey, North America. Analysis, by Rammelsberg: Carbonic acid, 52·214; magnesia, 47·786.

MALTHACITE occurs in these plates and massive. Fracture uneven or conchoidal. Colour white or yellowish. Streak shining. Soft like wax. Lustre waxy, weak. Streak shining. Translucent. Specific gravity 1·99 to 2·01. Found at Stendorfal between Lobau and Bauzen, and near Beraun in Bohemia. Analysis, by Meissner: Silica, 50·2; alumina, 10·7; lime, 0 2; peroxide of iron, 3·1; water, 35·8.

MARGARITE (*Pearl Mica*) occurs in thin hexagonal crystals, and in masses of small thin shining laminæ. Primary form a rhomboid. Cleavage distinct parallel to the bases, indistinct parallel with the sides. Colour greyish, reddish, and yellowish white. Streak white. Fracture not observable. Hardness 3·5 to 4·5. Rather brittle. Lustre pearly on the terminal faces, vitreous on the others. Translucent. Specific gravity 3·0 to 3·1. Found at Sterzing in the Tyrol. No accurate analysis appears to have been made.

MARCELINE (*Anhydrous Silicate of Deutoxide of Manganese*) occurs crystallized in octohedrons with a square base. Colour greyish black. Lustre slightly metallic or vitreous. Found at St. Marcel in Piedmont. Analysis, by Berzelius: Silica, 15·17; oxide of manganese, 75·80; oxide of iron, 4·14; alumina, 2·80. The analysis by Berthier gives considerably more silica and less oxide of manganese.

MARMATITE. [ZINC, *Ores of* P. C.]

MARMOLITE (*Silicate of Magnesia*) occurs massive. Structure columnar, irregularly intersecting. Columnar portions foliated, having a cleavage in two directions intersecting each other. Colour greyish and greenish. Hardness 3·5. Lustre pearly. Translucent, opaque. Specific gravity 2·47. Found at Hoboken, New Jersey, and the Bare Hills, near Baltimore, United States. Analysis, by Nuttall: Silica, 36; magnesia, 46; lime, 2; water, 15.

MASCAGNIN (*Sulphate of Ammonia*) occurs stalactitic, pulverulent, or efflorescent. Colour yellow or greyish. Taste acrid, bitter. Translucent, opaque. Found in the fissures of the earth, and among the lavas of Ætna and Vesuvius, in the Solfatara, and near Sienna in Tuscany. Analysis, by Gmelin: Sulphuric acid, 53·29; ammonia, 22·80; water, 23·91.

MELANOCHROITE. [CHROMIUM, *Ores of—Subsesquichromate of Lead*, P. C.]

MELANTERITE (*Sulphate of Iron, Green Vitriol*) occurs massive, fibrous, earthy, and crystallized. Primary form an oblique rhombic prism. Cleavage parallel to the primary planes. Colour green, with shades of yellow or brown. Streak white. Fracture conchoidal. Hardness 2·0. Brittle. Lustre vitreous. Transparent, translucent. Taste astringent. Specific gravity 1·84. Massive varieties—Amorphous, structure granular, botryoidal, reniform, stalactitic. Structure fibrous. Formed the decomposition of iron pyrites frequently in coal-mines. Found at Hurlet near Paisley, and Campsie, Scotland. Analysis, by Berzelius: Sulphuric acid, 28·8; protoxide of iron, 25·7; water, 45·4.

MENGITE (*Monazite, Edwardsite*) occurs crystallized. Primary form an oblique rhombic prism. No regular cleavage. Colour hyacinth or brick-red. Streak white. Fracture uneven, and the fractured surface dull. Hardness 5·0. Lustre vitreous. Translucent. Specific gravity 4·924. Found near Miask in Siberia. Analysis, by Kersten: Phosphoric acid, 28·50; peroxide of cerium, 26·00; oxide of lanthanium, 23·40; thorina, 17·95; peroxide of tin, 2·10; protoxide of manganese, 1·86; lime, 1·68 = 101·49.

MESITINE SPAR (*Carbonate of Iron and Magnesia*). Primary form an obtuse rhomboid. Cleaves parallel to the faces of the primary. Colour yellowish. Hardness 4·0. Lustre vitreous. Translucent. Specific gravity 3·35 to 3·63. Found at Traversella in Piedmont. Analysis, by Stromeyer: Carbonic acid, 44·23; protoxide of iron, 35·13; magnesia, 20·64, with some protoxide of manganese.

MISPICKEL. [ARSENICAL MINERALS, P. C.]

MICA. It is remarked by Brooke 'that several distinct species of minerals are included under this name, merely because they may be easily split into *very thin shining* plates; but they cannot at present be distinguished by any characters which have been hitherto given.' He treats of the various substances belonging to this mineral, under the heads of Rhomboidal Mica; Oblique Prismatic Mica; Lepidolite, or Lilac Mica [P. C.]; Margarite, Pearl Mica; Rubellan, or Red Mica; Oderit, or Black Mica [P. C.].

Rhomboidal Mica occurs massive and in hexagonal prisms. Primary form a rhomboid. Cleavage very distinct, perpendicular to the axis. Fracture not observable. Hardness of the cleavage surfaces 2·0 to 2·5, that of the edges 4·5 to 5·5. Colour white, grey, black, brown, pale red, dull yellow, green. Streak white, grey. Lustre vitreous, pearly on the cleavage surfaces. Transparent, translucent. Massive varieties globular, structure fibrous, foliated. Amorphous, structure foliated, granular, fibrous. Found in primitive rocks.

Oblique Prismatic Mica. Primary form an oblique rhombic prism, and according to Brooke the preceding descriptions will probably apply to this variety, except as to the form. Analysis, by Rose: Silica, 47·19; alumina, 33·80; peroxide of iron, 4·47; oxide of manganese, 2·58; lime, 0·13; fluoric acid, 0·39; potash, 8·35; water, 4·07 = 100·88.

MIDDLETONITE occurs in rounded masses, seldom larger than a pea, or in layers a sixteenth of an inch or less in thickness, between layers of coal. Colour reddish brown by reflected light, and deep red by transmitted. Powder light brown. Transparent in small fragments. Hard and brittle. Lustre resinous. No taste or smell. Blackens on exposure. Specific gravity 1·6. Found about the middle of the main coal or Haigh Moor seam at the Middleton collieries near Leeds; also at Newcastle. Analysis, by Johnston: Carbon, 86·437; hydrogen, 8·007; oxygen, 5·563.

MONRADITE occurs massive. Cleavage, one distinct, and another imperfect. Colour pale yellowish, verging on red. Hardness nearly that of felspar. Lustre vitreous. Specific gravity 3·2673. Found at Bergen in Norway. Analysis, by Erdmann: Silica, 56·17; magnesia, 31·63; protoxide of iron, 8·56; water, 4·04.

MONTICELLITE occurs crystallized. Primary form a right rhombic prism. Crystals small, and have usually the aspect of quartz. Colour generally yellowish. No cleavage planes have been observed. Hardness 5·0 to 6·0. Sometimes nearly transparent and colourless. Found at Vesuvius. It has not been analyzed.

MOSANDERITE occurs massive and fibrous, and crystallized in flat prisms. Cleavage in one direction distinct, in others indistinct. Colour dull reddish-brown. Streak greyish brown. Hardness 4·0. Lustre of cleavage face between vitreous and greasy; of other surfaces resinous. Thin splinters translucent and showing a bright red colour by transmitted light. Specific gravity 2·93 to 2·98. Found at Lammanskaret in Sweden. Analysis: according to Erdmann it consists mostly of silica, titanic acid, and the oxides of cerium and lanthanium, with some oxide of manganese, lime, a little magnesia, potash, and water.

NEEDLE ORE occurs crystallized in acicular four- or six-sided prisms, indistinctly terminated and longitudinally striated. Cleavage parallel to the axis of the prism. Colour, when first broken, steel-grey or blackish lead-grey, soon acquiring a yellowish tarnish. Cross fracture small-grained and uneven, with a shining metallic lustre. Hardness 2·0 to 2·5. Opaque. Specific gravity 6·125. Found near Ekaterinburg in Siberia. Analysis, by Frick: Sulphur, 11·58; bismuth, 43·20; copper, 12·10; nickel, 1·58; tellurium, 1·32.

NEMALITE occurs in slender fibres, which are elastic, sometimes curved, and easily separated. Colour white, with a shade of yellow. Streak white. Lustre highly silky. Opaque. Some decomposed varieties have an earthy appearance. Hardness 2·0. Specific gravity 2·353. Found in veins at Hoboken, New Jersey, and other places in the United States. Analysis, by Dr. Thomson: Silica, 12·568; magnesia, 51·721; peroxide of iron, 5·874; water, 29·666.

NUSSIERITE. Occurs in crystals, which are almost lenticular. Primary form a rhomboid. It is generally found implanted in mammillary masses. Colour yellow, greyish or greenish. Streak yellowish white, greyish. Fracture somewhat conchoidal. Hardness 4·0. Lustre greasy, feeble. Specific gravity 5·0415. Found in the mine of Nussière, near Beaujeu, department of the Rhône, France. Analysis, by Barruel: Phosphate of lead, 56·40; phosphate of lime, 22·20; chloride of lead, 7·65; arseniate of iron, 6·50.

ŒRSTEDTITE occurs crystallized. Primary form a right square prism. Colour brown. Lustre splendent. Hardness 6·5. Specific gravity 3·628. Found at Arendal, Norway. Analysis: Titaniate of zirconis, 68·965; silica, 19·708; lime, 2·612; magnesia, 2·047; protoxide of iron, 1·136; water, 5·332.

OKENITE (*Dysclasite*) occurs in fibrous masses, having a radiated structure; also imperfectly fibrous, or composed of minute crystals. Hardness 4·5 to 5. Colour white. Specific gravity 2·28. Translucent. Exhibits double refraction. Found at Disco Island, Greenland. Analysis, by Kobell: Silica, 56·99; lime, 26·35; water, 16·65.

OLIGOCLASE occurs crystallized. Primary form an oblique rhombic prism. Colour white, yellowish, and greenish white. Fracture conchoidal, uneven. Hardness 6·0. Transparent, sub-translucent. Specific gravity 2·64 to 2·67. Found at Danvikszoll near Stockholm, Arendal in Norway, &c. Analysis, by Berzelius: Silica, 63·70; alumina, 23·95; lime, 2·05; magnesia, 0·65; soda, 8·11; potash, 1·20; peroxide of iron, 0·50.

OLEGON SPAR (*Carbonate of Iron and Manganese*). Primary form an obtuse rhomboid. Cleavage on the faces of the primary. Colour yellow, reddish-brown. Lustre vitreous. Hardness 4·0. Specific gravity 3·745. Found at Ebrenfriedensdorf. Analysis, by Magnus: Carbonate of iron, 59·99; carbonate of manganese, 40·66.

OLIVENITE (*Olivenerz*) occurs crystallized and massive. Primary form a right rhombic prism. Cleavage parallel to the primary planes. Colour green, generally inclining to olive-green. Streak paler. Fracture uneven. Hardness 3·0. Lustre vitreous. Transparent, translucent. Specific gravity 4·28. Massive varieties, globular, nodular, reniform. Structure fibrous, sometimes granular, compact. Found near Redruth, Cornwall, and near Alston Moor, Cumberland. Analysis, by Richardson: Arsenic acid, 39·9; oxide of copper, 56·2; water, 3·9.

ORPIMENT. [ARSENIC, P. C.]

OXALATE OF IRON. [IRON, OXALATE OF.]

OXALATE OF LIME. [LIME, OXALATE OF.]

OTTRELITE occurs in small rounded brilliant plates, with a perfect basal cleavage. Colour greyish or greenish. Streak pale green. Fracture uneven. Scratches glass with difficulty. Specific gravity 4·40. Found near Ottrez on the borders of Luxembourg. Analysis, by Damour: Silica, 43·34; alumina, 24·63; protoxide of iron, 16·72; protoxide of manganese, 8·18; water, 5·56.

OZOKERITE (*Carburet of Hydrogen*). Colour yellowish brown. Translucent; has a slight bituminous odour, and softens by the heat of the hand, so that it may be kneaded. Fuses readily, emitting a stronger bituminous odour; burns with a clear bright flame without residue. Insoluble in water, only slightly in alcohol, but readily in ether and oil of turpentine. Found in considerable masses at Slanik in the Buchau district of Moldavia, and used for fuel. Analysis: Carbon, 85·204; hydrogen, 13·787. It appears to be similar in composition to Hatchettine.

PARGASITE. [AUGITE, P. C.]

PEKTOLITE occurs on spheroidal masses which have a radiating fibrous structure. Colour greyish. Hardness 4·0 to 5·0. Lustre pearly. Nearly opaque. Specific gravity 2·69. Found in large masses on Monte Baldo, in the Southern Tyrol, and at Monzoni in the Fassa-thal. Analysis, by Von Kobell; Silica, 51·30; lime, 33·77; soda, 8·26; potash, 1·57; alumina and oxide of iron, 0·90; water, 3·89.

PERICLASE occurs crystallized on regular octohedrons. Primary form a cube. Cleavage in three directions parallel to the faces of the cube. Colour obscure green. Hardness equal to felspar. Lustre vitreous. Translucent. Specific gravity 3·78. Found in the lava of Vesuvius. Analysis, by Damour: Magnesia, 92·57; oxide of iron, 6·91; insoluble matter, 0·86.

PEROVSKITE. Primary form the cube. Cleavage parallel to the faces of the cube. Colour grey or iron black. Streak greyish white. Hardness 5·5. Lustre metallic. Opaque. Specific gravity 4·071. Found at Achmatoosk, near Slatoust in the Ural. Analysis, by Rose, shows that it consists principally of titanic acid and lime.

PHARMACOLITE, MAGNESIAN. [MAGNESIAN PHARMACOLITE.]

PHARMAKOSIDERIT (*Cubic Arseniate of Iron, Cube Ore*) occurs crystallized and sometimes massive. Primary form a cube. Cleavage parallel to the primary planes, indistinct. Colour of various shades between light and bottle green, and yellowish and brownish green; streak paler. Fracture uneven; cross-fracture uneven or imperfectly conchoidal. Hardness 2·5. Brittle. Lustre vitreous. Transparent, translucent. Opaque. Specific gravity 2·9 to 3·0. Massive variety amorphous, structure granular. Found in Cornwall, and more rarely at St. Leonard in France, Schneeberg, Schwartzenberg in Saxony, and Franklin, North America. Analysis, by Berzelius: Arsenic acid, 38·00; peroxide of iron, 40·56; phosphoric acid, 0·70; oxide of copper, 0·60; water, 19·57; insoluble matter, 0·35.

PHENAKITE occurs crystallized. Primary form a rhomboid. Cleavage parallel to the primary faces. Colourless; also bright wine-yellow, inclining to red. Hardness above 6·0. Lustre vitreous. Transparent to opaque. Specific gravity 2·969. Found near Freiberg and near Framont. Analysis, by Hartwall: Silica, 55·14; glucina, 44·47; alumina and magnesia, 0·39.

PHOLARITE, a hydrous silicate of alumina, probably similar to HALLOYSITE.

PHOSPHORITE. [APATITE, P. C.]

PHYLLITE. [GIGANTHOLITE?]

PICKENGERITE (*Magnesia Alum?*) occurs in masses composed of long parallel fibres of a silky or satin lustre. Colour white, or, viewed in the direction of the fibres, pale rose-red or light green. Compact, but easily divided parallel with the fibres. Brittle. Specific gravity 1·78 to 1·80. Found at Tarapaca in Peru. Analysis, by Stromeyer: Sulphuric acid, 36·770; alumina, 11·515; magnesia, 3·690; peroxide of manganese, 2·617; chloride of potassium, 0·205; water, 45·739.

PICTITE. [TURNERITE, P. C.]

PIMELITE. [NICKEL, *Ores of*, P. C.]

PINGUITE occurs massive. Colour siskin or oil green; streak lighter. Fracture conchoidal or uneven. Hardness under 2·0. Lustre slightly resinous. Specific gravity 2·315. Feels greasy. Does not adhere to the tongue. Emits a feeble argillaceous odour when struck. Found at Wolkenstein in the Erzgebirge. Analysis, by Kersten: Silica, 36·90; peroxide and protoxide of iron, 35·60; alumina, 1·80; magnesia, 0·45; oxide of manganese, 0·14; water, 25·10.

PISSOPHANE occurs amorphous. Colour pistachio, asparagus, or olive green. Fracture conchoidal. Hardness 1·5. Very fragile. Lustre vitreous. Transparent. Specific gravity 1·93 to 1·98. Found at Garnsdorf, near Saalfeld. Analysis, by Erdmann: Sulphuric acid, 12·593; alumina, 35·228; peroxide of iron, 9·769; water, 41·695.

PLACODINE (*Arseniuret of Nickel*) occurs in crystalline masses and crystallized. Primary form an oblique rhombic prism. Colour bronze-yellow; streak black. Fracture conchoidal, uneven. Hardness 5·0. Lustre metallic. Specific gravity 7·988 to 8·062. Found at the Jungfer mine, Müsen. Analysis, by Plattner: Arsenic, 39·707; nickel, 57·044; cobalt, 0·900; copper, 0·862; sulphur, 0·617.

PLAGIONITE occurs massive and crystallized. Primary form an oblique rhombic prism. Cleavage lateral, perfect, but seldom affording smooth surfaces. Colour blackish lead-grey. Fracture imperfectly conchoidal. Hardness 2·5. Brittle. Lustre metallic. Opaque. Specific gravity 5·4. Found at Wolfsberg in the Harz. Analysis, by Rose and Kudernatsch: Sulphur, 21·53; lead, 40·52; antimony, 37·94.

PLUMBO-CALCITE (*Carbonate of Lime and Lead*) occurs crystallized and in crystalline masses. Primary form a rhomboid. Cleavage parallel to the primary planes. Colour white; streak white. Hardness 3·2. Lustre vitreous, sometimes pearly. Transparent, translucent. Specific gravity 2·829. Found at Wanlockhead, Lanarkshire, Scotland. Analysis, by Johnstone: Carbonate of lime, 92·2; carbonate of lead, 7·8.

POLISHING SLATE (*Polier schiefer*) occurs massive, with a slaty texture. Colour white, yellowish white, or yellow. Brittle. Opaque. Specific gravity 0·59. Found near Bilin in Bohemia, at Zwickau in Saxony, and Auvergne, and is supposed to be a volcanic product. Analysis, by Bucholz: Silica, 83·50; alumina, 4·00; lime, 8·50; oxide of iron, 1·60 water, 9·00.

POONAHLITE occurs crystallized in long slender crystals. Primary form a right rhombic prism. Fracture uneven. Colourless. Hardness 5·0 to 5·5. Transparent, translucent. Lustre vitreous. Found at Poonah in the East Indies. Analysis, by Gmelin: Silica, 45·120; alumina, 30·446; lime 10·197; soda with a trace of potash, 00·657; water, 13·386

POTSTONE (*Compact Talc*). [TALC, P. C.]

PRASE. [QUARTZ, P. C.]

PRASEOLITE occurs imperfectly crystallized in prisms of several sides, with the edges rounded. Cleavage in one direction. Colour light or dark green; streak clear green. Fracture splintery and flat conchoidal. Hardness 3·5. Lustre weak. Specific gravity 2·754. Found near Brevig, Norway, Analysis, by Erdmann: Silica, 40·94; alumina, 28·79; protoxide of iron, 6·96; protoxide of manganese, 0·32; magnesia, 13·73; titanic acid, 0·40; oxide of lead, copper, and cobalt with lime, 0·50; water, 7·38.

Prasilite occurs massive. Composed of loosely adhering fibres. Colour dark leek-green. Hardness not sufficient to scratch selenite, and may be crumbled to powder between the fingers. Specific gravity 2·311. Found on the Kilpatrick Hills. Analysis, by Dr. Thomson: Silica, 38·55; magnesia, 15·55; peroxide of iron, 14·90; alumina, 5·65; lime, 2·55; oxide of manganese, 1·50; water, 18·00. The loss amounting to 3 per cent. is attributed to an alkali.

Psilomelane. [Manganese, *Ores of*, P. C.]

Purple Copper-Ore (*Buntkupfererz*) occurs crystallized and massive. Primary form a cube, the faces of which are usually curvilinear. Cleavage parallel to the faces of the regular octohedron, indistinct. Fracture uneven, conchoidal. Hardness 3. Colour purplish and reddish brown; tarnishes speedily after being cut. Streak greyish black. Lustre metallic. Specific gravity 5·0. Massive variety amorphous, structure compact. Found in Cornwall and most copper-mines. Analysis, by R. Phillips, of a specimen from Ross Island, Lake of Killarney, Ireland: Sulphur, 23·75; copper, 61·07; iron, 14·00; silica, 0·50.

Pyrope. [Garnet, P. C.]

Pyrosklerite. Primary form a rhombic prism, with one perfect cleavage, and another at right angles with this, imperfect. Colour emerald-green and apple-green; streak white. Fracture uneven and splintery. Hardness 3·0. Lustre dull. Translucent. Specific gravity 2·74. Found in the island of Elba, and at Aker in Südermanland. Analysis, by Von Kobell: Silica, 37·03; alumina, 13·50; magnesia, 31·62; protoxide of iron, 3·52; oxide of chromium, 1·43; water, 11·00.

Pyrrhite occurs crystallized in regular octohedrons. No cleavage observable. Colour deep orange-yellow. Hardness equal to that of felspar. Lustre vitreous, brilliant. Transparent on the edges. Found at Alabaschka, near Mursinsk, and at the Azores. It has not been analyzed.

Reussite (*Soda Sulphate of Magnesia*) occurs in flat six-sided prisms, acicular crystals, and mealy efflorescences. Colour snow-white. Fracture conchoidal. Taste saline and bitter. Found in the vicinity of Seidlitz and of Seedschutz in Bohemia. Analysis, by Reuss: Sulphate of soda, sulphate of magnesia, 31·35; muriate of magnesia, 2·19; sulphate of lime, 0·42.

Rhenite (*Hydrous Phosphate of Copper*) occurs crystallized and massive. Primary form an oblique rhombic prism. Cleavage indistinct, parallel to the horizontal diagonal. Colour blackish green, and green of various shades; streak light green. Fracture uneven. Hardness 5·0. Lustre vitreous. Translucent, opaque. Specific gravity 4·2 to 4·3. Found at Rheinbreitbach, near Bonn, on the Rhine. Analysis, by Lunn: Phosphoric acid, 21·687; oxide of copper, 62·847; water, 15·454.

Riolite. [Zinc, *Ores of*, P. C.]

Romeine occurs crystallized in square octohedrons, in groups of minute crystals. Colour hyacinth or honey-yellow. Hardness scratches glass. Found at St. Marcel in Piedmont. Analysis, by Damour: Antimonious acid, 79·17; lime, 16·65; protoxide of manganese, 2·16; protoxide of iron, 1·19; silica, 0·64.

Rosite occurs in small grains, without crystallization. Fracture splintery, and in the larger grains somewhat foliated. Surface of the fracture shining. Colour faint rose-red to brownish red; the former more common. Subtransparent. Hardness 2·5. Specific gravity 2·72. Found in Südermanland. Analysis, by Svanberg: Silica, 44·901; alumina, 34·506; peroxide of iron, 0·688; oxide of manganese, 0·191; potash, 6·628; lime, 3·592; magnesia, 2·498; soda, a trace; water, 6·333.

Rubellan (*Red Mica?*) occurs in small hexagonal plates, not elastic. Colour reddish brown. Hardness 2 to 2·5. Lustre pearly. Transparent, opaque. Specific gravity 2·8 to 3·1. Found at Schima in the Mittelgebirge, Bohemia. Analysis, by Klaproth: Silica, 45; alumina, 10; oxide of iron, 20; lime, 10; potash and soda, 10; volatile matter, 5.

Rutile. [Titanium, *Ores of*, P. C.]

Sahlite. [Pyroxene, P. C.]

Sapphirine occurs granular disseminated in anthophyllite. Colour pale blue or greenish; streak white. Fracture uneven, conchoidal. Hardness 7·0 to 8·0. Lustre vitreous. Translucent. Specific gravity 3·42. Found at Akudlek in Greenland. Analysis, by Stromeyer: Silica, 14·50; alumina, 73·11; magnesia, 16·85; lime, 0·38; oxide of iron, 3·92; oxide of manganese, 0·53; water, 0·49.

Sassolin (*Native Boracic Acid*). [Boron, P. C.]

Schorl. [Tourmalin, P. C.]

Semi Opal. [Opal, P. C.]

Seybertite (*Clintonite, Holmesite*) occurs in masses which are imperfectly crystallized, or present a foliated structure and crystallized. Primary form a right rhombic prism. Cleavage parallel with the primary planes imperfect. Colour copper-red, reddish brown, yellowish brown, and reddish white; streak yellowish grey. Hardness 4·0 to 4·5. Lustre metallic, pearly. Translucent, opaque, in thin laminæ sometimes transparent. Specific gravity 3·07 to 3·10. Found in Orange County, New York, near the village of Amity. Analysis, by Clemson: Silica, 17·0; alumina, 37·0; magnesia, 24·3; lime, 10·7; protoxide of iron, 5; water, 3·60.

Shepardite (*Hydrate of Magnesia*) occurs rarely in hexagonal prisms, generally in laminar masses, and fibrous. Primary form a rhomboid. Colour white, greenish white. Streak white. Lustre pearly. Transparent, translucent. Hardness 1·0 to 1·5. Specific gravity 2·33 to 2·63. Found at Hoboken, in New Jersey, North America, and in the island of Unst, Shetland. Analysis, by Bruce: Magnesia, 70; water, 30.

Sismondine. Crystalline characters not given. Colour deep green, brilliant. Cleaves readily, affording highly lustrous laminæ. Brittle, easily powdered; colour of the powder bright greyish green. Scratches glass. Specific gravity about 3·565. Found at St. Marcel in Piedmont. Analysis, by Delesse: Silica, 24·1; alumina, 43·2; protoxide of iron, 23·8; water, 7·6; trace of titanium.

Smaragdite. [Amphibolite, P. C.]

Smithsonite. [Zinc, *Ores of*, P. C.]

Soapstone. [Steatite, P. C.]

Soda Alum occurs in white fibrous masses. The outer fibres opaque by decomposition, internally transparent and exhibiting a glossy or silky aspect. Not scratched by the nail. Specific gravity 1·88. Found at St. Juan in South America. Analysis, by Thomson: Sulphuric acid, 38·5; alumina, 12·0; soda, 7·5; water, 42·0; with a little silica, lime, iron, and manganese.

Sodaite. [Ekebergite.] Humboldtilite of Monticelli.

Somervillite (*Humboldtilite*) occurs crystallized. Primary form a square prism. Cleavage perpendicular to the axis, very distinct. Colour pale dull brownish-yellow. Fracture uneven. Transparent, translucent. Found in the cavities of matter ejected from Vesuvius. Analysis, by Monticelli and Covelli:—Silica, 43·96; lime, 31·67; magnesia, 8·83; alumina, 0·50; protoxide of iron, 2·00. Kobell found 4·25 per cent. of soda.

Sordawalite occurs massive. Fracture conchoidal. Colour greyish, greenish, or bluish black. Structure compact. Hardness 2·5 to 3·0. Brittle. Lustre vitreous. Opaque. Specific gravity 2·50 to 3·0. Found near Sordawla in Finland, and at Bodenmais in Bavaria. Analysis, by Nordenskiold: Silica, 49·40; alumina, 13·80; peroxide of iron, 18·17; magnesia, 10·67; phosphoric acid, 2·68; water, 4·38.

Spherostilbite occurs in globular masses. Structure radiated. Fracture brilliant. Lustre pearly. Fibres flexible. Hardness above 3·0. Specific gravity 2·31. Found in Iceland and the Faroe Islands. Analysis, by Gehlen, of a specimen from Iceland: Silica, 55·61; alumina, 16·68; lime, 8·17; soda, 1·53; water, 19·30.

Stellite. [Zeolites, P. C.]

Sternbergite occurs crystallized. Primary form a right rhombic prism. Colour pinchbeck-brown, with occasionally a violet tarnish in some of the faces. Streak black. Flexible in thin laminæ. Lustre metallic. Opaque. Hardness 1·0 to 1·5. Specific gravity 4·2 to 4·25. Found at Joachimstal in Bohemia. Analysis, by Zippe: Sulphur, 30; silver, 33·2; iron, 36.

Stilpnomelan occurs in crystalline, lamellar, and fibrous masses. Cleavage in one direction. Colour greenish or black. Streak greenish to liver brown. Lustre vitreous. Hardness 3·0 to 4·0. Specific gravity 3·27 to 3·4. Found at Obergrund and Zinkmantel, in Silesia. Analysis, by Rammelsberg: Silica, 46·500; protoxide of iron, 33·892; alumina, 7·100; lime, 0·197; magnesia, 1·888; water, 7·00 = 97·477.

Stilbite. [Zeolites, P. C.]

Suzannite (*Sulphato-tricarbonate of Lead*) occurs crystallized in two forms, viz. an acute rhomboid and a right rhombic prism. Cleavage of both forms perpendicular to the axis, and very distinct. Colour white, grey, pale yellow, or green. Streak white. Hardness 2·5. Transparent, translucent.

Specific gravity 6·2 to 6·4. Found at Lead-hills, in Scotland. Analysis, by Brooke: Carbonate of lead, 72·5; sulphate of lead, 27·5.

Stromnite (*Barytostrontianite*). [Strontium, P. C.]

Tabular Spar. [Wollastonite, P. C.]

Tellurbismuth (*Telluret of Bismuth*). [Tellurium, *Ores of*, P. C.]

Troostite (*Ferruginous Silicate of Manganese*) occurs crystallized. Primary form a rhomboid. Colour greenish, yellow, grey, and reddish-brown. Fracture conchoidal. Hardness 5·5. Brittle. Lustre vitreous, inclining to resinous. Translucent to transparent. Specific gravity 3·014 to 3·034. Found at Franklin, New Jersey, U. S. Analysis, by Dr. Thomson: Silica, 30·650; protoxide of manganese, 46·215; peroxide of iron, 15·450; carbonic acid and water, 7·300.

Tryphiline occurs crystallized and massive. Primary form a right rhombic prism. Massive variety has a coarsely lamellar or crystalline structure, with cleavages parallel to the planes of a right rhombic prism. Colour greenish grey. Streak greyish white. Hardness 5·0. Translucent in thin pieces. Specific gravity 3·6. Found at Bodenmais in Bayern. Analysis: Phosphoric acid, 41·47; protoxide of iron, 48·57; protoxide of manganese, 4·70; lithia, 3·40; silica, 0·53; water, 0·68.

Uranotantalite (*Columbate of Protoxide of Uranium*) occurs in flattened grains, occasionally with traces of crystallization. Lustre of the surface of fracture shining and submetallic. Hardness 5·5. Streak dark reddish-brown. Opaque. Specific gravity 5·625. Found in the Ilmen mountains near Minsk, in the Ural.

Uwarowite (*Chromium Garnet*) occurs crystallized in rhombic dodecahedrons. Colour emerald green. Hardness 7·5. Lustre vitreous. Nearly transparent. Specific gravity 3·41. Found at Bessersk, in the Ural mountains. Analysis, by Komonen: Silica, 37·11; alumina, 5·88; oxide of chromium, 22·54; protoxide of iron, 2·44; limo, 30·34; magnesia, 1·10; water, 1·01.

Vauquelinite. [Chromium, *Ores of*, P. C.]

Villarsite. Primary form a rhombic prism. Colour yellowish green. Fracture granular. Hardness 3·0 to 3·5. Subtransparent. Found at Traversella in Piedmont. Analysis, by Dufresnoy: Silica, 39·61; magnesia, 43·37; protoxide of iron, 3·59; protoxide of manganese, 2·42; lime, 0·53; potash, 0·46; water, 5·80.

Volborthite (*Vanadiate of Copper*) occurs in small clusters of olive-coloured crystals, sometimes united into globular masses. Streak green, almost yellow. In thin splinters transparent, with a vitreous lustre. Hardness, scratches calcspar. Specific gravity 3·55. Found on examining some Siberian copper-ores. Von Volborth, who examined it, has not given an exact analysis.

Voltaite (*Iron Alum*) occurs crystallized in regular octohedrons. Colour brown or black. Found at the Solfatara near Naples. Analysis, by Dufresnoy: Sulphuric acid, 45·67; protoxide of iron, 28·69; alumina, 3·27; potash, 5·47, water, 15·77.

Wagnerite (*Fluophosphate of Magnesia*). Primary form an oblique rhombic prism. Fracture uneven. Colour yellow, of different shades; often greyish. Streak white. Hardness 5·0 to 5·5. Lustre vitreous. Translucent. Specific gravity 3·11. Found in the valley of Holgraben in Salzburg. Analysis, by Fuchs: Phosphoric acid, 41·73; hydrofluoric acid, 6·50; magnesia, 46·66; oxide of iron, 5·00; oxide of manganese, 0·5.

Warwickite (*Fluoride of Titanium and Iron*). Primary form an oblique rhombic prism. Cleavage parallel to the longer diagonal, perfect. Colour dark hair brown to iron grey, and often with a copper-red tinge on the face of perfect cleavage. Decomposing crystals are nearly iron black, with a faint tinge of purple. Fracture uneven. Hardness 5·5 to 6·0. Brittle. Lustre metallic-pearly on the cleavage surface; of other surfaces, vitreous or subvitreous, often nearly dull. Specific gravity 3·0 to 3·29. Found near Amity and Edenville, in the State of New York. Analysis, by Shephard: Titanium, 64·71; iron, 2·14; yttrium, 0·80; fluorino, 27·33.

Washingtonite (*Ilmenite*). [Titanium, *Ores of*, P.C.]

Websterite [*Aluminite*, P. C. S.]

Weissite occurs in oblique rhombic prisms. Colour ash-grey or brownish. Presents only feeble traces of cleavage. Fracture even or coarse granular. Hardness, scratches glass, but is scratched by steel. Lustre pearly or hazy. Scarcely translucent. Specific gravity 2·80. Found at Fahlun, Sweden. Analysis, by Wachtmeister: Silica, 53·69; alumina, 21·70; magnesia, 8·99; protoxide of iron, 1·43; protoxide of manganese, 0·63; potash, 4·10; soda, 0·68; oxide of zinc, 0·3; water, with a little ammonia, 3·20.

Wernerite. [Scapolite, P. C.]

Wichtine. Cleavage parallel to the sides of a rectangular prism. Scratches glass. Colour black. Fracture flat conchoidal. Found at Wichty in Finland. Analysis, by Laurent: Silica, 56·3; alumina, 13·3; protoxide of iron, 13·0; peroxide of iron, 4·0; soda, 3·5; lime, 6·0; magnesia, 3·0.

Willemite (*Anhydrous Silicate of Zinc*). [Zinc, *Ores of*, P. C.]

Wöhlerite occurs in angular grains, and in tabular crystals; form undetermined. Cleavage distinct in one direction. Colour light yellow, wine-yellow, honey-yellow, brownish yellow. Streak yellowish white. Fracture more or less conchoidal, splintery. Hardness 5·5. Lustre vitreous. Subtranslucent. Transparent. Specific gravity 3·41. Found in an island near Brevig in Norway. Analysis, by Scheerer: Silica, 30·62; columbic acid, 14·47; zirconia, 15·17; lime, 26·19; soda, 7·78; oxide of iron, 2·12; protoxide of manganese, 1·55; magnesia, 0·40; water, 0·24.

Worthite occurs in rolled masses, having a foliated crystalline structure, and sometimes presenting very small apparently 4-sided prisms or plates. Colour white. Hardness 8·5. Lustre vitreous. Translucent. Specific gravity, 3·1. Found near St. Petersburg, and on the shores of the Bay of Finland. Analysis, by Dr. Hess: Silica, 40·79; alumina, 53·06; magnesia, 0·88; water, 4·63.

Xenotime occurs crystallized. Primary form a right square prism. Cleavage lateral, perfect. Colour yellowish brown. Streak pale brown. Fracture uneven and splintery. Hardness 4·25 to 5·0. Lustre resinous. Opaque. Found at Lindesnaes in Norway. Analysis, by Berzelius: Phosphorio acid, 33·49; yttria, 62·58; subphosphate of iron, 3·93.

Yellow Copper-Ore (*Copper Pyrites*) occurs crystallized and massive. Primary form a square prism. Common form a tetrahedron. Fracture conchoidal. Colour brass yellow, frequently with a violet and purple tarnish on the surface. Streak greenish black. Lustre metallic. Hardness 3·5 to 4·0. Specific gravity 4·17. Found plentifully in Cornwall, and in most copper-mines. Analysis, by Rose: Copper, 33·12; iron, 30; sulphur, 36·52.

Yttrocerite. [Yttrium, P. C.]

Yttrotantalite. [Yttrium, P. C.]

Zeagonite [Phillipsite, P. C.]

Zoisite. [Epidote, P. C.]

Zurlite occurs crystallized and massive. Primary form a cube or square prism. Cleavage indistinct. Colour asparagus-green, inclining to grey. Fracture conchoidal. Hardness about 6·0. Lustre resinous. Opaque. Specific gravity 3·27. Found on Vesuvius.

MINES. Mines are properly openings in the ground from which any thing is dug. Until an opening is made, the name is not properly applied, though the term is now generally used to signify coal, lead, iron and so forth, before an opening is made for digging them out.

Mines belong to the tenant in fee-simple of the land, with the exception of gold and silver mines, which belong to the king by his prerogative, but by 1 W. & M. c. 30, a mine of copper or tin is not to be considered a royal mine, though silver be extracted from the ore. The owner of land in fee-simple is the owner of everything which lies in a perpendicular direction under the surface to any depth. A tenant for life, unless his estate is without impeachment of waste, cannot dig earth, lime, clay or stone, except for the repair of buildings or the manuring of the land. In fact the general principle is that the land, which term comprehends everything in it or that is permanently attached to it, cannot be taken away by any other person than the tenant in fee-simple or a tenant in tail. Accordingly a tenant for life cannot open a new mine, but he may work mines which are already open, and he may open new shafts for working veins of coals which have been already worked. A tenant in tail has an estate of inheritance, and incident to it the power of committing waste, as by cutting down timber or opening mines.

If a man who has an estate in fee leases the land with the mines upon it, the lessee is thereby empowered to dig for the minerals; and if he leases lands on which mines are already open, the lessee may work them.

The freehold of all copyhold lands is vested in the lord, and it is a legal consequence that he has the freehold of the mines. In some cases a copyholder of inheritance has by the custom of the manor a right to the timber, and the lord has no right to dig mines, unless there be a custom which gives him the right.

If a man works mines under his own land and follows the ore or other substance under his neighbour's land, he is a trespassor.

The act 7 & 8 Geo. IV. c. 30, § 6, 7, enacts certain punishments for malicious injuries done to mines. [MALICIOUS INJURIES, P. C.]

A partnership for working a mine is subject to the same legal rules as any other partnership. [PARTNERSHIP, P. C.]

MIREVELT. [MIEREVELT, P. C. S.]

MITCHELL, THOMAS, was born on the 30th of May, 1783, in London, and was the son of a riding-master. At the age of seven he was admitted into Christ's Hospital, where he remained until the year 1802, when he went to Pembroke College, Cambridge, on one of the exhibitions of the Hospital. In 1806 he took his degree of B.A., and the distinguished manner in which he acquitted himself at college induced the governors of Christ's Hospital to present him with a handsome silver cup. He did not however obtain a fellowship, as he had hoped, for no more than two persons educated at the same school are allowed to hold fellowships in Pembroke College at the same time. This regulation, which was then made and carried into effect for the first time, deranged all Mitchell's schemes, who had determined to devote himself to philological pursuits. A few years afterwards however his acquirements as a scholar procured him a fellowship at Sidney Sussex College, Cambridge. Mitchell never married, and if he had taken holy orders he might have remained in the enjoyment of that fellowship for life, and would have been spared the cares and anxieties for a livelihood to which he was afterwards exposed. But he never took orders from a fear of the great responsibilities of the pastoral office, and consequently, after a limited number of years, he was obliged by the statutes of the college to vacate his fellowship. He afterwards earned his livelihood by private tuition and by writing for the press: he was engaged for ten years as tutor in private families. In 1813 he commenced a series of essays for the 'Quarterly Review' on Aristophanes and Athenian manners, and this led him to translate some of the plays of Aristophanes into English verse: his translation appeared in 2 vols. 8vo., 1820-22. His articles in the 'Quarterly Review' impressed the patrons of a vacant Greek chair in one of the Scotch universities with so much respect for his classical attainments, that they invited him to accept the situation; but as he would have had to sign the Confession of the Scotch Kirk, which was to him an insurmountable obstacle, he declined the lucrative office, notwithstanding his poverty. During the last twenty years of his life Mitchell lived with some of his relations in the county of Oxford, and occasionally superintended the publication of the Greek works which were from time to time printed at the Clarendon press. During the years 1834-38 he edited, in separate volumes, five of the plays of Aristophanes, with English notes; and in 1839 he began an edition of Sophocles, likewise with English notes; but after the first three tragedies had appeared, the publication was suspended in 1842, because English notes were thought objectionable; and Mitchell now had no other employment but what the Clarendon press might casually offer. The almost entire cessation of literary income not only caused him great pecuniary difficulties, but broke down his health and spirits. His friends became alarmed about him, and made his condition known to Sir Robert Peel, who immediately placed at his disposal the sum of 150*l*. from the royal bounty fund. In 1843 the publication of Sophocles was resumed, and the remaining four plays were likewise edited by Mitchell, though with briefer notes than the preceding three. In 1844 he undertook the publication of a minor edition of a 'Pentalogia Aristophanica,' with short Latin notes, and had nearly completed his task when he died suddenly, on the 6th of May, 1845, at his house at Steeple Aston near Woodstock. His health had long been in a weak state, but his death was unexpected.

The works which Mitchell edited and commented upon contain evidence that he was a Greek scholar of considerable eminence; but his notes are often irrelevant, and the text of his author is seized upon to furnish opportunities of showing his strong political opinions: he had a passionate antipathy to the Athenian democracy and democratical forms of government in general.

(*Classical Museum*, vol. iii. p. 213, &c.)

MITE. [ACARUS, P. C.]

MITFORD, WILLIAM, the eldest son of John Mitford, Esq., of Exbury in Hampshire, was born in London on the 10th of February, 1744. In his boyhood he spent some time at the school kept at Cheam in Surrey by the well-known Mr. Gilpin, who afterwards owed to him the living of Boldre. Ill health caused his removal from school about the age of fifteen; and it seems to have been with very insufficient preparation that he became a student of Queen's College, Oxford. His time at the university was idly spent; and he left it without taking a degree. Perhaps the most important influence exercised on his mind by his academical residence was derived from the Vinerian lectures of Blackstone, which he attended regularly. He studied law for a time in the Middle Temple, but found the study distasteful; and, having succeeded to the family estate in 1761, on his father's death, he abandoned the profession to his younger brother, who afterwards became Lord Redesdale. In 1766 Mr. Mitford married; and for seven years afterwards his time was chiefly spent in the retirement of his country-seat, where his early predilection for the Greek language and literature grew into a settled passion. In 1769 he became a captain in the South Hampshire militia, of which the historian Gibbon was then major; and the conversation and advice of Gibbon confirmed, if they did not prompt, his resolution to undertake a history of Greece. His first work, 'An Inquiry into the Principles of Harmony in Languages, and of the Mechanism of Verse, Modern and Ancient,' appeared in 1774, and was reprinted in 1804. In this early part of his life, too, he published 'A Treatise on the Military Force, and particularly the Militia, of this Kingdom.' In 1776 he lost his wife, and was himself seized with a dangerous illness, on his recovery from which he left England to spend the winter at Nice. Before leaving home he had become acquainted with the French scholars Villoison and De Meusnier: the former introduced him to the Baron de Sainte Croix; and his intercourse with these young and ardent students matured his own literary ambition. On his return home, however, he allowed public duties to claim frequent precedence. He acted as a county magistrate, and in 1778 was appointed Verdurer of the New Forest. He retained his commission in the militia, succeeded to Gibbon's lieutenant-coloneley in 1779, and in 1805 was appointed to the coloneley, which he resigned in the course of the next year. From 1785 till 1790 he sat in the House of Commons as member for Newport in Cornwall; from 1796 till 1806 he represented Beeralston, a nomination borough of his maternal kinsman the Duke of Northumberland; and from 1812 till 1818 he was member for New Romney. His parliamentary appearances were chiefly confined to two or three speeches on the militia laws. In 1802 he succeeded, through his mother, to the Revely estates in Yorkshire. But his paternal estate on the borders of the New Forest continued to be his country residence. He died there on the 8th of February, 1827.

His 'History of Greece' was written and published in successive portions, the dates of the first edition, in quarto, being the following: vol. i., 1784 (second edition, 1789); vol. ii., 1790; vol. iii., 1797; vol. iv., 1808; and vol. v., 1818. It closes with the death of Alexander the Great; and the author, enfeebled by age and partly blind, was unable to execute his intention of continuing it to the subjugation of Greece by the Romans. In 1815 appeared an octavo edition of the volumes which had previously been published; and in 1829 there appeared a new edition of the whole work, in eight octavo volumes (since reprinted), with an introduction by his brother, Lord Redesdale, furnishing some particulars of the author's life, but chiefly taken up in vindicating the political opinions expressed in tho work. These opinions have exposed Mr. Mitford's History to much animadversion. He is determinedly anti-democratic; and this turn of thinking affects seriously the fairness of the estimate which he forms both of characters and of events. His partisanship is especially palpable in his account of the war between the Greeks and Philip of Macedon. Philip is with him a perfect king, hero, and statesman. Demosthenes is a dishonest and malignant demagogue, and the Athenians are a horde of treacherous miscreants. Yet tho author's research and perspicacity have thrown much light upon this as well as upon other parts of Grecian history. He has elucidated with remarkable success the state of political parties in some of the severest struggles of Greek politics; and he has suggested new and more accurate views of many particular events. He has been led to these results mainly by his severely critical way of estimating the antient authorities, and by his systematic endeavour to gain his knowledge from cortemporary sources. Accordingly his history will always be valuable to the classical student, notwithstanding the bias above noticed, and in spite also of its deficiency both in philosophical reflection and in animation of narrative. In style indeed the work is exceedingly faulty; and the few corrections made in the last edition have removed only the least of the technical faults, the perverse affectation of the orthography. A treatise on the religions of Antient Greece and Rome, which he published late in life, in a small octavo volume, was regarded by him as a supplement to his History, and would probably have formed a part of it had he been able to complete his original design.

MODELLING. Modelling in clay is so completely a practical art, and depends so much on the experience and formative skill of the modeller, that beyond a few remarks on the necessary consistency of the clay, nothing more can be given here than an account of the nature and uses of the tools, and some description of the sculptor's process.

The tools, called modelling tools, are made of wood and wire, but no tool is more useful than the finger; indeed tools have been invented as mere aids to the fingers, and are designed only to do what they cannot perform. Wire tools are the most useful, being fashioned into loups of various shapes and sizes, round and angular, and fixed into wooden handles. They accomplish any required form without driving the clay on to any already modelled part, the superfluous clay remaining in its place while the wire passes under it and until the tool is removed, when it either falls of its own weight, or is removed by the slightest touch of the modeller. The wire tools are most efficient when applied to concave surfaces, especially those in the close or narrow folds of draperies: the wire is sometimes notched or indented, to give a rough surface to the clay. The wooden tools are made of box and ebony, of various shapes and sizes—curved, straight, pointed, rounded, and flat and broad; the broad tools being notched, and designed chiefly for working the large convex masses, or large folds in drapery. In modelling a bust, especially the features, great nicety is required, and the modeller must be particularly careful not to injure what is already done, by retouching with the tool while clay is adhering to it, or he may risk the complete destruction of his work: the adhering clay will drive up the surface. A good method to guard against this accident is to keep the wooden tools which are used for the finer work soaked in oil; the clay is then not liable to adhere, and much time is accordingly saved in finishing the model. The above is perhaps, without practical demonstration, all that can be usefully said about the working tools.

The clay used is common potters' clay, but should be of the best quality. It must be so wet that it will not stand in a mass much higher than its own width without support. The clay adheres much more to the tools when wet, but it is at the same time much more easily and quickly worked, a matter of great consequence, as the patience of the artist is less tried, and some expenditure of time is saved. The supports for the clay are a most important consideration, for if not properly attended to, the finished work, the fruits of months of labour, might suddenly fall to pieces by its own weight. This accident happened to Don José Alvarez, a celebrated Spanish sculptor, while at Paris. He modelled, about the year 1805, a colossal statue of Achilles receiving the fatal arrow into his heel, which, owing to the insufficient support of the clay, fell to pieces shortly after it was finished: it was much admired by the connoisseurs of Paris, but Alvarez had not courage, or wanted opportunity, to restore it. This accident might certainly have been prevented by proper attention to the supports of the clay while the model was in progress, for though in large models this is a work of great care and labour, it is always practicable. The support of a figure of the heroic or ordinary size (seven feet) is comparatively easy, but this also exacts strict attention, especially if in any very active or unusual attitude. Sculptors generally model figures of the ordinary size upon a bench or stand called a banker, about thirty inches high, and about thirty inches square,—for a bust it must of course be much higher; above this a solid circular plinth is fixed on a wooden box, and is revolved upon six or more wheels, or what are better, short slightly conical rollers, fixed to the plinth near the circumference: the plinth moves more easily on such rollers than wheels, and the rollers afford a more solid support and last longer. A revolving plinth is necessary to enable the sculptor to see his work on all sides in any light, and it enables him to work on all parts, in one spot, or in the same light. On the centre of the plinth there must be fixed vertically a strong iron bar, about the height of a man, and from about six to ten inches in circumference, according to the weight of the figure; it must necessarily be strong and firmly fixed, as it is the main support of the whole skeleton of supports. In loosely draped figures, which are proportionally heavy, it is advisable to fix a vertical beam of wood to the main iron bar; for though the bar will keep the clay perpendicularly in its place, it is no provision against the sinking of a great mass; and the quantity used in some figures, even of the heroic size only, amounts to about two tons. Two cross pieces of wood must be fixed to the main bar at the shoulders and the loins, from which the supports of the arms and legs must be started; and a third piece may be fixed in the middle to diminish the weight of clay: the supports of the legs must be bars, straight or bent, according to the position of the legs; but the supports of the arms, when not detached from the body or drapery, may generally be made of twisted thick copper wire, small pieces of wood being twisted in with it at short intervals and at right angles, like the pieces of paper in the tail of a boy's kite. The fingers, if separated, will require similar care; indeed the clay should be gradually built up against a complete skeleton of supports, and sufficiently strong not to yield in the least to the weight of the clay when the model is finished. The building of such a skeleton for a figure of the heroic size is often the work of a week or more, and it would be always advisable for the young sculptor, in modelling his first figure, to procure some experienced hand to construct his skeleton of supports for him. If an arm is slightly elevated, and detached from the figure, the support might be so contrived as to allow the arm to be removed at pleasure, which would enable the sculptor to model the part beneath it with much greater ease, and would considerably diminish the risk of injury to the arm. The contrivance is easily accomplished, for nothing more is required than a pipe or tube in the shoulder support, which could receive and hold firmly the skeleton support of the arm, which might be a bar of wood or of metal; or merely thick or twisted wire, when of a small size. In modelling a bust very little support is necessary, an upright piece of wood with a cross bar at the shoulders being quite sufficient; but a small cross bar at the head would do no harm.

Another essential part of modelling is preserving the moisture of the clay, which should be always uniform if possible; it must never be allowed to dry, and it can be kept moist with very little trouble. While the modeller is at work, and the figure is exposed, especially in warm weather, he should repeatedly sprinkle it with water. A plasterer's brush is the best instrument for this purpose, and much superior to a syringe or the mouth, which some sculptors formerly used to apply as a squirt, even in the presence of their sitter, when modelling a bust: Nollekens, according to his biographer Smith, adopted this elegant method of keeping his clay moist while modelling the bust of George III., and in the king's presence. Bacon, on a similar occasion, used a silver syringe. At night time, or when the artist is not at work on the model, it should be covered over with a wet cloth or sheet. A figure may be kept moist for a long period without adding water, provided the air be kept away from it; this may be done by an oil-silk or any air-proof bag, which can be made fast to the plinth of the banker by clay. Sculptors generally model flowing draperies from lay-figures. When the model is complete, the next process is to take the cast, to work the marble from, or to make other casts from. The whole model, while wet, must be covered, in two or three masses, or more if necessary, with plaster of Paris; when this is fixed and dry, the whole may be separated at the joints, without any regard to the preservation of the model, for when the mould is taken the model is no longer of any value. When the clay is completely removed from the mould, the component parts of the mould must be again put together, and in the place of the original clay it must be filled with plaster of Paris, and when the cast is well set, the mould may be carefully broken off in fragments, and the cast is exposed, and complete, the finished work. If casts of it are required, a new working mould, or *safe mould*, as it is termed, must be taken, in many parts; and if the figure is to be executed in marble, it is copied by the carvers, with the assistance of the pointing-machine, of which the most complete is that invented and used by W. C. Marshall, A.R.A. It is so contrived that it can diminish or increase the scale of the model with perfect ease and nicety. It is always best to make the model of the size of the intended figure if practicable, because any error in a small model becomes multiplied in a larger one in proportion to the difference of size. Flaxman was in the habit of making small models, and he had in consequence sometimes immense labour to go through to diminish errors in the full-sized marble work: it is hardly possible to completely rectify them.

The antient sculptors used to bake their models, but this is not so good a plan as making plaster casts from them, though less troublesome and much cheaper: the clay in drying shrinks, and is apt to crack, and certainly never comes out of the oven the same shape that it was when put into it, or at least when originally modelled. These baked models are called terra-cotta (*baked earth*) figures, are extremely numerous, and are generally of small dimensions, but there are a few of a large size in various European museums. There are four at Naples which were found at Pompeii; and the inferiority of these works is some proof of the advantage of the modern method of taking plaster casts from the models over the antient system of baking them, for the errors in the proportions of these works are probably to a great extent due to the shrinking of the clay in the oven. The antients made also moulds of clay, which they likewise baked, and they formed their casts by the pressure of clay into these: this practice of pressing clay, or any malleable substance, into a mould is still occasionally had recourse to in works of fine art, and constantly in the potteries, and by frame-makers.

The antients used also wax for casting and in forming their models, especially those of the small bronzes, which are still so exceedingly numerous, and it is the common material used by goldsmiths and medalists. Modelling wax is prepared by melting virgin wax with a very small quantity of Venice turpentine and flake-white in fine powder: if coloured wax is required, a colour in fine powder must be substituted for the flake-white. The tools used in modelling in wax are made of wood and ivory, and have the same shapes as those of wood, already spoken of, for modelling in clay. Other processes in the art of sculpture will be found explained in the articles BRONZE; FOUNDING; SCULPTURE, P. C.; and WAX MODELLING, P. C. S.

MO'DENA or MU'TINA, TOMMA'SO DA, a painter of Modena, of the fourteenth century, who has been claimed by some German writers, without any better foundation than the possession of some of his works, for Bohemia. He appears to have been at Prague in the time of the Emperor Charles IV., who was a patron of the arts, but it is also quite possible that the emperor bespoke the works in his possession of the painter at Modena. The name of Tommaso da Modena is of more importance than it otherwise would have been on account of various pretensions which his works have given rise to. The altar-piece, in three compartments, of the Virgin and Child, with Saints Wenceslas and Palmatius, patrons of Bohemia, formerly at Carlstein, but now in the gallery of the Belvedere at Vienna, was said to be an oil painting, and, in Von Mechel's catalogue, to have been painted in 1297; it was therefore eagerly caught at by writers of Germany and Italy, to confute Vasari, to vindicate the title of their respective countries in opposition to the Flemish claim. This picture however bears no date, and more recent chemical analysis has shown that it is a *tempera*, and not an oil painting. The figures are half-length, about half the size of life, and are painted upon a gold ground; and the picture bears the following inscription:—

Quis opus hoc finxit? Thomas de Mutina pinxit,
Quale vides lector Barisini filius auctor.

Von Mechel read Rarisini, but some documents mentioned by Federici, Tiraboschi, and Lanzi show that Barisini should be the reading; Barisino being the name of Tommaso's father, and his own full name accordingly Tommaso di Barisino da Modena.

There is an extensive work, a series of many portraits, in the chapter-house of the Dominicans at Trevigi, which Fra Federici, a Dominican, has had engraved for his account of the antiquities of Trevigi—'Memorie Trevigiane su le Opere di Disegno.' They were painted in 1352, and are accompanied by the following inscription:—Anno Domini MCCCLII. Prior Travisinus ordinis prædicatorum depingi fecit istud Capitulum, et Thomas Pictor de Mutina pinxit istud. These works are completely in the style of their time, but rather above the standard than otherwise.

MODESTI'NUS, HERENNIUS, a Roman classical jurist, was apparently a pupil of Ulpianus. He lived under the Emperor Alexander Severus, and was one of his legal advisers (consiliarii); he also taught law to the younger Maximinus (Jul. Capitol., *Maximin. Jun.* 1). Modestinus often cites Ulpianus and Paulus. The Florentine Index enumerates the following works of Modestinus: nineteen books of Responsa, twelve books of Pandects, ten books of Regulae, nine books of Differentiae, six books of Excusationes, four books on Poenae. The work on Excusationes was written in Greek (*Dig.* 27, tit. 1, *De Excusationibus*). Nine other works by Modestinus, in single books, are enumerated in the Florentine Index.

The period of Modestinus is also determined by an inscription, which contains the judgment in a suit which was prosecuted some time between A.D. 227 and 245. The inscription was first printed by Fabretti, in his work on Inscriptions (p. 278). Modestinus is mentioned in a rescript, of the year A.D. 239, of the Emperor Gordianus. There are 345 excerpts from Modestinus in the Digest.

The compilers of the Digest have made a few excerpts from two writers posterior to Modestinus. These writers are Hermogenianus and Aurelius Arcadius Charisius. Modestinus is cited by Charisius (*Digest*, 50, tit. 4, s. 18).

MODUS. [TITHES, P. C.]

MOEHRINGIA, a genus of plants named after Paul Henry Gerard Moehring, a German physician, author of 'Hortus Proprius,' and other works. This genus belongs to the natural order Caryophylleæ, and has 5 sepals, 4 or 5 petals, either entire or slightly emarginate; 8 to 10 stamens, 2 or 3 styles, the capsule opening with 4 or 6 valves; the seeds numerous, with an appendage at the hilum. The species are alpine plants with the habit of Arenaria.

M. trinervia has ovate acute stalked 3-5-nerved leaves, the upper ones sessile, the petals shorter than the calyx, the sepals lanceolate acute 3-ribbed; the intermediate rib stronger and rough. This plant was formerly referred to Arenaria, but it may be distinguished from that genus by the appendage to the hilum of the seed. This plant is found in damp shady places, and is a native of Great Britain. Four other species of this genus are described by Koch in his 'Flora Germanica;' —*M. muscosa*, *M. prona*, *M. polygonoides*, and *M. villosa*.

The species are alpine plants, and adapted for cultivation on rockwork or in small pots. They may be propagated by dividing them at the root. They are best grown in pots, in a mixture of sand, loam, and peat.

(Babington, *Manual*; Don, *Gardener's Dictionary*.)

MOENCHIA, a genus of plants named after Conrad Moench, professor of botany at Marburg, who wrote several works on botany; amongst others, 'Enumeratio Plantarum Indigenarum Hassiæ, præsertim inferioris,' Cassel, 1777, 8vo.; also a work on the cultivation of North American forest-trees in Germany.

The genius Moenchia belongs to the natural order Caryophylleæ, and has 4 erect sepals, 4 entire petals, 4 stamens, a many-seeded capsule opening at the end with 8 teeth.

M. erecta is the only British species. It is a small glaucous plant growing in dry gravelly and sandy places.

(Babington, *Manual*.)

MOITTE, JEAN GUILLAUME, Chevalier, the son of the engraver P. E. Moitte, was a distinguished French sculptor, and was born at Paris, in 1747. He was first the pupil of Pigal, after whose death he studied under Lemoyne. In 1768 he obtained the grand prize in sculpture for a statue of David carrying the head of Goliath, and he went, as entitled in consequence, to complete his studies at the French Academy at Rome; the Roman climate however proved quite unfit for his constitution, and he was forced to return to Paris.

Moitte has executed many excellent bas-reliefs and figures, and some equestrian statues; but he left many models, and among them his principal works, unfinished at his death, as the great bassi-rilievi for the column of Boulogne, and the equestrian statue of General d'Hautpoul, a model in plaster, made for the French government. Moitte was a member of the old French Academy of Painting and Sculpture, and afterwards of the Institute of France, and a Chevalier of the Legion d'Honneur. He died in 1810.

The following are some of his principal works:—A marble statue of Cassini; another of General Custines; a basso-rilievo for the tomb of General Leclerc in the Pantheon; a Vestal sprinkling the holy water; Ariadne; a sacrificer; the large basso-rilievo of the front of the Pantheon, representing the Father-land, or La Patrie, crowning civic and military virtues, which was removed after the Restoration; a basso-rilievo in the court of the Louvre, representing History inscribing l'An VI. and the name of Napoleon with his French title of Le Grand; other bassi-rilievi for the barriers of Paris, and the Château de l'Ile Adam, and the colossal figures of Bretagne and Normandie at the barrier des Bons Hommes; an equestrian statue of Napoleon; and the basso-rilievo of the warrior devoting himself to his country, or France surrounded by virtues and calling her sons to her defence, now in the gallery of the Luxembourg: it was ordered in 1798 for the vestibule of the Luxembourg facing the garden.

(Gabet, *Dictionnaire des Artistes de l'Ecole Française*, &c.)

MOLI'NIA, a genus of grasses belonging to the tribe Festucineæ. It has unequal glumes without lateral ribs, shorter than the lanceolate spikelet of 2 or 3 semicylindrical flowers and a subulate rudiment of another. The paleæ hardening on the loose fruit, and the styles terminal. There is one species which is British—

M. cærulea, which has an erect elongate narrow panicle, spikelets from 1- to 3-flowered; the outer palea 3- rarely 5-nerved, downless, the upper part of the stem naked. The leaves are long, linear, and alternated. It grows on wet heaths in alpine situations. This species is the *M. depauperata* of Lindley.

(Babington, *Manual of British Botany.*)

MOLYN, PIETER. [TEMPESTA, P. C.]

MONCALVO. [CACCIA, GUGLIELMO, P. C. S.]

MONCREIFF, SIR HENRY, a divine, and ecclesiastical leader in the church of Scotland, was born at Blackford, in Perthshire, on the 6th of February, 1750. His father Sir William Moncreiff, though a cadet of the family, succeeded to the baronetcy by the failure of the elder line, when he was minister of Blackford, in 1744. Sir Henry was the sixth of his family that had belonged to the clerical profession. He studied at Glasgow and Edinburgh, and was ordained a minister on the 15th of August, 1771. Though he was probably the only man of rank who ministered in the church of Scotland, he was as strongly imbued with the spirit of the Presbyterian policy as those, by far the most numerous class in that church, whom the profession was the means of raising from the more humble grades of society. He had a commanding appearance, was gifted with a powerful argumentative oratory, and was zealous and learned. With such advantages, personal and social, he naturally occupied the first rank in the church. He was for some time his father's successor as minister of Blackford, and in 1775 he was appointed to the charge of St. Cuthbert's, in Edinburgh, where he remained till his death on the 14th of June, 1827. He was frequently moderator of the General Assembly, and his name was conspicuous in nearly all the ecclesiastical discussions connected with the church of Scotland during his ministry in Edinburgh. He was the author of many pamphlets connected with these questions. In 1815 he published 'Discourses on the Evidence of the Jewish and Christian Revelations, with Notes and Illustrations,' and in 1818 an 'Account of the Life and Writings of Dr. John Erskine.' [ERSKINE, JOHN, P. C. S.] His Sermons, of which there had been some separate publications during his life, were collectively published after his death (1829-1831) in three volumes 8vo., with a short memoir of the author, by his son Lord Moncreiff.

MONESES (from μόνος, sole, or alone), a genus of plants belonging to the natural order Ericaceæ and the tribe Pyroleæ. It has a 5-toothed calyx; 5-lobed corolla; 10 inclined stamens; the anthers dehiscing at the base by two holes, the cells elongated and tubular; the stigma 5-toothed; the capsule 5-celled; the valves dehiscing from the apex, destitute of tomentum. There is but one species of this genus, *M. grandiflora*. It has a creeping root; large solitary terminal drooping open white flowers, nearly an inch broad; very large stigmas. It is a native of Europe, Asia, and North America, in Alpine mossy woods. It is found in Great Britain, in the mountainous woods of Scotland. It may be cultivated in the same manner as the species of Pyrola. [WINTER-GREEN, P. C.]

MONEY is the medium of exchange by which the value of commodities is estimated, and is at once the representative and equivalent of such value.

Barter is naturally the first form in which any commerce is carried on. A man having produced or obtained more of any article than he requires for his own use, exchanges a part of it for some other article which he desires to possess. But this simple form of exchange is adapted to a rude state of society only, where the objects of exchange are not numerous, and where their value has not been ascertained with precision. As soon as the relations of civilized life are established in a community, some medium of exchange becomes necessary. Objects of every variety are bought and sold, the production of which requires various amounts of labour; these at different times are relatively abundant or scarce; labour is bargained for as well as its products: and at length the exchangeable value of things, in relation to each other, becomes defined, and needs some common standard or measure by which it may be expressed or known. It is not sufficient to know that a given quantity of corn will exchange for a given quantity of a man's labour, for their relative value is not always the same; but if a standard is established by which each can be measured, their relative value can always be ascertained as well as their positive value, independently of each other.

As a measure of value only money is thus a most important auxiliary of commerce. One commodity from its nature must be measured by its weight, another by its length, a third by its cubic contents, others by their number. The diversity of their nature, therefore, makes it impossible to apply one description of measure to their several quantities; but the value of each may be measured by one standard common to all. Until such a standard has been agreed upon, the difficulties of any extensive commerce are incalculable. One man may have nothing but corn to offer for other commodities, the owners of which may not have ascertained the quantity of corn which would be equivalent for their respective goods. To effect an exchange these parties would either have to guess what quantity of each kind of goods might justly be exchanged for one another, or would be guided by their own experience in their particular trades. Whenever they wanted a new commodity their experience would fail them, and they must guess once more. But with money all becomes easy; each man affixes a price to his own commodities, and even if barter should continue to be the form in which exchanges are effected, every bargain could be made with the utmost simplicity: for commodities of every description would have a denomination of value affixed to them, common to all and understood by everybody.

But however great may be the importance of money as a measure of value in facilitating the exchange of commodities, it is infinitely more important in another character. In order to exchange his goods it is not sufficient that a man should be able to measure their value, but he must also be able to find others who, having a different description of goods to offer as an equivalent, are willing to accept his goods in exchange, in such quantities as he wishes to dispose of. Not to enlarge upon the obvious difficulties of barter:—suppose one man to have nothing but corn to sell, and another nothing but bricks: how can any exchange be effected unless each should happen to require the other's goods? But presuming that this is actually the case, is it probable that each will require as much of the other as will be an exact equivalent; or in other words, as much as represents an equal amount of labour? Such a coincidence might occur once or twice, but it is not conceivable that it should occur often. Corn is consumed annually: but bricks once produced endure for many years; and their interchange between two persons in equal proportions, for any length of time, would therefore be extremely inconvenient. In order to dispose of his corn, the producer might buy the bricks and dispose of them to others; but in that case, in addition to the business of growing corn he must become a seller of bricks. But human labour has a natural tendency to a division of employments; and as society advances in wealth and in the arts of life, men confine themselves more and more to distinct occupations, instead of practising many at the same time. [DIVISION OF EMPLOYMENTS, P. C. S.] With this tendency a system of simple barter is obviously inconsistent; as by the one, a man is led to apply the whole of his labour to one business: by the other, he is drawn into many. By the one he has only to produce and sell; by the other he must also buy what he does not want himself, and become a trader.

But all these difficulties are removed if some one commodity can be discovered which represents a certain amount of labour, and which all persons agree to accept as an equivalent for the products of their own industry. If such a commodity be found, it is no longer necessary for men to exchange their goods directly with each other; they have a medium of exchange, which they can obtain for their own goods, and with which they can purchase the goods of others. This medium, whatever it may be, is Money.

When money has assumed the character of a medium of exchange and equivalent of value, the cumbrous mechanism of barter gives place to commerce. But what must be the qualities of an article which all men are willing to accept for the products of their own labour? It is now no longer like a weight or measure, the mere instrument for assessing the value of commodities; but, to use the words of Locke, 'it is the thing bargained for as well as the measure of the bargain.' A bargain is complete when money has been paid for goods; it has no reference to the price of other goods, nor to any circumstance whatever. One party parts with his goods, the other pays his money as an absolute equivalent. But though money as a medium of exchange thus differs from money as a mere standard of value yet in both characters it should possess, if it be possible, one quality above all others—an invariable equality of value at all times and under all circumstances. As a measure of value it is essential that it should always be the same, as that a yard should always be of the same length. And unless, as a medium of exchange, its value be always the same, all bargains are disturbed. He who gives his labour or his goods to another in exchange for a delusive denomination of value instead of for a full equivalent which he expects to receive, is as much defrauded as one who should bargain for a yard of cloth and receive short measure.

But however desirable may be the invariableness of money, complete uniformity of value is an impossibility. There is no such thing as absolute value. All descriptions of measures correspond with absolute qualities, such as length, weight, and number, and may be invariable. But as value is a relative and not an absolute quality, it can have no invariable measure or constant representative. The value of all commodities is continually changing; some more and some less than others. Their real value depends upon the quantity of labour expended upon them; but temporary variations in their exchangeable value are caused by abundance or scarcity —by the relations which subsist between supply and demand. No commodity yet discovered is exempt from the laws which affect all others. If precisely the same quantity of labour were required for a long series of years to produce equal quantities of any commodity, its real value would remain unchanged; but if it were at the same time an object of demand amongst men, variations in the proportion between its supply and the demand for it would affect its exchangeable value. It follows therefore, that to be an invariable standard, money must always be produced by the same amount of labour, and in such quantities as shall constantly bear the same proportion to the demand for it.

But even if any description of money could be invented which possessed these extraordinary qualities, the value of all other articles would still be variable, and thus its representative character would be disturbed. At one time, for example, a given denomination of money will represent a certain number of bushels of wheat; at another time, the same money, unchanged in real value or in demand, will represent a much greater number. Every application of machinery, every addition to the skill and experience of mankind, facilitates production, and by saving labour reduces the real value of commodities. Their value is also liable to temporary depreciation from other causes, from too abundant a supply, or from an insufficient demand. But if money maintain the same value, in relation to itself, notwithstanding the diminished value of other articles, its proportionate value is practically increasing. The consequences of a growing disproportion between the representative value of money and the value of commodities are these: 1st, a producer has to give a larger quantity of his goods than before for the same amount of money; 2ndly, those who are entitled to payments in money, receive the value of a greater quantity of commodities than they would have received if the relative value of money and of commodities had not been disturbed. It follows from these circumstances, that, as a general rule, all creditors whose debts have been calculated in money derive advantage from any increase in its value relatively to commodities; while debtors derive benefit from any circumstance which raises the value of commodities as compared with that of money, whether it be by increasing the value of the former, or by depreciating the value of the latter. To make these principles intelligible the following example may not be superfluous: Suppose a farmer to hold land under a lease for twenty-one years at a money rent; and that from any cause the value of agricultural produce is no longer represented by money in the same manner as when the arrangement was entered into with his landlord, but that the value of money has been relatively increased. In order to pay his rent, he must now sell a larger proportion of his produce, even though its production may have cost him as much as ever. On the other hand, his landlord receives the same money rent, but is able to purchase more commodities than before on account of the increased comparative value of money.

Thus far we have thought it convenient to confine ourselves to the abstract qualities and uses of money, and to explain such general principles only as are introductory to the consideration of particular kinds of money, and of the modes of using and regulating them.

In all ages of the world, and in nearly all countries, metals seem to have been used, as it were by common consent, to serve the purposes of money. It is true that other articles have also been used, and still are used, such as paper in highly civilized countries, and cowrie shells in the less civilized parts of Africa; but in all some portion of the currency has been and is composed of metals. We read of metals amongst the Jews, the Chinese, the Egyptians, the Persians, the Greeks, the Romans. In the earliest annals of commerce they are spoken of as objects of value and of exchange; and wherever commerce is carried on they are still used as money. But as they were introduced for this purpose in very remote times, it is not probable that they were selected because their value was supposed to be less variable than that of other commodities. More than two thousand years ago, indeed, Aristotle saw clearly (but what did he not see clearly?*) that the principal use of metallic money was that its value was less fluctuating than that of most other substances (*Ethic. Nicom.* v. 5). But however clearly this great philosopher may have observed the true character of money, many ages after the circulation of metals, those who first used them were men engaged in common barter, who considered their own convenience and security without reference to any general objects of public utility. They must have used metals not as a standard of value, but as an article of exchange, which facilitated their barter. All metals are of great utility and have always been sought with eagerness for various purposes of use and ornament: but gold and silver are especially objects of desire. Their comparative scarcity, the difficulty and labour of procuring them, their extraordinary beauty, their singular purity, their adaptation to purposes of art, of luxury, and display; their durability and compactness; must all have contributed to render them most suitable objects of exchange. They were easily conveyed from place to place; a small quantity would obtain large supplies of other articles; they were certain to find a market; none would refuse to accept articles in payment which they could immediately transfer to others: and thus gold and silver naturally became articles of commerce, readily exchangeable for all other articles, before they were circulated as money, and were acknowledged as such by law and custom.

The transition of the precious metals from the condition of mere articles of exchange, amongst many others, to that of a recognised standard of value by which the worth of all other articles was estimated, was very natural. Merchants carrying their wares to a distant market would soon find it necessary to calculate the quantity of gold and silver which they could obtain, rather than the uncertain quantities and bulk of other commodities. They would not know what articles it would be prudent to buy until they reached the market and examined their quality and prices: but a little experience would enable them to predict the quantity of gold and silver which would be an equivalent for their own merchandise. Merchants from different parts of the world, meeting one another in the same markets, and finding the convenience of assessing the value of their goods in gold and silver, would begin to offer them for certain quantities of those metals, instead of engaging, more directly, in bartering one description of goods for another; and thus, by the ordinary course of trade, without any law or binding custom, the precious metals would become the measure of value and the medium of exchange.

But when gold and silver had attained this position in commerce, they were not the less objects of barter; nor were

* Many important principles of political economy, the discovery of which is attributed to Adam Smith and other modern writers, may be found in the works of Aristotle, expressed with wonderful precision and clearness. Mr. M'Culloch, for example, refers to Locke as the first who laid it down that labour is the source of value; but the same principle was affirmed by Aristotle in more than one part of his works, and more accurately than by Locke (*Ethic. Nicom.* v. 5). Again, he perceived, perhaps as distinctly as any other writer, the distinction between productive and unproductive labour (*Metaph.* ix. 8). As another example we would refer to his account of the origin of barter, its development into commerce, and the connexion of the latter with the use of money (*Pol.* i. 6). And, lastly, any economist must be struck with his clear perception of the relations between a division of employments and the exchange of the products of labour (*Ib.* ii. 2).

they distinguishable in character from any other articles of exchange. They were weighed, and being of the required fineness, a given weight was known as a denomination of value, but in the same manner only as the value of a bushel of wheat may be known. In the earliest ages gold and silver seem to have been universally exchanged in bars, and valued by weight and fineness only. The same custom exists at the present day in China. There is no silver coinage, 'but the smallest payments, if not made in the copper *tchen*, are effected by exchanging bits of silver, whose weight is ascertained by a little ivory balance on the principle of the steelyard.' (Davis's *China*, c. 22.)

Notwithstanding the ease with which gold and silver are divided into the smallest portions, each of which is of the same intrinsic purity and value as the others, the trouble of weighing each piece, and the difficulty of assaying it, render these metals in bars, or other unfashioned forms, extremely imperfect instruments of exchange, especially when they are used in small quantities. However accurately they may be weighed, it requires considerable skill and labour to assay them, which in small pieces would scarcely be repaid. Even in large quantities the difficulty of assaying their fineness, in countries which have made considerable advances in the arts, is greater than might be expected. The Chinese affect much accuracy in the art of assaying. The stamped ingots of silver in which their taxes are paid are required to contain ninety-eight parts in a hundred of pure silver, and two per cent. only of alloy; and strict regulations for maintaining this standard are rigidly enforced. Hence we should naturally infer that the attention of merchants and of all persons dealing in silver would be particularly directed to the most accurate assays. Yet at Canton an enormous trade in opium has for a long series of years been conducted entirely in sysee silver, which has been found to contain so large an admixture of gold that it bears a premium of five or six per cent. for exportation to England. (Davis's *China*, § 22.)

If the Chinese have been unable to discover the presence of gold, which it would be their interest to appropriate, how difficult must it be to detect alloys of baser metals in gold or silver circulated amongst a people in the ordinary course of trade. To obviate this difficulty coinage was introduced, by which portions of gold, silver, copper, and other metals have been impressed with distinctive marks, denoting their character, and have become current under certain denominations, according to their respective weight, fineness, and value. These coins have always been issued by the government of each country as a guarantee of their genuineness; and the counterfeiting of them has been punished as a serious offence against the state.

In rich countries these three metals of gold, silver, and copper are very convenient substances for the manufacture of coins, on account of the differences in their relative value. Gold coins, containing a high value in small compass, are convenient for large payments, silver coins for smaller payments, and copper coins for those of the lowest value; while all the larger coins are multiples of the smaller. These several descriptions of coin serve the ordinary purposes of trade sufficiently well: they are universally received as money within the country in which they circulate, and the principal part of all payments of moderate amount is made in them. But payments of large amounts cannot conveniently be made in coins of any metal; and in this and other countries paper money and various forms of credit have been used as substitutes. Of these we shall speak presently; but it will first be necessary to consider the suitableness of gold and silver coins as standards of value.

Coins made of these metals are not exempt from the laws which govern the prices of other commodities. They have accordingly varied in their own value in successive periods, and are at no time secure from variation. In the sixteenth century new mines of extraordinary richness were opened in America which were worked with such ease, and were so unusually productive, that the value of the precious metals, as representatives of so much labour expended in their production, was lowered all over Europe to about a third of their previous value. And thus a revolution, so to speak, was effected in the gold and silver coins of that period as standards of value. Similar causes have produced the same effect at other times, though not in the same degree; and we cannot be secured against their recurrence.

If the production of gold and silver be free, like that of other commodities, the only circumstance which can permanently diminish their value, in relation to themselves at different periods, is a reduction in the quantity of labour required for their production. But they are also liable to fluctuations in their value by reason of variations in the demand for them in particular countries. Though fashioned into coins, they retain all their properties as articles of commerce: they are readily fused into other forms, and rendered available for all purposes of use and ornament; and the occasions of commerce often withdraw them from one country and attract them elsewhere. From these causes their value, instead of being always the same, is liable to permanent alterations, and also to occasional fluctuation.

Both gold and silver are alike subject to these general laws, and are therefore imperfect standards of value. If one be the standard independently of the other, it is liable to change in itself, and also in its relation to other commodities: if both be adopted as standards at the same time, they will not only each vary in themselves, and in relation to other commodities, but they will vary also in regard to each other. And thus another element of uncertainty is introduced into the coinage, which becomes still more imperfect as a standard.

But it is not customary for the state to allow coins to fluctuate in their legal value according to the circumstances which determine the market prices of gold and silver. Coinage does not merely authenticate the weight and fineness of a piece of metal, leaving it to find its own level in exchange for other commodities; but it attaches to it a definite value, by fixing the standard price of the metal as well as the weight and fineness of the coin. The object of this regulation is to maintain a greater equality in the standard; and as regards small fluctuations in the value of the precious metals, it will generally have that effect. But if any considerable disproportion should arise between the standard price of bullion and the market price, no such regulation can prevent a practical change in the standard. If the market price should become considerably higher than the standard price, the coins would be melted down for the sake of the profit arising from the difference. If it should become considerably lower for any length of time, the value of the coins, though nominally unchanged, would in fact be depreciated; for they would exchange for a less quantity of other commodities than they exchanged for before. And thus a currency composed exclusively of metals cannot be made an accurate standard of value by any expedients of law.

We may here remark however, that a seignorage, or charge by government to cover the expenses of coinage, acts as a protection, within certain limits, against the melting of coins, because unless their value be depreciated by over-issue, the whole charge will be added to their value as coins, and will be lost when they are melted. For this amongst other reasons a seignorage should always be charged by the state.

There is yet another imperfection in coins as standards of value. Notwithstanding their natural durability, they are subject to continual wear, and must be gradually diminished in weight. They are also exposed to the fraudulent experiments of men whose trade it is to rob them of a portion of their weight by artificial wear. The value of coins is therefore certain to be continually depreciated by loss of weight, apart from any other causes of variation.

From all these circumstances it is evident that gold and silver coins have qualities inherent in them which render them necessarily imperfect standards of value, with whatever care and skill they may be regulated. But, in addition to these natural causes of imperfection, others have been artificially produced by erroneous or dishonest political expedients. There is no country perhaps in which the coinage has never been debased by the government. Debasement of coins was formerly a common artifice for increasing the revenue of states, and it has been effected in three different ways:—1, by diminishing the quantity of metal, of the standard fineness, in coins of a given denomination; 2, by raising their nominal value and ordaining that they shall pass current at a higher rate; and, 3, by debasing the metal itself—*i. e.* by leaving the coin of the same weight as before, but reducing the quantity of pure metal and increasing the quantity of alloy. In all these ways have the coins of England been debased at different periods of our history; and to so great an extent were they debased by successive kings, that from the Conquest to the reign of Queen Elizabeth the total debasements of the silver coins have been estimated at 65 per cent. (Lord Liverpool, *On Coins*, p. 35.) By expedients of an opposite character the standard of coins may be artificially raised; and the result of measures connected with the coinage of this country was, that in a period of 115 years, from the 1st James I. to the 1st George I., the value of gold coins, as compared with silver coins, was raised 39 per cent. (Ibid., p. 84.) No further examples are needed to prove the inconstancy of coins as a standard, when they form the sole currency of a country.

But notwithstanding these imperfections, the convenience of gold or silver coinage, as money, has led to the universal adoption of one or the other, or of both conjointly, as the standard of value. The objections to a double standard have already been noticed, but throughout a long period of the history of this country we find gold and silver prevailing equally as standards. There appears to have been no public coinage of gold at the royal mints prior to the 41st Henry III. The gold pennies coined at that time were expressly declared not to be a legal tender, and never obtained a very general circulation. Silver was then the universal medium of exchange, and the people were unaccustomed to the use of gold as money: but as their commerce and riches increased gold naturally became more convenient for large payments. The results of this progress became apparent in the reign of Edward III., who established a general circulation of gold coins, which, though partially introduced nearly a hundred years before, by Henry III., had not been continued by his successors. From this time gold and silver coins circulated together, and were both legal tenders. To what an extent their relative value varied at different periods, has already been noticed; but they were equally recognised by law as authorised standards of value in all payments whatever, until the year 1774, when it was declared by statute (14 Geo. III. c. 42) that, in future, silver coins should not be a legal tender in payment of any sum exceeding 25*l.*, except according to their value by weight, at the rate of 5*s.* 2*d.* an ounce. This was a temporary law, but was continued by several statutes until the year 1816, when the legal tender of silver coins was further restricted to payments not exceeding forty shillings (56 Geo. III. c. 68). And thus, as all large payments were made and calculated in gold coins, they became the sole standard of value, so far as coinage alone was the real medium of exchange.

The expediency of adopting gold as the standard instead of silver, has been a question of much doubt and controversy amongst the highest authorities upon monetary affairs. It was the opinion of Locke, of Harris, and Sir William Petty (all great authorities) that silver was the general money of account in England, and the measure of value in its commercial dealings with other countries. Its general adoption for such purposes was urged as a proof of its superiority as money over gold; and of this opinion are many thinkers of high authority, at the present day. On the other hand it has been argued, that the metal of which the chief medium of exchange is fabricated, should have reference to the wealth and commerce of the country for which it is intended; that copper or silver coins of the lowest denominations suffice for the convenience of a very poor country; but that as a country advances in wealth its commercial transactions are more costly and require coins of corresponding value. As a matter of convenience this is undoubtedly true. Gold is the standard in England; silver is the standard in France; and the comparative facility of effecting large payments in the current coins of the two countries can admit of little doubt. Habit will familiarize the use of silver, and render a people insensible to its inconvenience; but it is certain that in England fifty sovereigns can be carried about in a man's waistcoat pocket, while in France the value of that sum in silver would weigh about 48 lbs. troy: so heavy and bulky indeed would it be, that a carriage would be required to convey it from one part of Paris to another.

But the convenience of coin for a certain class of payments is a question quite distinct from that of its fitness for a standard of value. It is not necessary to exclude gold from the coinage because it is not adopted as the standard; it may be circulated as freely as the people desire to use it, while, instead of being the legal standard, its value may be calculated in silver. If silver be the standard, a large gold coinage may circulate at the same time for the convenience of larger payments, just as silver circulates for small payments where gold is the standard. In either case, however, that metal which is chosen by the state as the lawful standard governs all calculations and bargains, while the other metal merely conforms to its standard, and is subsidiary to it. But even if the relative convenience of gold or silver as a standard were the sole question, it could not be determined by the modes of effecting large payments only. All payments are calculated as easily in the coins of one metal as of another, in whatever form they may be actually effected. But by far the greater number of bargains are made for articles of small value. It is in silver and copper that the consumption of all commodities is mainly paid for. The wages of the country are paid and expended in that form; and in that form the prices of nearly all the ordinary articles of daily use are calculated. However the wholesale bargains of merchants may be conducted, the goods bought and sold by them are ultimately distributed to the consumers in very small quantities, the prices of which are estimated in silver and copper. The aggregate value of the small bargains must be equal to that of the large mercantile bargains which relate to the internal trade of the country, and in frequency and number they are beyond all comparison more important. It is certain also that in the vast operations of commerce the bargains, in whatever medium they may be calculated, are very rarely paid for in any coin whatever, but are settled by various forms of credit; while all minor transactions—the bargains of daily life—can be adjusted by money payments only. It is for such purposes therefore that the metallic currency of a country is mainly needed; and it may be contended with much force that silver represents the value of commodities more universally than gold, and is consequently a fitter standard.

The fitness of a standard however cannot be determined solely by considerations of convenience; for we must chiefly regard its intrinsic qualities as a permanent measure of value. How shall uniformity of value be maintained as far as practicable in the money of a country? is the main question to be determined; and not, Which is the most convenient form in which to make bargains? In what medium shall the whole property of the country be valued, from one year to another? By what standard shall the relative value of all things be compared? How shall fluctuations be restrained in the value of this standard itself? These are the questions to be answered.

In favour of gold as a standard it is argued that being less extensively used for plate and other manufactures, it is less an article of commerce than silver, and is confined more specifically to the purposes of money. On the other hand, it is contended that gold is used in large quantities for jewellery, watches, and decorative purposes, and that being a comparatively scarce material, its consumption in this manner affects its quantity and value to a greater extent than the use of plate affects the price of silver.* And in this argument there is much weight, for it is estimated that the quantity of gold compared with the quantity of silver is as 1 to 50; and their relative value is as 1 to 15. (See *Bullion Report*, 1810, *Allen's Evidence.*) Now it is evident that any variation in the commercial demand for gold must be more sensibly felt than a similar variation in the demand for silver.

But it is not sufficient to consider the demand for the precious metals as articles of consumption only; they are suddenly sought for in large quantities for other purposes. If the exchanges be unfavourable to a country, its precious metals are in greater demand for exportation than its commodities; or if there be a foreign war, its metals are in demand for the payment of the troops and for the purchase of food and munitions of war. Here again gold must feel the demand to a greater extent than silver. If metals be required for exportation in payment of goods, gold is sure to be preferred by merchants; it is compact and portable; a large value can be exported at a small cost and without difficulty; while fifteen times as much silver must be taken to effect the same purpose. In war gold is even more in request than for the purposes of commerce: its facility of transport is so important that it must be obtained at any cost, and it is consequently drained from all countries in which it can be found. Thus not only is gold, from its limited quantity, more sensibly affected by any increased demand than silver, but it is more peculiarly liable to great and sudden drains from any country in which it forms the standard of value.

If it should happen that one country has a large gold coinage in circulation in addition to all the bullion which is required for the purposes of commerce, while all the adjacent countries use a silver currency, and possess very little more gold than is necessary for its consumption, it is clear that whenever a large demand for gold arises, it must be directed to the country in which there is a gold currency. That country will be immediately used by all others as a rich gold mine, whence abundance of metal without alloy, and assayed ready to their hands, may at once be grasped, without digging

* For an account of the consumption of gold and silver in various manufactures, see Jacob 'On the Precious Metals,' chap. xxvi vol. ii. p. 270.

in the earth. No laws and no vigilance can restrain its export: as soon as it is wanted abroad, it disappears like water through a sieve. And this has been the case with England. Every other country in Europe has a silver standard; and whenever gold is wanted, her coinage supplies it. The extent to which gold is exported when the foreign exchanges are unfavourable may be estimated from the returns of bullion retained by the Bank at different periods. On the 28th February, 1824, the Bank had in its coffers 13,810,060*l*. in bullion; at the same period, in 1825, it had 8,779,100*l*.; on the 31st August in that year its treasure was reduced to 3,634,324*l*.; and on the 28th February, 1826, to 2,459,510*l*. Again in March, 1836, the bullion amounted to 8,003,400*l*., but was reduced by the following February to 3,938,750*l*. A similar exhaustion of treasure was exhibited in 1838-9. In December, 1838, the Bank possessed 9,686,000*l*. of bullion; and in August, 1839, no more than 2,444,000*l*.

These are undoubtedly very strong objections to a gold standard, and in order to test them thoroughly it would be satisfactory to compare the actual prices of gold and silver, and estimate their relative variations. But such comparisons are extremely delusive, for there is no common standard by which to compare the price of each metal. If silver be purchased with gold, how shall we determine in which there has been variation? Or if gold and silver be both purchased alike with bank notes, there is a standard wanting; for the notes are made to conform to the value of the gold, and not to the value of the silver. These elements of uncertainty make all returns fallacious; but if reliance could be placed upon them, the fluctuations in the price of silver bullion would appear to be very slightly greater than those of gold. (See *Bank Charter Report*, 1832; *Sess. Paper*, No. 722, App. p. 98; *Banks of Issue Report*, 1841, No. 410, App. p. 316.) These results do not corroborate the objections to a gold standard; but it must be recollected that, independently of fluctuations in the prices of bullion, a diminution in the quantity of money circulating in a country raises the value of the remainder, and disturbs its relation to the prices of other commodities. It is in this form that the effects of an abstraction of gold must be felt rather than in the price of bullion; and though its influence upon prices is very injurious, the cause is not always perceptible. If a country had a circulation composed exclusively of gold, it might sometimes be deprived of all its money; if of gold and silver conjointly, it might sometimes be deprived of all its gold; but no country could be deprived of all or nearly all its silver by the operations of commerce. When paper money is added to gold and silver coins as part of the circulation, a country can always command a sufficient quantity of money; but the drain of its metals has an important influence upon the value of its circulating medium, and upon the operations of commerce; but of these matters more will be said hereafter.

The principal imperfections of the precious metals as standards of value have now been adverted to. Both of them are less liable to variation than any other known commodity which could be used for the purposes of money; but of the two, silver would appear to be, upon the whole, the most suitable for a standard of value.

But whatever metal may be chiefly used as money, there is a disadvantage attending the circulation of coins which remains to be noticed. To maintain a large circulation of them is the most expensive mode of furnishing a people with a medium of exchange. In the first place the whole value of the metals of which they are composed is subtracted from the productive capital of the country, in order to facilitate the exchange of other commodities. Unless this expense be absolutely necessary, it is an unwise extravagance. It is as if children should play at cards with gold counters instead of ivory fish. Secondly, the wear and abrasion of coins makes it necessary to supply their deficiency with more of these costly metals, in addition to the amount already coined. Thirdly, not only are coins diminished in weight, but great numbers are irretrievably lost and destroyed. They are buried in the earth by misers, and never found again; they are lost in the sea; they are wasted by fire; they are dropped in the roads, and trampled under foot with the dust and stones. Every accident of this kind diminishes the wealth of the country, and wastes the products of its labour. Some cheaper kind of money therefore should, as far as possible, be used as a substitute for gold and silver;—and such a substitute has been found in paper.

Not only is paper more economical than gold and silver, but it is more convenient than either for effecting large payments, or for transmitting sums of money to a distance. In this respect it excels gold more than gold excels silver. A million of money may be paid in bank notes as easily as ten sovereigns, and transmitted to a distance even more easily.

But notwithstanding these advantages, paper may be deemed an imperfect instrument of exchange, because it is subject to forgery. It shares this defect however with other kinds of money. Gold and silver coins are counterfeited in baser metals; paper-money is imitated by the forger. But the more exquisite the art with which a coin is struck, the more difficult it is to counterfeit its impression; and, in the same manner, the more elaborate the design of a promissory note, the greater will be the obstacles to forgery. No precautions perhaps can altogether prevent a spurious imitation of valuable articles; but the possibility of forgery can only be objected to the use of paper-money in the same manner as the danger of buying paste ornaments may be urged against the wearing of diamonds.

Paper is thus as well suited as any other material for the purposes of a currency; but its character is essentially different from that of other descriptions of money. Its cheapness, which renders its use economical, prevents it from being exchanged as an absolute equivalent for other commodities. Gold and silver have a value of their own, distinct from their value as money; but, except in its monetary character, paper is nearly worthless. To be accepted, therefore, in exchange for commodities, paper must represent some value besides its own.

In considering what that value may be, it will be convenient to describe the character and functions of a promissory note. The state, a bank, or some person of known wealth, instead of paying a sum of money in the ordinary coins of the country, issues a note promising to pay that sum, on demand, to any person who shall present it for payment. This is the form of promissory notes which circulate as money; but there are also promissory notes, payable at some particular period, which, for reasons which will be presently explained, do not form part of a monetary circulation. Now, in the ordinary transactions of life, no one will promise to pay a sum of money without receiving or expecting to receive an equivalent for it, and such equivalent, whatever it may be, is the value represented by the note. Suppose that A in London owes B at Edinburgh a thousand pounds, and that he has a thousand sovereigns to discharge his debt. Instead of transmitting the gold to Edinburgh, A takes it to the bank and exchanges it for a promissory note of that amount, which is accepted by B in payment of his debt. In this case it is clear that the note represents a thousand sovereigns; and any person in whose possession it may be can obtain them from the bank. Suppose again that C applies to D for a loan of 1000*l*., for the repayment of which he is able to offer security in the shape of goods or property; and that D, instead of advancing that sum in money, gives him his promissory note for 1000*l*. payable on demand. In that case, the promissory note, if issued by a solvent person, would be equally payable in coined money, but it would represent the security upon which it was given. The issuer of the note will suffer if that security be insufficient, for he has pledged his own property against it; but the interest which he expects to receive is a compensation for the risk he incurs in realizing, as it were, the property of another. A promissory note, it seems, may therefore represent either coined money or capital in any other form. But here an important question arises which affects the entire character of paper-money. Why do persons accept promissory notes instead of gold and silver? Why are they satisfied with the representative of value instead of receiving the value itself? For the explanation of this point it will be necessary to divide promissory notes into two kinds, viz.: 1, those issued by the state, or by a state bank; and 2, those issued by bankers, or other persons unconnected with the state.

1. Promissory notes issued by the state or by a state bank are under the protection of the law, and are made a legal tender. When once in circulation they discharge debts as completely as the current coin; they may not be refused in payment, although, if from any cause their value be depreciated, they may be taken in exchange for a less sum than they profess to represent. Such notes are therefore money, to all intents and purposes, just as if they were composed of gold and silver. Their value is liable to fluctuation, according to the regulations under which they are issued: but they are lawful money, coined by the state in paper, instead of in the precious metals. Such money will be current throughout

the country in which it is issued; but it differs from gold and silver, inasmuch as it cannot serve the purposes of an international currency. Gold and silver are current all over the world, and their value is everywhere understood; but paper-money is necessarily confined to the purposes of internal circulation.

2. Promissory notes issued by bankers or other persons unconnected with the state, not being a legal tender, may be refused in payment of any debt. They can only be circulated, therefore, with the entire concurrence of those who receive them. It is by means of banking accommodations, however, that they usually get first into circulation. A person who wishes to borrow money is not very particular concerning the form in which he obtains it, and he willingly accepts a note, if it be offered him instead of gold. He probably owes money to another, to whom he, in his turn, offers the note as payment. This third party will readily accept it, for he wishes to secure the payment of the debt, and if he distrust the value of the note, he may immediately call upon the party who issued it, for gold. When the credit and solvency of a bank are well known in any neighbourhood, its notes pass from hand to hand without any distrust, but they rarely circulate beyond the adjacent district. Within its own district they are received as money, as readily as a state bank-note is received all over the country; beyond its district they are sure to be returned for gold, just as a Bank of England note would be returned from Russia. A bank of issue is also a bank of deposit, and the people amongst whom its notes are circulated pay them into the bank whence they issued, and receive credit for them—not as notes only, but as current money: and when they draw again upon their deposits, they may receive the amount in gold and silver or in state bank-notes. In this manner the distinction between local notes and other descriptions of money is gradually lost sight of; they are readily convertible: they are universally circulated: habit familiarises the use of them; and at length, without the sanction or protection of any law, they become money: usage, and not the state, has coined them. Still any one may refuse to receive them, and the extent of their circulation depends upon the credit of the issuer. Let a whisper be heard against his solvency, and in a single day all his notes may be returned to him for immediate payment in the currency of the state.

The circumstances which occasion a large circulation of both these kinds of paper-money in a country are, the convenience of such a circulation, and the difficulty of obtaining a sufficient coinage for effecting the various purposes for which money is used. The demand for money is continually increasing in proportion to the increase of commodities in quantity and value: and in a rapidly improving country no coinage can keep pace with such an increase. When paper-money is issued it does not supersede gold and silver, but is used concurrently with them. Its denominations of value are the same as those of the coins; and if it be a properly regulated currency, its value will also be precisely the same as that of the coins of a like denomination. A hundred pound note should be of precisely the same value as a hundred sovereigns. But how is this equality of value to be maintained between two descriptions of money differing so materially in character? Gold and silver, as already explained, have a known value as articles of commerce, and their real value depends upon the quantity of labour required for their production. If this continue unchanged for many years, their exchangeable value may still be liable to fluctuation by reason of varying proportions between supply and demand. The supply of them may be the same with an increased demand: or the demand may remain the same, and the supply be either increased or diminished. But paper has scarcely any real value when used as money; the labour expended upon it compared with its denomination of value is merely nominal: and its value, supposing its credit to be good, must therefore depend entirely upon the proportion which the quantity issued bears to the requirements of commerce. If less be issued than there is a demand for, its value will rise; if it be issued in excess, its value will be depreciated. So strong is the operation of this principle, that promissory notes, which are a legal tender, may even be raised above the value of gold, though inconvertible into specie, if their amount be sufficiently limited. This result was actually produced, after the suspension of specie payments in 1797; when, so far from being depreciated in value, bank-notes bore a premium over gold, until they were issued in excess, and fell to a discount. It is evident, therefore, that the value of paper-money is independent of convertibility. If convertible, but issued in excess, its value will be depreciated; if inconvertible, but limited in amount, its value will be sustained. And further, if government paper and local notes be concurrently in circulation, and if either be issued in excess, the value of both will be depreciated, because the aggregate quantity of paper-money will be increased beyond the demand for it.

The mode of regulating the issue of paper-money so as to sustain its value and to prevent it from fluctuation, is one of those difficult problems which have perplexed theorists and statesmen, and still remain to be completely elucidated by experience; but the principles upon which any sound system of paper-currency must be founded are now agreed upon by the best authorities.

Let it be supposed that no paper-money is in circulation but government notes inconvertible into specie, and that it is the desire of government to maintain them at the same value as the gold and silver coinage. By what principle could the issue be regulated so as to effect this object? Gold and silver maintain a reasonable steadiness of price, as they are possessed of a real value, and being in demand all over the world, are distributed in quantities proportioned to the wants of each country. Without any standard price being fixed by the state, their value will, therefore, be self-regulated; but paper-money, not being possessed of any real value, has no element of stability in itself, and unless its issue be adjusted with the utmost nicety, its value will be constantly fluctuating. As the object to be secured is an equality of value between the precious metals and paper-money, and as the former have an element of stability which is wanting in the latter, it is clear that paper-money must be made, in some manner, to conform to the value of the precious metals. Now this can only be accomplished by making paper-money convertible into gold or silver, whenever its holders demand such a conversion. To regulate the issues of inconvertible paper is like filling a vessel with water in the dark, and without a measure: it is by the overflow only that the vessel is known to be full; while a convertible paper, under proper regulation, adjusts itself to the standard of the precious metals.

If convertibility be desirable when there is no other paper in circulation but that issued by government, it is indispensable when promissory notes are permitted to be issued by other parties; for, in that case, it is necessary to guard against an excessive issue of both descriptions of paper; and when government paper is convertible, other issues of paper will in some degree conform to its standard, as it, in its turn, conforms to that of the precious metals.

The manner in which convertibility restrains the over-issue of notes may be thus explained. If too much money be in circulation, its value is depressed, and the prices of commodities relatively raised. It thus becomes more profitable to export money than commodities in payment of the price of imports; but paper-money not being current abroad, gold or silver is taken, and whenever this occurs, the exchanges are said to be unfavourable. If a state bank issuing notes be required to give gold or silver in exchange for them, it must be constantly possessed of a large store of the standard metal. If it be the sole or chief bank of issue, it will be the principal depository of bullion in the country; and thus any drain caused by unfavourable exchanges will be first and chiefly felt by it. Persons wishing to export bullion will demand it of the bank in exchange for notes. In this way the bank is apprised of the state of the foreign exchanges, and learns that money is too abundant; while it has the power of immediately contracting its circulation by means of this very demand for bullion. It has merely to lock up those notes which it has received back in exchange for bullion, and every exportation of its bullion effects a proportionate contraction of the currency and restores the exchanges to a healthy state, by adjusting the quantity of money to the requirements of commerce. This is a simple mode of regulating the circulation of a country, and if all the paper-money were issued by one body only, it could not fail to be effectual. So far as the principle has been tested in England it has been successful; but its operation has been interfered with by the competing issues of many independent banks, and by the admixture of banking business with the issue of notes, in the bank itself. Both these causes of disturbance have been partially provided against by the recent Bank Charter Act (7 & 8 Vict. s. 32), and the experience of a few years will show if there be any imperfection in the principle, that the paper-circulation of the country must be regulated by the foreign exchanges.

Any further reference to the particular laws and practice by which the circulation of this country is regulated, in connection with a complicated system of banking, will be unnecessary for the explanation of principles, and these matters have already been treated under another head. [BANK, P.C.] But we cannot quit the subject of convertibility without adverting to a point of great importance. In order to regulate the issues of paper with reference to the exchanges, it is by no means necessary that gold or silver coins should be given by the issuing body in exchange for its own notes. Uncoined bullion would serve the purpose equally well, and would occasion a considerable economy in the coinage. It would be sufficient therefore to require the bank, or other issuing body, to give bullion in exchange for its notes, at the standard price, whenever a certain amount should be demanded. There can be no object in giving facilities to every person who possesses a 5*l.* note, to exchange it for gold, and much mischief is caused by such facilities, in times of panic; while, on the other hand, no impediment would be offered to the great operations of commerce by raising the minimum quantity of bullion to be demanded. By this arrangement whenever notes fell below the value of bullion, they would be brought in exchange for it, until the prices of both were again equalized; and if, by any undue limitation of issue, the value of notes should be raised above that of bullion, the bank should be obliged to give its notes in exchange for bullion. In this manner the circulation would be enlarged and the equilibrium between gold and paper restored. This excellent system was proposed by the late Mr. Ricardo in his able pamphlet entitled 'Proposals for an Economical and Safe Currency,' and was carried into effect, for a short period, on the resumption of cash payments, in 1819, but was succeeded by the present plan of convertibility into gold coin, which is more costly and less secure in its operation.

In regard to the issue of paper-money there are two antagonist theories, which remain to be noticed, although it will be impossible to enter fully into the arguments by which each is supported. By one it is proposed that all paper-money should, like gold and silver, be coined by the state alone, in order that its issue may be properly regulated and its convertibility secured. By the other it is maintained that the issue of paper-money should be open to all persons without restriction, like the drawing of bills of exchange, except in so far as securities may be necessary for the solvency of the issuers. In this country neither of these principles has been adopted singly, but the circulation has been founded upon the union of them both. It has however been the policy of the government gradually to contract the issues of private banks, and to replace them by the notes of the Bank of England, which, for the purposes of issue, now stands in the position of the government itself.

In considering the relative merits of a system of government issues and of free competition amongst issuing bodies, there are three main questions to be considered: 1st, the profits arising from the issue of notes; 2ndly, the solvency of the issuers; 3rdly, the convertibility of the notes and the securities against over-issue. If the two first questions were the sole consideration, it would be difficult to oppose the claims of those who insist upon the right of free issue.

1. The profits arising from the circulation of paper may be regarded as one of the many forms in which profits are realized by trade. It is true that the right of issuing money has ordinarily been claimed as a royal prerogative, and that promissory notes might be included in that category. If such a claim had been made on the first introduction of paper-money, it could undoubtedly have been supported by the analogy which paper-money bears to a coinage; and if the law had pronounced in favour of the claim, a lucrative prerogative would have been created, instead of a profitable branch of banking. But no such claim was advanced: the issue of notes has always been distinct from the coinage of money; and the state is now no more entitled to the profits arising from a paper-circulation, than to the profits of any other description of business.

2. The solvency of the issuers of promissory notes is a matter which can be provided for by law. There are few who will question the necessity of some security, when money is permitted to be issued by private parties. It is indeed contended by some that a promissory note is like a bill of exchange—that it represents capital and securities, and that, in its representative character, it is circulated instead of money, upon the credit of the issuer, and upon the responsibility of those who accept it. But there is an essential difference between a promissory note and a bill of exchange. The one is money and discharges a debt; the other leaves a debt outstanding until the bill becomes due and is paid. Again, a note passes from hand to hand upon the sole credit of the issuer; a bill of exchange passes not only upon the credit of the acceptor, but also upon the credit and responsibility of each indorser. A bill is circulated amongst merchants precisely as credit is given to persons of known solvency; but a promissory note, whatever may be the solvency of its issuer, if received at all, is received as money. It is obviously just, therefore, that when the state permits so important a privilege to be exercised as that of the issue of money, it should at the same time provide securities against its abuse. Such securities cannot be enforced without interfering, in some measure, with an unrestricted freedom of issue, but they are essential to the public safety, and they should on no account be neglected.

3. But the solvency of the issuers of notes concerns those parties only who may happen to hold the notes of a particular bank: it does not affect the whole country. If a bank fail, its creditors suffer like the creditors of any other bankrupt firm; but the general business of the country is not disturbed by its failure. On the other hand, however, the regulation of its issues had an influence upon the entire trade of the country. However effectual may be the securities against the insolvency of private banks—however complete the protection of the individual holders of their notes—the public interests are still in need of protection against the consequences of an ill-regulated currency. The securities against insolvency and the securities against over-issue are entirely distinct: the former may be complete; the latter may, at the same time, be inoperative. The mode of sustaining the value of paper-money on a par with the precious metals has already been explained. It is only by means of convertibility and by a reference to the foreign exchanges, that the issues of paper can be adjusted to the wants of the country; and this principle is incompatible with an unrestricted issue of paper by private banks.

If no control be exercised by government or by some central body over the issues of private banks, notes will be circulated, not according to any fixed principle, nor with reference to the exchanges, but to promote the business of banking. If too many should be in circulation, the action of the foreign exchanges cannot be brought to bear upon many independent banks with sufficient force and distinctness, and the convertibility of all the paper-money in the country is consequently endangered. This is the danger which is sought to be averted by restrictions upon the issues of private banks, and by the gradual substitution of the notes of one issuing body for those of many. No interference with the business of banking would be justifiable, except for the protection of the public interests; but the evils arising from the suspension of specie payments are so great, that every practicable precaution must be taken to avert it. It deranges all commercial transactions, it injures public credit, disturbs prices, and suddenly withdraws the standard of value by which all existing obligations and all future bargains are to be adjusted. When notes are issued by one body only, a limitation of its issues, as already noticed, may sustain their value; but when many independent bodies are issuing notes, during a period of inconvertibility, there is no principle at work to regulate or to limit their issues, and it is almost certain that their notes will not only be greatly depreciated, but also will be liable to constant fluctuations of value.

There are some political reasoners who have ascribed every commercial convulsion to an ill-regulated currency; while others deny its influence upon prices and upon the general arrangements of commerce. The opinions of both these parties are probably extreme, and their facts somewhat exaggerated; but the temperate view taken by Mr. S. Jones Loyd may be adopted with less hesitation. He says, 'The currency, in which all transactions are adjusted, has the same reference to the healthy state of trade, which the atmosphere in which we all live has to the physical constitution of our bodies; irregularities and disorders may arise from a variety of causes, but the duration and virulence of them will materially depend upon the pure, healthy, and well-regulated condition of the medium in which they exist. A well-managed currency cannot prevent the occurrence of periods of excitement and over-trading, nor of their necessary consequences—commercial pressure and distress; but it may tend very powerfully to diminish the frequency of their return, to restrain the suddenness of their outbreak, and to limit the extent of their mischief.' (*Remarks on the Management of the Circulation*, 1840.)

As yet such promissory notes only have been spoken of as are payable on demand: but a few remarks may be added concerning promissory notes and bills of exchange payable at some period more or less distant. These are regarded by some as paper-money, and are said to form part of the general circulation; but the essential distinction between them and paper-money has been more than once noticed above. They do not discharge obligations, but are merely written engagements to discharge them at a future period: they are one of the many forms of credit, and as such are used as substitutes for money; but they cannot be considered a part of the national currency. When transferred from one hand to another they do not pass as money, but as the transfer of a debt, of which the payment is guaranteed by each endorser in succession. It is true that that they are among the most efficient agents for economising the use of money, and that they leave the circulating medium more free for other purposes, in which payments are made in notes or specie. If this were not the case, the circulation of notes must be almost indefinitely increased in order to meet the various demand of commerce; but this economy in the use of money makes a comparatively small circulation sufficient. It is this circulation, however, of which the relative scarcity or abundance affects the prices of commodities and the foreign exchanges. The final settlement of a bill of exchange must be adjusted in the current money of tho country. If money be dear, the acceptor exchanges more goods for it in order to meet the bill when it becomes due; if money be relatively cheap, he makes a better bargain; but the bill of exchange itself is no more money than the goods which had been originally purchased with it. Every bill of exchange when first drawn and accepted, and subsequently endorsed, represents, at each transfer, a distinct commercial transaction, of which the bill is the immediate result. The number and amount of bills of exchange in circulation cannot therefore be added to the currency in order to compare the aggregate circulation with the aggregate amount of commodities; for those commodities which are exchanged by means of bills may be set off against the value of other commodities represented by the bills, while the notes and specie taken together may be compared with the aggregate of other transactions, added to the balances of accounts arising out of the final settlement of bills of exchange. It is undeniable that bills of exchange perform many of the functions of money, and they are regarded as a part of the circulation by some high authorities in monetary matters; but it appears to us that the balance of reason and of authority inclines to the other side and assigns to bills of exchange a distinct place as substitutes for currency instead of including them as part of the currency itself. (See tho Evidence upon this point before the Committee on Banks of Issue, 1840.)

A similar question arises in reference to the monetary character to be assigned to banking deposits: are they currency or not? The transfer of deposits pays debts and purchases commodities; it performs the functions of money, and so far would seem to be a part of the currency and to have an influence upon prices and upon the foreign exchanges. But it cannot be contended that the whole of the deposits are currency, for a large portion of them is invested by the bankers; and if every depositor were to call for his deposits at once, they could not be paid. Nor can the uninvested portion be properly called money; it is a form of credit which, like bills of exchange, economises the use of money and is a substitute for it, but is not the thing itself. It bears so close a resemblance to currency that to assign to it a distinct character is a matter of some difficulty; but still we are disposed to class all portions of banking deposits which are not actually held by the bankers in notes and specie, in the same category with bills of exchange, book-debts, and transfers in account. All these are modes of facilitating the exchange of commodities by a refined species of barter, without the intervention of any circulating medium. Each transaction is valued in the current medium of exchange, and final settlements of accounts are adjusted in money; but the estimated value of the transaction itself cannot be reckoned as a part of the circulation, for if it were, then commodities themselves would be money.

An ordinary case of barter would seem to offer a good illustration of the functions of all forms of credits as substitutes for money. Suppose a merchant, A, to have indigo to the value of 1000*l.* to sell, and that he wishes to purchase cotton of the same value, which B is willing to give in exchange for the indigo. The transfer is made at once between them: the transaction is complete without the passing of a shilling, for the indigo performs the functions of money. But can the indigo on that account be reckoned as a part of the circulating medium? Suppose again, that these merchants, at the time of the transfer, each drew a bill for 1000*l.* upon the other at three months, which each accepted. These bills would represent the value of the indigo and of the cotton; but no more money would pass between them until these bills became due, than if no part of their bargain had been committed to paper. When the bills became due, each would be indebted to the other to the same amount, and might write off one debt against the other; or each might transfer a portion of his bank-deposits to the other. In the case first supposed, no money would pass, but one commodity would be taken as an equivalent for the other. In the second case the credit of each party would be accepted as an equivalent for the goods without the intervention of a money payment: and this credit would afterwards be exchanged for another form of credit—a bank-deposit. In neither case, as it would seem, does the transaction involve the use of any portion of the circulating medium, nor call any new description of currency into existence.

It is of the utmost importance to form a clear opinion as to the distinction between various forms of credit and the circulating medium of a country; for if they be confounded one with another, all the established theories of currency are put into confusion. All hopes of regulating and controlling the circulation must be abandoned, for its variety and magnitude would be such as to defy tho operations of the government, or of a bank, by means of paper issues, which would form only one insignificant portion of the aggregate currency; and free trade in banking and free trade in the issue of notes must be recognised as the only reasonable principle for supplying commerce with a circulating medium.

We have now adverted to the main principles involved in the consideration of the character and functions of money. In treating of a subject which has been so fruitful of controversy, we have been obliged to touch lightly upon many points which to deep students of the 'currency question' may seem to have deserved more consideration. To examine them fully would add volumes to the many which have already been published upon that subject; and frequent allusions to the opinions of others, however deserving of attention, would give a controversial character to an inquiry after truth. We have endeavoured to state, as concisely as we could, the opinions we have formed, together with the grounds upon which we have formed them; and those who agree with us will think us right, while they who differ from us will pronounce us wrong. Upon currency questions unanimity is nowhere to be found; but the more men seek after truth in preference to quarrelling with one another, the more certainly will truth be found at last.

(Harris, *Essay on Money and Coins;* Locke, *Considerations on Raising the Value of Money;* Sir W. Petty, *Political Anatomy of Ireland;* Hume, *Essay* III. (*Of Money*); Lord Liverpool, *On Coins;* Adam Smith, *Wealth of Nations*, vol. iv. and Note by M'Culloch; Ricardo, *Principles of Political Economy*, c. 27; *Proposals for a Safe and Economical Currency*, 1816; Jacob, *Historical Enquiry into the Production and Consumption of the Precious Metals; The Gemini Letters*, 8vo., 1844; *Observations on the System of Metallic Currency in this Country*, by W. Hampson Morrison; *Remarks on the Management of the Circulation in* 1839, by Samuel Jones Loyd, 1840; *Reply Thereto*, by J. R. Smith, President of the Manchester Chamber of Commerce; *Observations on the Standard of Value*, by W. Debonaire Haggard, 1840; *Reflections on the recent Pressure of the Money-Market*, by D. Salomons, 1840; *Answers to Questions 'What constitutes Currency?' &c.*, by H. C. Carey, 1840; *Report of the Manchester Chamber of Commerce*, Dec. 12th, 1839; *A Letter to Thomas Tooke, Esq.*, by Col. Torrens, 1840; *On the Causes of the Pressure of the Money Market*, by J. W. Gilbart, 1840; *The Credit System in France, Great Britain, and the United States*, by H. R. Carey, 1838; *Remarks on the Expediency of Restricting the Issue of Promissory Notes to a Single Issuing Body*, by Sir W. Clay, Bart., M. P., 1844; *A Treatise on Currency and Banking*, by C. Raguet, 1839; *Bullion Report of* 1810; *Reports of Lords and Commons*, 1819; *On the Resumption of Cash Payments; Reports on the Circulation of Notes under 5l. in Scotland and Ireland*, 1826-27; *Bank Charter Report*, 1832; *Reports on Agricultural Distress*, 1833 and 1836; *Reports on Banks of Issue*, 1840 and 1841; *Debates on the Resumption of Cash Payments*, 1819; *and on the Bank Charter Renewal Bills*, 1832 and 1844; Tooke, *History of Prices.*)

MONKSHOOD. [ACONITUM, P. C. S.]

MONNOYER, JEAN BAPTISTE, a very celebrated fruit and flower painter, was born at Lille, in 1635. He was educated as an historical painter at Antwerp, but he afterwards adopted flower painting and went very early to Paris, where he was noticed and employed by Le Brun, and in 1665 was elected a member of the French Academy of Painting. He was employed by Le Brun in the decoration of the palace of Versailles, in which he painted many festoons of flowers and other similar pieces. It was owing to the beauty of these works that he was invited, about 1680, to London by the Duke of Montague, then English ambassador at Paris, to decorate Montague House (the late British Museum) in a similar manner; and the free and beautiful flower decorations of this palace, which is now pulled down, must still be fresh in the recollections of many.

Monnoyer painted in many other noblemen's houses in London and at other places; at Burlington House, at Lord Carlisle's, at Hampton Court, and at the Duke of St. Albans' at Windsor. One of his most remarkable works is a looking-glass painted in Kensington Palace for Queen Mary, who took such delight in seeing him paint that she spent nearly all the time that he was at work in watching him. There are fourteen flower-pieces by Monnoyer, or Baptiste as he is now commonly called in England, in the apartment named George II.'s private chamber, at Hampton Court; they are however dirty and badly hung. Monnoyer was commonly styled 'the flower-painter' in England in his own lifetime. He paid a few visits to Paris after his first arrival in London, but his permanent abode was in London, where he died in 1699, and was buried in St. James's. The French offended him by allowing his son-in-law, who was a painter and living at Paris, to touch and alter some of his works.

Monnoyer's style, though not by far so minute or highly finished as that of Van Huysum, is infinitely more free and more brilliant, equally true and more effective. His selection of flowers, his grouping, his colouring, and light and shade, and touch, are all equally excellent and faultless: his works in their perfect condition must have rivalled nature herself. The brilliancy of his colouring is extraordinary. He was particularly fond of grouping roses, poppies, pionies, tulips, and a few white flowers together in a marble vase, and there are several etchings of such groups by his own hand: the vases are placed on pedestals or tables. His best works are in this country. The prints after his works amount to about 80, and make a good folio volume: his own etchings are marked J. Baptiste, sculp., whence probably his now common name of Baptiste. His son Antoine Monnoyer, likewise a good flower-painter, was called the younger Baptiste in England. There is a portrait of Monnoyer engraved by White from a picture by Sir Godfrey Kneller.

(*Essay towards an English School*, 1706; D'Argenville; Walpole; Huber.)

MONOTROPA (from μόνος, one, and τρόπος, a turn), a genus of plants belonging to the natural order Ericaceæ and the tribe Monotropeæ. It has a 4-5 parted calyx, a corolla of 4-5 petals each, with a hooded nectariferous base; 8-10 stamens with kidney-shaped 1-celled 2-valved anthers; a peltate stigma; the capsule 5-celled, 5-valved, many-seeded. The species of this genus are singular-looking plants, found growing at the roots of trees, and destitute of the green and bright colours which characterise the other forms of vegetation.

M. Hypopitys, Yellow Bird's-Nest, has the flowers in a drooping cluster, lateral ones with 8 stamens, the terminal ones with 10 stamens, the fruit erect, the bracts and flowers glabrous externally. The stem of this plant attains a height of 6 or 8 inches, is succulent, simple, clothed with ovate scales, terminating in a short cluster, dingy yellow, at length turning nearly black. The flowers with large scaly bracts. It is a native of Great Britain. This, with the other species of Monotropa, being constantly found at the roots of trees, was supposed to be parasitical upon them; recent researches have, however, led to the conclusion that in the case of this species such an opinion is erroneous. Mr. Rylands, in a paper published in the 'Phytologist,' page 341, has given the result of a very accurate investigation of this subject, and has proved that the fibrillæ of the roots of Monotropa possess spongioles and take up their nutriment in the same way as other plants. Most specimens of Monotropa, when recently dug up, present masses of a fibrous substance, which adhere to their fibrils and the roots of the plant near which they grow, so closely, that they were supposed to be portions of the roots of the Monotropa. On examining this fibrous substance with care, Mr. Rylands found that in all cases it consisted of a species of byssoid fungus which had been developed upon the roots of the Monotropa, having no organic connection with the plant. The species of fungus varied in different specimens, and were found to belong to hitherto undescribed forms of Cryptogamia. There can be little doubt that the other species of Monotropa are of the same nature as Hypopitys, and that their parasitism is imaginary. Some writers have referred the species here described, and two others, to a genus called Hypopitys. This includes the European species, whilst the old genus, Monotropa, embraces two American species, *M. Morisoniana* and *M. uniflora*. The last species have not the musky semi-fragrant odour of those belonging to the genus Hypopitys.

(Don, *Gardener's Dictionary*; *Phytologist*, vol. i.; Babington, *British Botany*.)

MONTAGUE, GEORGE, was descended from an antient family residing at Lackham, in the central part of Wiltshire, where he had an estate. He was distinguished for his love of natural history, and was one of the early members of the Linnean Society of London. In 1802 he published an 'Ornithological Dictionary, or Alphabetical Synopsis of British Birds,' 2 vols. 8vo. This work exhibited much research as well as an extensive knowledge of the department of natural history to which it was devoted, and may be consulted with advantage at the present day by the ornithological student. In 1803 he produced his 'Testacea Britannica; or Natural History of British Shells, Marine, Land, and Fresh-water, including the most minute; systematically arranged and embellished with Figures,' London, 4to. This work also contained a great mass of valuable information on the subject on which it treated. A 'Supplement' was published in 1809 containing several plates and descriptions of new species. Besides these two great works he published several papers in the Transactions of the Linnean Society. Of these the following are the principal—

1. Description of three rare Species of British Birds. Vol. iv. 1796.
2. Description of several Marine Animals found on the south coast of Devonshire. Vol. vii. 1802.
3. On some Species of British Quadrupeds, Birds, and Fishes. Vol. vii. 1803.
4. Of the larger and lesser Species of Horse-shoe Bats, proving them to be distinct, with a Description of Vespertilio Barbastellies taken in the South of Devonshire. Vol. ix. 1805.
5. On the Natural History of the Falco Cyaneus and Pygargus. Vol. ix. 1807.
6. Of several New or Rare Animals, principally Marine, discovered on the South Coast of Devonshire. Vol. xi. 1811.
7. Of some New and Rare British Marine Shells and Animals.—*Ib.*

During the latter part of his life Mr. Montague lived at Knowle, near Kingsbridge, in Devonshire, where he died in 1815.

(*Biographical Dictionary of Living Authors*; Watt's *Bibliotheca Britannica*.)

MONTALEMBERT, MARC-RENE', MARQUIS DE, a distinguished military engineer of the eighteenth century, was born July 16, 1714, at Angoulême. He was descended from an antient and noble family; and, having received an education in which both literature and science were judiciously conjoined, he entered the army at eighteen years of age.

In the course of his first campaign (in 1733), he was present at the siege of Kehl, and in the following year he distinguished himself at the siege of Philipsburg. He served afterwards with considerable reputation in Bohemia, when a French army under Marshals Broglio and Belleisle was in that country; and, on the retirement of the army from thence, he returned to Paris, where he devoted himself to the study of subjects which have relation to the military art. He was admitted a member of the Académie des Sciences in 1747; and he wrote several 'Mémoires,' which were inserted in the volumes published by that body. About the same time he established a foundry at Perigord for the purpose of casting heavy ordnance, which was then much wanted for the French navy. During the Seven Years' War Montalembert was attached, as an agent for the French government, to the staff of the Swedish and Russian armies; and he appears to have been consulted by the allied generals respecting the arrangements of the plans for the different campaigns. In 1777 he published a small work entitled 'Correspondance pendant la Guerre de 1757,' which contains much interesting matter relating to that war. In 1779 he was appointed to construct a fort for the purpose of securing the isle of Aix against the English fleet; and this fort, which was built entirely of wood, is said to have borne, without experiencing any damage, the shock occasioned by the simultaneous firing of all the artillery which was mounted on it: the experiment seems to have been made in order to disprove the assertion of several engineers that the fort would fall in ruins by the fire of its own guns.

Montalembert published, in 1758, a small work in 4to., entitled 'Mémoire Historique sur la Fonte des Canons;' and, in 1766, one under the title of 'Cheminée-Poele.' He also published, in 8vo., a pamphlet designated 'Relation du Siège de Saint-Jean d'Acre.' But the work by which his name will be for ever remembered is his great treatise, entitled 'La Fortification Perpendiculaire, ou l'Art Defensif supérieur à l'Offensif,' which was published at Paris in eleven quarto volumes (1776 to 1796).

In the first volume, having shown the defects of the bastioned fortifications which are constructed according to the principles of Vauban, he proposes to suppress the flanks of the bastions, continuing the faces of those works till they meet in the middle of each front of fortification, and, at the place of meeting, to have a casemated work like a small ravelin. The advantage to be gained by this project is, chiefly, a diminution of the expense of construction; and, after proposing some other modifications of the existing fortifications, Montalembert dwells at length on that system which gives its name to the treatise. [FORTIFICATION, P. C.] The perpendicular fortification consists of four lines of rampart, the branches of which form right angles with one another at the re-entering parts, and three of these are defended by a powerful fire of artillery, which, being placed in casemates, is not liable to be dismounted by the enemy; while spacious terre-pleins at the foot of each rampart afford room for the troops of the garrison to engage the besiegers with forces superior to any which can be brought against them.

In the second volume, after giving an interesting account of the war in 1741, in which the importance of fortified positions is pointed out, he describes the construction of redoubts or small forts. In the third volume there is a project for the construction of a simple fortification, consisting of a crenelated wall covered by a rampart on which are constructed casemated traverses: this is proposed as a good kind of defensive work for sea-ports; and it is said that some of the forts which defend Cherbourg were executed on that principle. The fourth volume contains an abridged history of the reign of Louis XIV., together with sundry projects relating to the formation of lines of intrenchments for the defence of the frontiers of a state. In the fifth are some details concerning the construction of batteries for the defence of seacoasts; and the sixth and seventh volumes are occupied with refutations of the objections which had been made to his systems. The eighth contains some observations on the forts at Cherbourg and on the isle of Aix. The ninth volume, which is particularly entitled 'L'Art Defensif supérieur à l'Offensif,' contains sundry projects for circular redoubts and for a casemated star-fort. The tenth and eleventh consist of memoirs relating to fortification and artillery.

The leading principle on which the projects of this engineer are founded is, that a fortified post should contain an abundance of casemates for the security of troops and artillery: Montalembert considers that these alone will enable a small number of men to resist with success the attack of a numerous army, and that a few guns so protected are capable of dismounting all that an enemy can place behind parapets made merely of earth. His projects were severely criticised during his life; but, though some parts of his constructions are open to objections, the principles are unexceptionable; and it is important to observe that many of his ideas have been adopted by the Prussian and Austrian engineers in the works recently constructed for the defence of Western Germany.

In 1770 Montalembert married a lady who was distinguished by her talents as a performer on the French stage, and who wrote a novel entitled 'Elise Dumesnil,' which was printed in London in 1798. It is said that Montalembert composed for the theatre some small pieces which had a certain success; and his attachment to the Muses is proved from the fact that his biographer, Lalande, had in his possession a number of his songs and tales in verse which are said to have been characterized by grace, elegance, and imagination.

In publishing his great work, and in making his experiments for the improvement of the military art, he seems to have incurred expenses which injured his fortune. He had given up to the government his foundries at Perigord, and his applications for the sum of money which he claimed as an equivalent were fruitless; he was even deprived of a pension which he enjoyed for the loss of an eye in the service of the country. About the year 1790 he came to London; but, after remaining here a few months, he returned to Paris, leaving his wife in this country. It is said that, in order to save some of his property, he joined the revolutionary party; and it is painful to record that he entered so far into the prevailing spirit of the time as to divorce his wife in order to marry the daughter of an apothecary. He sold an estate for the purpose of satisfying his creditors, but receiving payment in assignats, which immediately afterwards suffered an enormous depreciation, he became involved in serious difficulties. He continued however, to employ an artist on a work with which he had long been occupied—the construction of a considerable number of models relating to fortifications and artillery, and the valuable collection, when completed, he presented to the Committee of Public Safety. At the same time, with other eminent engineers, he was constantly consulted by Carnot on subjects relating to the military affairs of the republic. He died of a dropsy, March 29, 1800, being then eighty-six years of age.

(*Eloge de Montalembert*, by Delisle de Sales; *Biographie Universelle.*)

MONTEN, DIETRICH, an eminent German battle painter, was born at Düsseldorf in 1799. He showed from his earliest youth a great love for accounts of wars and battles; and Homer, Tasso, and Ariosto were his favourite authors, from which he used to sketch the most striking scenes of arms. In order that he might have some practical knowledge in military matters he enlisted into the Prussian army as a volunteer in 1818, and served accordingly for twelve months. At the expiration of his term of military service, he entered the Academy of Arts of Düsseldorf, and after studying two years in that institution he removed to Munich, in order to benefit himself by the study of the works of Peter Hess, who almost rivals Horace Vernet as a battle painter, and is still resident in Munich.

Monten was not long in attracting the attention of Cornelius, then the Caposcuola of the painters of Munich, and the notice of the present king of Bavaria, Ludwig I. He was intrusted by Cornelius, in 1827, with the execution of three of the frescoes of the arcade of the Hofgarten—the storming of a Turkish entrenchment by the Bavarians at Belgrade in 1717, under the elector Carl Albrecht and his brother Ferdinand; the battle of Arcis sur Aube, in which the Bavarians under Wrede were engaged; and the granting of the Bavarian constitution by Maximilian Joseph I. in 1818. These works, though hard and much too positive in colour, have great merit, and allowance must be made for the comparative infancy of the then only reviving art of fresco-painting in Munich. After these works Monten painted for the king a picture of the battle of Saarbrück, 1815, for the Hall of Victory (Siegessaal) in the state apartments of the new palace; and for the same patron of the arts, the departure of the Poles from their fatherland in 1831. These were followed, in 1836, by the death of Gustavus Adolphus in the battle of Lützen, now in the King of Hanover's collection; in 1838, by George I. in the battle of Neerwinden; and in 1839, by the great camp in 1838 at Augsburg, for the Emperor Nicholas, at which that emperor was present. He painted besides these principal works many smaller pieces, which are all conspicuous for extraordinary spirit in the incidents and in the execution, and display much fine drawing and good colouring, though in many parts too sketchy and undefined; he wanted the necessary patience for elaborate modelling and uniform finish. But when the exact degree of this technical excellence is missed, its absence is more agreeable than its excess; and all Monten's works have a very agreeable effect: their greatest defect is an occasional extravagance of action. His horses are always very spirited. He died after a short but severe illness, in December, 1843, in the prime of life, being in his forty-fifth year only, universally regretted by all who knew him. Several of his works have been lithographed by Bodmer, Hanfstängel, and others.

(*Kunstblatt*, 1836-1844; Von Hormayr, *Geschichtlichen Fresken in den Arkaden des Hofgartens zu München.*)

MONTGOMERY, ALEXANDER, an old Scottish poet, was a younger son of a good family in Ayrshire. The Bannatyne Manuscript, written in 1568, contains some of his verses: but the very few events of his life which are exactly known fall within the reign of King James VI. of Scotland. He is described as having been a captain, probably in the guard of Morton the regent. King James quotes some of his poems in a work of his own, published in 1582; and he obtained a pension of five hundred Scottish marks, which led him into a troublesome law-suit on his return from a continental tour, begun in 1586. He appears to have died between 1607 and 1611. In the former of those years was published his principal work, an allegorical poem, called 'The Cherry and the Slae' (or Sloe). This poem is still popular in Scotland, and has been very frequently reprinted in a cheap form. It, and the author's sonnets and other poems, are both lively in fancy and pleasing in versification. In 1822 there appeared at Edinburgh a neat edition of all his poems, edited by Mr. Laing, with a biographical preface by Dr. Irving.

MONTIA, a genus of plants named in honour of Dr. Joseph Monti, professor of botany and prefect of the medical garden at Bologna. He paid much attention to the scientific arrangement of the Gramineæ and Cyperaceæ. He published also a catalogue of the plants in the botanic garden at Bologna, in which he described several new species. The following are the principal works which he published:—1, 'Catalogi Stirpium agri Bononiensis Prodromus, Gramina et adfinia complectens,' Bononiæ, 1719, 4to. 2, 'Indices Horti Bononiensis ad Usum Demonstrationum quæ in Horto Bononiæ quotannis habentur,' Bononiæ, 1724, 4to.

The genus Montia belongs to the natural order Portulaceæ, and has a persistent calyx of 2 sepals; a corolla 5-parted with 3 segments smaller than the others, with the tube split to the base in front; 3 stamens inserted in the throat and opposite to the smaller segments of the corolla; the ovary turbinate; the style very short; the stigmas 3, downy; the capsule of 1 cell with 3 valves and 3 seeds. There is but one species of this genus, *M. fontana*, which is a native of Great Britain. It is also found in North and South America in bogs, ponds, and ditches; and is commonly known by the name of water-chickweed. It closely resembles the species of the genus Claytonia.

(Babington, *Manual of British Botany*.)

MONTO'RSOLI, FRA GIOVANN' ANGELO, a celebrated Italian sculptor, was born in 1507, or about the beginning of the sixteenth century, at Montorsoli near Florence, on the road to Bologna, a villa belonging to his father Michele d' Angelo da Poggibonzi. He was first instructed by Andrea da Fiesole, with whom he lived three years. After the death of his father he found employment at Rome, at Perugia, and at Volterra, where he assisted in making the monument to Raffaello Maffei. He was next employed by Michelangelo in the church of San Lorenzo at Florence, and gained the admiration and lasting friendship of the great Florentine. In 1527 Montorsoli had a strong disposition to turn as it appeared to him to the only life in which peace was to be obtained; but after trying in vain several convents, he fixed, in 1530, upon the brotherhood of the Nunziata at Florence, and became a friar of the order dei Servi della Nunziata. Shortly after he had taken up his abode in this convent, he was called to Rome by Clement VII. to restore several antient monuments, much to the dissatisfaction of his brothers of the Nunziata: he had been recommended to the pope by Michelangelo. Montorsoli restored the Laocoon, to which he made the right arm, and he made the left arm of the Apollo, and executed other restorations. When these and a statue of the pope were finished, he returned to Florence with Michelangelo to complete the statues and other sculptures of the sacristy and library of San Lorenzo, of which his best is San Cosimo. After the death of Clement, Montorsoli again joined Michelangelo at Rome and assisted him in the works of the monument of Julius II.; but while engaged on this work he was invited by Cardinal Turnone, and advised by Michelangelo, to go with the cardinal to Paris, to Francis I., who commissioned him to make four great statues, but owing to difficulties with the treasury and servants of the court in Francis's absence, Montorsoli left Paris and returned to Florence without executing these works. After completing several good works in Florence and its neighbourhood, he went by Rome to Naples, and there constructed the tomb of Jacopo Sannazzaro. He next finished at Genoa the statue of Andrea Doria which was commenced by Baccio Bandinelli; and ornamented the church of San Matteo there with many works. Upon the completion of these works he returned to Michelangelo at Rome, but departed again soon afterwards, in 1547, for Messina, where he was employed to make a grand fountain for the place in front of the cathedral. The principal basin is thirty-four palms in diameter, and is ornamented on its twenty irregular sides with twenty bassi-rilievi illustrating the various antient fables connected with the watery element: it has besides the usual marine monsters and other designs contrived for jetting the water: the whole fountain is crowned by a figure of Orion with the arms of Messina engraved upon his shield. The successful completion of this great work induced the Messinese to commission Montorsoli to erect another fountain in the front of the Dogana (Custom-house) close to the sea. He designed also at Messina the church of San Lorenzo, a lighthouse, aqueducts, and many other considerable works in architecture and in sculpture. But in 1557 by a decree of Pope Paul IV., all religious persons, or all who had taken holy orders and were living at large in the world without respect to their religious character, were ordered to return to their convents and reassume their religious habits; and Montorsoli was accordingly obliged to leave many works unfinished, which he intrusted to his pupil Martino, and he returned to his convent at Florence. He was however shortly afterwards called to Bologna to construct there the high altar of the church of his own order dei Servi, which he completed with great magnificence in twenty-eight months. He returned to Florence in 1561, and being rich he built a common sepulchre for artists in the chapter-house of the convent of the Nunziata, with the requisite endowment for regular masses at appointed times, and gave the whole sepulchre, chapter, and chapel, to the then almost decayed society of St. Luke, or company of painters, &c., which upon the completion of the sepulchre, was at a solemn feast celebrated by forty-eight of the principal artists of Florence, re-established by the consent and authority of the Duke Cosmo I. upon a firmer and permanent basis; and the society still subsists as the Academy of Florence, though since that time it has been considerably enriched and endowed by successive Dukes of Tuscany. Montorsoli died, says Vasari, on the last day of August 1563, aged fifty-six.

(Vasari, *Vite de' Pittori*, &c.)

MORCELLI, STE'FANO ANTO'NIO, born at Chiari, near Brescia, in 1737, studied at Rome, entered the Order of the Jesuits, was sent to Ragusa, and afterwards returned to Rome, when he was made Professor of Rhetoric in the Roman College. After the suppression of the Order of the Jesuits in 1773, he became librarian to Cardinal Alessandro Albani, and then wrote his work 'De Stilo Inscriptionum Latinarum Libri III.,' Rome, 1781. In 1790 he was elected Provost of the Chapter of his native town, Chiari, where he busied himself in doing good to his townsmen, and for their sake he afterwards refused the see of Ragusa, which had been offered to him. He founded an institution for the gratuitous education of young girls; he gave in his life-time his own select library to the town of Chiari; he repaired and embellished the churches of the same town, and was very charitable towards the poor. He died at Chiari, in 1821. Besides his work on inscriptions already noticed, he wrote: 1, 'Inscriptiones Commentariis subjectis.' 2, 'Parergon Inscriptionum Novissimarum.' 3, 'Kalendarium Ecclesiæ Constantinopolitanæ cum Commentariis illustratum,' from an antient MS. anterior to the schism between the Eastern and Western churches. Morcelli translated the MS. from Greek into Latin, adding his own commentaries, and rendering it a valuable work on church history. 4, 'Explanatio Ecclesiastica Sancti Gregorii.' This Gregory was one of the earliest bishops of Agrigentum. 5, 'Africa Christiana,' 3 vols. 4to., Brescia, 1816. This is another important work on church history, from A.D. 197 till A.D. 697. It may be styled the Fasti of the Christian Churches in Northern Africa.

Morcelli's works on Inscriptions have been collected and published together: 'Opera Epigraphica,' 5 vols., Padua, 1818-25, and Professor Schiassi has added to them a 'Lexicon Epigraphicum Morcellianum,' in Latin and Italian.

Morcelli wrote also a book of epigrams—'Electorum Libri II.;' and various dissertations on Roman antiquities.

(Lombardi, *Storia della Letteratura Italiana*.)

MORDVINES. [RUSSIA, P. C.]

MORELLI, CO'SIMO, an Italian architect of considerable note among those of the last century, was born at Imola in 1732. He was the son of Domenico Morelli (an architect also), and studied under Domenico Trifogli, who executed several works of merit at Imola. It was Cosimo's good fortune to obtain powerful patronage at the very outset of his professional career,—first that of Gioan-Carlo Bandi, bishop of Imola, for whom he made designs for rebuilding the cathedral of that city, and through him, that of his nephew Giovanni Antonio Braschi, who was elevated to the papal throne in 1775, with the name of Pius VI. The new pontiff, who entertained a personal regard for Morelli himself, almost immediately appointed him city-architect at Cesena (the pope's native town), and among various other commissions commanded from him designs for a new sacristy at St. Peter's. If that and some other projects were not realized, the designs themselves obtained universal though transitory admiration. No art is more subject to blights than architecture, it being one in which the best ideas are often rejected. Yet as far as mere employment and number of works go, Morelli had no reason to complain,—rather to consider himself favoured beyond most of his contemporaries, as will appear from an enumeration of the principal structures executed by him, namely, the cathedral of Imola, the metropolitan church at Fermo, the duomo at Macerata, and the conventual church at Fossombrone, St. Petronio at Castel Bolognese, a church at Barbiano, that of the nuns of St. Chiara at Imola, and St. Maria in regola in the same city, and another church at Lugo, also some alterations in the metropolitan church at Ravenna. It happens, too, rather singularly, that Morelli was almost as much employed in theatrical as in ecclesiastical architecture. The buildings of this class erected by him are—the theatre of Imola (destroyed by fire a few years afterwards, but preserved in the volume of engravings of it published in 1780), Fermo, Jesi, and Osimo; also that of Ferrara, which is confidently claimed for him by some, although Foschini was likewise in some manner or other employed upon it. [FOSCHINI, P. C. S.] Besides the above works, he built the Palazzo Braschi at Rome, the Anguisola at Piacenza, the Berio at Naples, and the Cappi at Bologna; the façade of the Ridotto at Cesena, and the Hospital at Imola, the façade of the Palazzo Publico, and the Palazzo Vescovile. He would probably have done more, but for the unpropitious state of things in Italy for architecture towards the close of his life. He died, after a severe paralytic attack, in February, 1812.

(T. Papotti, in Tipaldo's *Biographia.*)

MORELLI, GIA'COMO, one of the most distinguished librarians of modern times, was born at Venice on the 14th of April, 1745. He was the son of poor parents, who were unable to give him a liberal education. It was against their will that he resolved to enter the church, although in all other respects he always showed the greatest deference to their wishes. He afterwards supplied the deficiencies of his education by private study; and the knowledge which he thus acquired was more substantial and extensive than that of any of his Italian contemporaries, though it was not till late in life that he became acquainted with the Greek and French languages. At an early period he pursued his private studies in the library of the family of the Zaniani, and his unremitting perseverance attracted the attention of the librarian de Rubeis, who soon became his adviser and faithful friend. After having read through the greater part of that library, his avidity to acquire knowledge led him to examine the other libraries of his native city to which he could gain access. His love of independence induced him to refuse several very advantageous offers that were made to him both by the church and by wealthy collectors of books at Venice, and he continued to live as a simple Abbé. He formed however an intimate friendship with the patrician Farsetti, of whose rich collection of MSS. he published a catalogue, under the title of 'Biblioteca Manuscritta del Bali T. G. Farsetti,' Venice, 1771-80, 2 vols. 12mo. While this work was in course of publication he also wrote 'Dissertazione Storica intorno alla Publica Libreria di S. Marco,' Venice, 1774, in which he discussed and solved a great many questions connected with the history of literature. He then prepared a similar work on the history of the library of the academy at Padua, whither he had accompanied his friend Farsetti; but the materials which he collected for that purpose were unfortunately left in the hands of Colle, the historiographer of that institution, through whose carelessness they were lost. In 1776 he published a catalogue of the MSS. of antient writers which were in the library of the Narni family; and somewhat later a catalogue of the MSS. of Italian works contained in the same library. These works alone would have sufficed to secure to Morelli an honourable place among the eminent bibliographers of modern times; but he acquired a still greater reputation as librarian of the library of St. Mark, an office which he received in 1778, and which he held until his death, which happened on the 5th of May, 1819. He devoted himself with the greatest zeal to the completion and arrangement of that famous library; but during the French rule in Italy he had, to his great vexation, to superintend the removal of the library from its venerable antient building to a new one, the splendour and convenience of which however consoled him in some measure for the loss of the former building. In 1795 he discovered a considerable fragment of the 55th book of Dion Cassius, which he published at Bassano, together with new various readings of other books of the same historian. This little work was afterwards (in 1800) republished at Paris, uniform with Reimarus' edition of Dion Cassius. The work which exhibits his extensive knowledge and his critical acumen in the strongest light is his 'Bibliotheca Manuscripta Graeca et Latina,' of which however only one volume was published at Bassano (1802), although he had collected materials for several more volumes. His last production was 'Epistolae Septem variae Eruditionis,' Padua, 1819. Abbé Morelli is acknowledged by all who had occasion to visit the library of St. Mark during the time that he was at the head of it, to have been the most amiable, kind, and obliging person, and his vast learning was equalled only by his extraordinary modesty. After his death there appeared, 'Operette ora insieme con Opuscoli di Antichi Scrittori,' Venice, 1820, 3 vols. 8vo.

(Bettio, *Orazione recitata nelle solenne Esequie nella Chiesa Patriarcale di Venezia*, Venice, 1819.)

MORETON BAY lies on the eastern coast of Australia, in New South Wales, and extends from north to south over more than a degree of latitude, chiefly between 27° and 28° S. lat.; one arm passes north of 27°. It is one of the most spacious bays on that coast, being probably more than 80 miles long, whilst the width of the main body, lying between 27° and 27° 30′, exceeds 10 miles. Those portions of the bay which lie farther south and north are comparatively narrow branches, being hardly anywhere more than three miles across. The bay is formed by two long islands, which extend lengthwise parallel to the shore of the mainland. The southern island, called Stradbroke, is about 40 miles long, and the northern, Moreton, 24 miles. In width these islands vary between two and four miles. They are moderately elevated above the sea-level, and contain some high hills. Of the three entrances leading between these islands to the bay, the most southern can only be passed by boats, but the two others admit large vessels. That between Stradbroke and Moreton islands is called South Passage, and that between the last-named island and the projecting cape of the mainland, North Passage. Two moderately large rivers fall into the bay: the northern, called Brisbane, may run more than a hundred miles, and the southern, Teviot, about seventy miles. A rather high range of hills lies between them, which appears to be connected with the high land situated at the distance of about eighty miles from the sea, and forming the eastern edge of the elevated table-land of the interior of New South Wales. The country between the ranges and on the banks of the river is clothed with woods which contain many large trees covered with climbing plants of various descriptions; the soil appears to be good. Since 1839 settlements have been formed on them, of which however no account has reached us lately. It was then supposed, that wheat, maize, tobacco, sugar, indigo, grapes, and many other articles would be raised in that part of the colony, as the climate approaches that of the inter-tropical countries. The elevation of the mountains at the back of the lower tract, screens this country from the hot winds that prevail during a great part of the year on the elevated table-land, and to the vicinity of the sea the frequency of showers may be attributed, which fall here when other districts are parched with drought.

(*Parliamentary Papers*, 1841.)

MORGHEN, RAPHAEL SANZIO, Cavaliere, one of the most celebrated engravers of recent times, was born at Florence, June 19, 1758, by his own account, according to the authority of Niccolo Palmerini, his pupil, who published a complete catalogue of his works.

Morghen's grandfather was a lace-merchant of Montpellier, who married a Genoese wife and settled in Florence, where he had two sons, Filippo and Giovanni. They both followed the arts: Filippo, the elder, and the father of the subject of this notice, was an engraver. He settled early in Naples, and married there the daughter of Francesco Lisni, court-painter to Charles III., and by her had several daughters and an only son, Raphael Sanzio, who became one of the most distinguished engravers of his own or any other time.

Filippo must have made a visit with his wife to Florence some time after his marriage, and before the birth of Raphael, as Florence was his birthplace by his own account.

Raphael Morghen's first works were small landscapes and prints of the neighbourhood of Naples: he was very early instructed by his father in the first principles of his art, and he could engrave a tolerable plate as early as his twelfth year. But his first engravings of consequence were seven plates from the masks of the carnival of 1778, the Pilgrimage of the Grand Signor to Mecca; a work of such extraordinary merit for a youth of twenty, that his father deemed it right that he should have the benefit of the best instruction that could be procured, and sent him accordingly to the celebrated Volpato at Rome, who gave him at first a print of E. Sadeler's, of Christ and Mary Magdalen in the Garden, to copy. He engraved also about this time Gavin Hamilton's allegoric figure of Painting, for the brothers Hackert. In 1781 he engraved Raphael's allegoric figures of Poetry and Theology, from the Vatican. In the same year he married Volpato's only daughter Domenica; and assisted Volpato on his plate of the Parnassus of Raphael, or the historical illustration of Poetry, in the Stanze of the Vatican. In 1787 he engraved the Aurora, painted in fresco by Guido for the garden-house of the Palazzo Rospigliosi; but this, though one of his principal works, is not one of his best. Though some of its parts are better, the Hours around the chariot of the Sun are less graceful and less buoyant than those in the print by Fry, executed long before it. The extremities, especially the hands, are in both badly drawn, but those of Morghen's print are inferior to Fry's, and the faces want regularity and beauty. This plate however was retouched by the school of Volpato, and is said to have been damaged. The impressions without the words 'In Aedibus Rospigliosis,' and those taken before the retouch, are much more valuable than any of those taken afterwards. In 1790 Morghen visited Naples, and engraved a portrait of his father. The Neapolitan court wished to persuade him to reside at Naples in 1792, and offered the inducement of a salary of 600 ducats; but Morghen accepted in preference an invitation from the Grand Duke of Tuscany to Florence, and established himself there in 1793, with a salary of 400 scudi and free apartments in the town, under the sole condition that he should keep a public school; with the privilege of engraving what he might choose, and his prints remaining his own property.

The first print engraved by him in Florence was the Madonna della Seggiola. In 1795 he commenced the celebrated Madonna del Sacco, after Andrea del Sarto, and Raphael's Transfiguration; but his time was much taken up by portrait commissions from the royal family of Florence. The first picture is in Florence; the second he engraved from a drawing by Tofanelli: he had commenced one from a copy by A. del Era; but upon comparing this with the original he found it very faulty, and he was forced to abandon what he had already done. This practice of engraving from copies and publishing the works produced as engraved from the original pictures, may be a custom with engravers, but it is a practice that cannot be justified, unless the original is not within the reach of the engraver, or unless the source be acknowledged upon the print. An engraver may commence his print from the print of another man if he has compared the copy with the original and found it to be exact; but an acknowledgment of the availed assistance is imperative in point of honour. A print which is sold as a faithful copy of a certain work of art, and is only the copy of a copy, without reference to the original, is virtually a forgery. Jordan, the Russian engraver, who has just completed a very large and excellent engraving of the Transfiguration, was actually engaged thirteen months in the Vatican making his chalk drawing from the picture, to execute his engraving from, and it was pronounced by all who saw it as exact a copy as could be made. All engravers cannot do this, but they can all ascertain whether the drawings they work from are approved copies or not.

Morghen's Transfiguration was not completed until 1812, when it appeared with a dedication to Napoleon, and the emperor invited the engraver to Paris, and honoured him with various presents. This print was originally sold at about twenty scudi, or four guineas, but the price afterwards very much increased, and reached, in some impressions, from 20*l.* to 30*l.* Jordan's print, however, will now materially interfere with the commercial value of Morghen's. The cast-away print was also finished by Morghen's brother, Antonio, but it is said that only two hundred impressions of it were ever printed: the plate came into the possession of Artaria and Co., at Mannheim. Though less correct, it has more technical effect as an engraving than the second print. Of the second print there are eight different kinds of impressions:—etchings, in five degrees of progress, in which additional portions are finished; fifteen impressions in which all is finished but the book in the hand of St. Andrew; impressions in the same degree of progress, with the inscription, 'Et transfiguratus est ante eos,' written with the needle; and, lastly, the completely finished prints. This engraving is a work of great labour, of great skill, and of extraordinary merit as far as the execution of the lines goes, yet it leaves much to be desired; it wants tone and aerial perspective, it is hard and metallic, and, as a whole, is flat, though the individual parts are beautifully rounded. Morghen was engaged while this work was in progress, three years, upon a print of the Last Supper by Lionardo da Vinci, and this is his masterpiece. The flatness and equality of his general execution is not perceptible or detrimental to this work, as the picture is comparatively in one plain, and it is sufficiently large to admit of great detail of expression: it was made from a drawing by Teodoro Matteini. Later impressions are retouched; the first and by far the most valuable have no comma after the word *vobis—dico vobis*, &c. The last impressions are also without the comma, which was removed.

Raphael Morghen died at Florence, April 8, 1833, and an extravagantly eulogistic inscription has been placed upon his tomb. His pupil Palmerini published at Florence, in 1824, a life and portrait of him, with a list of his works, 'Catalogo delle Opere d' Intaglio di Raffaello Morghen, raccolte ed illustrate da N. Palmerini, &c.' Morghen has engraved, according to this list, 73 portraits; 47 biblical and religious pieces; 44 historical and mythological pieces; 24 views and landscapes; and 13 vignettes and crests, &c.; in all 201 pieces: there are probably others omitted in the catalogue. Dr. Nagler has reprinted the list entire in his *Künstler Lexicon*.

MORHOF, DANIEL GEORGE, is well known as the author of a very useful work entitled 'Polyhistor.' A Life of him, extending to 78 closely printed quarto pages, is prefixed, under the title of 'Prolegomena,' to the second volume of that work, by the editor, John Moller, rector of the grammar-school of Flensburg in Schleswig. From this copious dissertation it appears that Morhof was born at Wismar, in the duchy of Mecklenburg-Schwerin, on the 6th of February, 1639. His father was Joachim Morhof, notary public, assistant-clerk to the town-council (Senatui urbano a judicii inferioris secretis), who had been born of humble parentage in the Mark of Brandenburg, and is described as distinguished both for his probity and his learning; his mother was Agnes, daughter of Daniel Hintzius, a respectable merchant. Young Morhof was taught his Latin rudiments at home by his father, who also made him early familiar with the Bible and with the elements of general history. Before he knew his alphabet he was fond of music, in which he afterwards made remarkable progress. When he was in due time sent to the Athenaeum, or academy, of his native town, he distinguished himself not only in Latin and Greek, but in history and in the mathematical sciences. In March, 1655, he was sent to the Royal Paedagogium of Stettin; whence after two years he proceeded to the university of Rostock to study law. He continued however to give a great part of his time to elegant literature, and especially to poetry, composing verses both in Latin and German with great facility and much to the admiration of his friends. In 1660 he obtained the professorship of poetry in the university. In the end of the same year, before commencing his public prelections, he visited Holland and England, remaining for some time in this country that he might have the use of the Bodleian Library. He also addressed a congratulatory Latin poem to Charles II. on his restoration. On his return to the Continent he was made doctor of laws by the University of Franeker, in Friesland, on the 26th of September, 1661. He greatly distinguished himself by the manner in which he performed the duties of his professorship; and in 1665 he was invited and induced to accept the appointment of Public Doctor of Eloquence and Poetry in the newly founded university of Kiel in Holstein. In the summer of 1670 he made a second journey to Holland and England; and stayed for a considerable time in London, where he enjoyed the society, among others, of Boyle, Isaac Vossius, and Oldenburg, the secretary of the Royal Society. On the 23rd of October, 1671, he married, at Kiel, Margaret, daughter of Caspar a Degingk, senator of Lübeck. She died in 1687, after having brought him four sons; of whom the second, George Marquard, and the fourth, Eric George, died young; the first, Caspar Daniel, and the third, Frederic, survived their father.

In 1673 Morhof succeeded to the professorship of history; and in 1680 he was appointed librarian to the university. The latter charge to so devoted a reader was peculiarly gratifying. From the time of the loss of his wife, however, his health began to break down. In 1690 he was attacked by a serious illness; and when he had partially recovered, in the spring of the following year he undertook an ill-advised journey to the mineral waters of Pyrmont, from which he never returned: he only got back as far as Lübeck, and there breathed his last, on the 30th of July, 1691, in the fifty-third year of his age.

Morhof was a very voluminous author. The account of his writings, published and unpublished, fills nearly fifty pages of the memoir by his friend Moller. His first production consisted of two Latin poems, published together in 1657. This was followed by an academical disquisition entitled 'Diatriba de Morbis et eorum Remediis Juridica,' in 1658; and afterwards, among other works, by an octavo volume entitled 'Epigrammatum et Jocorum Centuria Prima,' in 1659; 'Diatribe Philologica de Novo Anno ejusque Ritibus,' in 1663; a curious defence of the miraculous powers claimed by the kings of England and France in the cure of the king's-evil, under the title of 'Princeps Medicus,' in 1665; a volume of 'Miscellanea Poetica,' in 1666; another entitled 'Venerum, sive Epithalamiorum, Liber,' in 1667; another entitled 'Funerum Liber,' in the same year; several other volumes of Latin verse at various times; a translation into Latin of several of Boyle's tracts, in 1671; 'Disputatio de Sole Igneo Academica,' in 1672; in 1673 'Epistola de Transmutatione Metallorum,' (from which it is evident that he was a believer in the philosopher's stone); in 1682, an 8vo. volume, in German, on the history of the German language and poetry (*Unterricht von der Deutschen Sprache und Poesie*, &c.), with a collection of his own German verses (*Teutsche Gedichte*); in 1684, 'Liber de Patavinitate Livianâ;' in 1686, 'Otiorum Divinorum, seu Carminum Sacrorum, Liber;' and the first and second books of his 'Polyhistor,' in 1688. After his death appeared, among other works, in 1694, 'D. G. Morhofii CVIII. Quaestiones Chymicae, ex variis Autoribus Chymicis collectae;' in 1697, 'Morhofii Opera Poetica Latina omnia;' in 1698, 'Morhofii Orationes et Programmata;' in 1699, 'Morhofii Dissertationes Academicae et Epistolicae.' For the works which he left in manuscript, mostly in an unfinished state, and which have never been printed, we must refer to the ample pages of his biographer. They are far too numerous to be noticed here. So great a quantity of literary production in so short a life sufficiently attests Morhof's diligence and facility. His judgment, however, appears to have been hardly in proportion to his acquirements; and even his learning was more remarkable for its superficial extent than for its depth. Of all the mass of authorship to which his name is attached, his 'Polyhistor' is, we believe, the only portion that is still held in any esteem.

The full title of this work is 'Polyhistor Literarius, Philosophicus, et Practicus. Of the 'Polyhistor Literarius,' intended to form the first volume, Two Books, as already mentioned, were published by the author himself in 1688. They were brought out in 4to., at Lübeck. The First is entitled 'Bibliothecarius;' the Second, 'Methodicus.' As reprinted in the last edition of the work they make together 588 pages. A Third Book, entitled Παρασκευαστικος, was printed from Morhof's manuscript at Lübeck in 1692, with a re-impression of the two preceding Books. It extends to 156 pages. The remainder of the first volume, consisting of Book IV., entitled 'Grammaticus,' (206 pp.); Book V., entitled 'Criticus,' (20 pp.); Book VI., entitled 'Oratorius,' (60 pp.); and Book VII., entitled 'Poeticus' (72 pp.), was compiled from notes of Morhof's lectures, by Moller and John Frickius, professor of theology at Ulm; they also added the 'Polyhistor Philosophicus,' in Five Books; and the 'Polyhistor Practicus,' in Seven Books; and published the completed work in two vols. 4to. in 1704. A new edition of the whole work was produced in two vols. 4to., by John Albert Fabricius, in 1731; and another edition in 4to., by the same editor, in 1747. All the editions have been published at Lübeck. With the ample indexes which Fabricius has appended (though the plan of notation is rather complicated), and with the corrections and additions which it has received from his extensive and accurate learning, the 'Polyhistor' is still a useful survey of universal literature down to the middle of the last century. As in almost all such works, however, some subjects which happened to be favourites with the author or his editors, are treated at disproportionate length, while others of greater real importance are too summarily dismissed.

MORO, ANTO'NI, or Sir Antony More, was born at Utrecht, about the year 1525, and was the pupil of Joan Schoorel. He obtained, while still young, a great reputation at Rome, especially as a portrait painter, and when the Emperor Charles V. requested the Cardinal Granvelle to send a painter to Lisbon, to paint the future bride of his son Philip, the cardinal selected More. He was introduced to the Emperor, at Madrid, in 1552, painted Philip's portrait there, and, at Lisbon, painted besides the Infanta Mary, King John III., and the emperor's youngest sister, Queen Catherine of Portugal; for which he received 600 ducats and a very valuable gold chain as a present. Van Mander says that his usual price for a portrait was 100 ducats, which at that time was a very large sum.

After a short interval, in 1554, More was sent to paint another bride of Philip's, Queen Mary of England: for this picture he was also richly rewarded, says Van Mander, and had a salary of 100*l.* per annum settled upon him, as painter to the King and Queen (Walpole says 100*l.* per quarter). More remained in England during the reign of Queen Mary, by whom he was probably knighted, and he painted several portraits of her and many of the English nobility of the time, some of which are at Hampton Court, and many others are still in the private collections of the descendants of the families. Some of his works doubtless pass as Holbein's, but More was much inferior to Holbein. After the death of Mary, in 1558, More rejoined Philip in Spain, and appears to have lived on such terms of familiarity with the king, that, upon an occasion, in the year 1560, when Philip struck him with his open hand on the shoulder, the painter ventured to return a blow with his mahlstick, but he soon repented of his familiarity, and was heartily glad to escape with temporary banishment. Philip, however, sent to recal him, and the king's messenger overtook More on his way, but the painter excused himself, not daring to trust himself again within Philip's power. Philip wrote to him in the Netherlands, but, through the Duke of Alva, with a similar result. More had entered the service of the Duke of Alva, who sent for him from Utrecht, and he was appointed by the duke receiver-general of the revenues of West Flanders, an appointment, says Van Mander, which so elated him, that he made a bonfire of all his painting materials at Utrecht, and made presents to all his friends. Some suppose from this that he gave up painting; but so far from this, he was constantly painting, especially portraits of women, for the duke, at Brussels, whose high position enabled him to reward the painter with a public office for private services. The whole of More's family was also richly provided for, by Philip, or by the duke.

More died at Antwerp, in 1581, aged fifty-six, while engaged on a picture of the Circumcision, for the church of Notre Dame there, and it was left unfinished. More painted chiefly portraits; there are, however, also several good figure pieces by him, but they are painted in the prevailing dry style of that time in the Netherlands, and with its hard positive colouring. Yet he made a good copy for Philip, of Titian's Danaë, which is now at Madrid. There is much confusion about the dates of More's birth and death, some placing his birth in 1512; the above, however, is the account in the second edition of Van Mander, where it is fully explained in a note. More's portrait is in the Florentine gallery of painters' portraits.

(Van Mander, *Het Leven der Schilders*, &c., 1764.)

MORO'NI, GIAMBATTISTA, a celebrated Italian historical and portrait painter, was born about 1510, at Albino in the territory of Bergamo, and was the scholar of Moretto da Brescia, whom he did not equal in composition, but surpassed as a portrait painter. In this last branch he was inferior to Titian only in his time, and that great painter is said to have repeatedly recommended applicants to him to go to Moroni. The heads and draperies of his portraits are beautiful: the hands might be improved. In his historical pieces he belongs rather to the Milanese school than the Venetian. The date of his death is not known, but his works range, according to Count Tassi, from 1557 to 1578.

(Tassi, *Vite de' Pittori Bergamaschi*, &c.; Lanzi, *Storia Pittorica*, &c.)

MORPETH, a municipal and parliamentary borough in the township and parish of Morpeth, in the western division of Morpeth ward, in the county of Northumberland; 302

miles from the General Post-office, London, by the former mail-coach road through Ware, Huntingdon, Grantham, Newark, Doncaster, York, Thirsk, Northallerton, Durham, and Newcastle-upon-Tyne; or 331 miles—namely, 307 miles by railway through Rugby to Newcastle, and 24 miles from thence by coach: it is on the road to Berwick-upon-Tweed and Edinburgh. The parish of Morpeth comprehends an area of 7600 acres, and is partly in the east and west divisions of Castle ward, and partly in the western division of Morpeth ward. The population at the different enumerations in the present century was as follows:—1801, 3707; 1811, 4098; 1821, 4292; 1831, 4797; 1841, 4237. It is divided into eight townships—Hepscott or Liepscott and Morpeth Castle, (the latter having Catchburn and Stobhill united with it,) in the east division of Castle ward; Newminster Abbey, Shilvington, Tranwell and High-church, and Twizell in the west division of the same ward; and Morpeth and Buller's-green in the west division of Morpeth ward. The boundaries of the municipal borough include about half of the area, and nearly all the population of Morpeth township, and a small waste portion of the township of Newminster Abbey; the town is chiefly in the borough, but a portion of it is in the township of Buller's Green. The number of houses and persons in these two townships nearly coincides with the houses and population of the town. The return in 1831 and 1841 were as follows:—

		Houses.			Population.	
		Inhabit.	Uninhab.	Buildg.	Families.	Persons.
In 1831.						
Morpeth Township	Acres.	560	7	1	897	3890
Buller's Green ditto	900	52	7	0	57	203
	Total	612	14	1	954	4093
In 1841.						
Morpeth Township	Acres.	588	42	0	Not given.	3441
Buller's Green ditto	900	33	11	0	Ditto	169
	Total	621	53			3610

The diminution of the population, 483, or nearly 12 per cent., in ten years, and the circumstance that there were no houses building in 1841, show the decline which had taken place. The parliamentary borough, as regulated by the Boundary Act, comprises the parish of Morpeth, excepting the townships of Shilvington and Twizell (population of the two 151 in 1831, 137 in 1841), and the adjacent parish of Bedlington, or Bedlingtonshire (population in 1831, 2120; in 1841, 3155), a detached portion of the county of Durham. The population of the parliamentary borough in 1831 was therefore 6766; and in 1841, 7255.

Morpeth town stands in a sort of peninsula formed by the windings of the river Wansbeck, which surrounds the town on the west, south, and east sides, but is not navigable. The road from Newcastle enters the town from the south by an elegant bridge of three arches over the river, erected from the designs of Mr. Telford, and there is a suspension bridge on the west side. The streets are irregularly laid out, and, when the Municipal Corporations' Commissioners made their report (1835), were not lighted: they were formerly indifferently paved with pebbles, but in 1828 the pavement was taken up and the streets macadamised, to the great comfort of the townspeople and travellers. The town is supplied with water from a spring at Stob-hill. There are not many good houses in the town. The church is nearly half a mile from the town, on the south side of the river: it is in the style of the fourteenth century, and consists of a nave and chancel, and a western tower engaged with the nave: few old churches are more destitute of objects of interest, architectural or antiquarian. In the spacious churchyard is an antient octagonal cross, but little injured. In the town, close to the bridge, is an antient chapel, part of which is used for a grammar-school, and part is still used as a chapel-of-ease for performance of divine service. In a suburb of the town, on the south side of the bridge, on the east side of the road, is the gaol and house of correction for the county, erected about twenty years since, at a cost of 70,000*l.* It is an octagonal building, entirely of stone, in a dry and elevated site. The average number of prisoners in the year 1842-3 was 80, of whom 10 were debtors. The Gateway is an imposing mass of building and contains the chapel, the sessions-house or hall for county business, in which the Easter sessions for the county are held, and other apartments. Near the gaol, on the opposite side of the road, are the remains of Morpeth Castle, a rude and strong building, of which the gateway-house and the outer wall, now much shattered, are still standing; the area enclosed by them, 82 yards by 53, is occupied as a nursery-ground. The town-hall, a building by Sir John Vanburgh, was used as a sessions-house until the erection of the present gaol. There are a Roman Catholic chapel; and meeting-houses for Presbyterians, Independents, and Methodists. The Rev. John Horsley, the antiquary, author of the 'Britannia Romana,' was minister of the Presbyterian congregation from 1729 till his death in 1731, at the age of forty-six. The trade of Morpeth is not of much importance; but there is a good weekly market for live stock on Wednesday: the weekly sale of oxen is 200; of sheep and lambs, 2500. There are a dispensary, a savings-bank, a subscription library, and a Mechanical and Scientific Institution. Races are held yearly on the first week in September, on a course on Cotting-wood, north of the town. The race-course is about a mile and a quarter in circuit.

Morpeth is a borough by prescription. Under the Municipal Corporations' Reform Act, it has 4 aldermen and 12 councillors, and is not to have a commission of the peace except on petition and grant. The borough first sent members to parliament in 1553. It returned two down to the time of the Reform Act, when it was reduced to one. By the Boundary Act its limits for parliamentary purposes were enlarged from the existing municipal boundaries to the extent already described. The number of registered electors was in 1835-6, 354; in 1839-40, 363; in 1842-3, 428, namely 142 freemen and 286 ten-pound householders. Morpeth is a polling-station for the northern division of the county of Northumberland.

The town of Morpeth is not noticed in history till the reign of John (A.D. 1199), who granted a charter for a fair and market; it was burnt by John A.D. 1216, during his war with the barons. In the civil war of Charles I., Morpeth Castle was occupied by a body of the Scottish Covenanters, from whom it was taken in 1644 by the Marquis of Montrose. The late Dr. Morrison, the eminent Chinese scholar, was a native of Morpeth. The town gives the title of Viscount to the Earl of Carlisle, and by courtesy to his eldest son.

The living of Morpeth is a rectory, with the perpetual curacy of Ulgham, in the rural deanery of Morpeth, in the archdeaconry of Lindisfarne, in the diocese of Durham: the annual value of the benefice is 1611*l.*, with a glebe-house.

There were in the borough in 1833 thirteen day-schools with 448 to 458 scholars, viz. 260 to 270 boys and 188 girls; giving less than one-eighth of the population under daily instruction. Of the day-schools one, with 43 boys, was a free grammar-school founded and endowed by Edward VI.: two others were supported by the corporation. There were four Sunday-schools with 464 scholars, viz. 209 boys and 255 girls. Lending libraries are attached to two Sunday-schools; one (that of the Church school) is for the general use of the parish. A library of little value is attached to the grammar-school.

(*Parliamentary Papers*; Hodgson, *History of Northumberland.*)

MORTON, THOMAS, was born in 1764, in the county of Durham. His parents having died while he was young, his uncle, Mr. Maddison, a stockbroker in London, took him into his care. He was educated at the Soho Square Academy, celebrated for the annual theatrical performances of the pupils, several of whom became distinguished actors. He was afterwards entered a student of Lincoln's Inn, but the fondness for theatrical amusements which he had contracted at school was not to be subdued; he became a constant play-goer, and directed his studies to the drama rather than the law. Having written a dramatic piece which was favourably received, he abandoned the legal profession without having been called to the bar.

Morton thenceforward devoted himself entirely to play-writing, and became one of the most successful of modern dramatists. So great was his reputation and the confidence of managers in his power of pleasing an audience, that when his comedy of 'Town and Country' was to be brought out in 1807, Mr. Harris, the lessee of Covent-Garden Theatre, gave him 1000*l.* for the play before the parts were written out for rehearsal, taking on himself all risk of failure. Out of fourteen or fifteen comedies, comic-operas, and farces, five or six still continue to be stock-pieces at almost every theatre where the regular English drama is performed.

The following is a list of his plays, perhaps incomplete as to two or three of the later productions: 'Columbus,' 1792; 'Children in the Wood,' 1793; 'Zorinski,' 1795; 'Way to get Married,' 1796; 'Cure for the Heart Ache,' 1797;

'Speed the Plough,' 1798; 'Secrets worth Knowing,' 1798; 'The Blind Girl,' 1801; 'School of Reform,' 1805; 'Town and Country,' 1807; 'Roland for an Oliver,' 1819; 'School for Grown Children,' 1826; 'Invincibles,' 1828.

Morton was a respectable man, of regular and orderly habits. His conversation was sprightly, and abounded in anecdote. He was fond of cricket-playing, and was a constant attendant at the cricket-grounds, where he enjoyed his favourite exercise. He died March 28, 1838, in his seventy-fourth year, leaving a widow, three sons, and a daughter.

To those who are acquainted with Morton's plays only by reading them, his uniform and great success will probably be matter of surprise; to those who are engaged in dramatic writing, it must be no less a matter for investigation. Morton has no claim to the reputation of a great dramatist. He is deficient in the highest qualities of the art. He gives no true representations of character either in its broad and strong markings or in its nicer discriminations; he shows nothing of the real operation of motives, nothing of the genuine workings of feeling; his serious and his comic characters are alike artificial and exaggerated; they are strictly and peculiarly stage-characters, and anything resembling them in real life will rarely if ever be met with. But he has extraordinary dramatic tact: he foresees distinctly what may be effected in the performance, and the situations, as well as the characters are admirably contrived for displaying an actor's skill, abounding as they do in sudden transitions of feeling and bursts of passion, overflowings of excessive liveliness, or exhibitions of strange peculiarities, such indeed as have never been witnessed, but which, when well performed, are exceedingly amusing. His dialogue has no wit and little genuine humour, but is never languid or heavy; and the very speeches which when read produce a smile of contempt or a feeling of incredulous disgust, afforded to Lewis, Munden, Quick, Fawcett, Emery, John Kemble, and Edmund Kean, the medium by which they were enabled to exhibit the triumphs of the actor's art.

(*Gentleman's Magazine*, 1838; *Biographia Dramatica*, by Baker, Reed, and Jones; Inchbald's *British Theatre*.)

MOSER, GEORGE MICHAEL, R.A., gold-chaser and enameller, the first keeper of the Royal Academy of Arts in London, was born at Schaffhausen in Switzerland, in 1704. He came young to London, and was first employed as a chaser in gold and also of brass for the ornaments of cabinet-work, in which he obtained a great reputation. He was also an excellent medallist and a good painter in enamel, but he did not carry his works in this respect much beyond enamels for watchcases, in one of which he painted, for the king, George III., portraits of the Prince of Wales and the Bishop of Osnaburg. Moser's chief services were as keeper of the Royal Academy, who by virtue of his office is principal teacher of the students: the superintendence of and the instruction in the antique academy are the principal duties of the keeper. Before the foundation of the Royal Academy in 1768, Moser was for many years treasurer and manager of the private academy in St. Martin's Lane. He died in the beginning of 1783, and Sir Joshua Reynolds wrote an eulogium upon him, which is printed in Malone's Life of Sir Joshua. As a chaser in gold, says Sir Joshua, Moser was the first in his profession; and he had a universal knowledge in all branches of painting and sculpture. 'He may truly be said,' he continues, 'in every sense to have been the father of the present race of artists.' Hogarth, Rysbrack, Rouhilliac, Wills, Ellis, and Vanderbank, were Moser's early companions, all of whom he outlived.

Mary Moser, his only daughter, was a very distinguished flower painter, and is the only lady, besides Angelica Kauffman, who has ever been elected an Academician: she became afterwards Mrs. Lloyd. Miss Moser, says Smith, in his Life of Nollekens, was somewhat precise, but was at times a most cheerful companion: he has printed three of her letters, two to Mrs. Lloyd, the wife of the gentleman to whom she herself was afterwards married; and the other to Fuseli while in Rome, of whom she was said to have been an admirer. In one to the former, alluding to the absurd fashions of the beginning of the reign of George III., she says, 'Come to London and admire our plumes; we sweep the skies! a duchess wears six feathers, a lady four, and every milkmaid one at each corner of her cap. Fashion is grown a monster: pray tell your operator, that your hair must measure just three-quarters of a yard from the extremity of one wing to the other.' The second is chiefly on Lord Chesterfield's advice to his son: she says to her friend, 'If you have read Lord Chesterfield's letters, give me your opinion of them, and what you think of his lordship: for my part I admire wit and adore good manners, but at the same time, I should detest Lord Chesterfield, were he alive, young, and handsome, and my lover, if I supposed, as I do now, his wit was the result of thought, and that he had been practising the graces in the looking-glass.' In her letter to Fuseli she gives an account of the exhibition of the Royal Academy in the year 1770:—'Reynolds was like himself in pictures which you have seen; Gainsborough beyond himself in a portrait of a gentleman in a Vandyck habit; and Zoffany superior to everybody in a portrait of Garrick in the character of Abel Drugger, with two other figures, Subtle and Face. Sir Joshua agreed to give a hundred guineas for the picture; Lord Carlisle half an hour after offered Reynolds twenty to part with it, which the knight generously refused, resigned his intended purchase to the lord, and the emolument to his brother artist.—He is a gentleman! Angelica made a very great addition to the show, and Mr. Hamilton's picture of Briseïs parting from Achilles was very much admired; the Briseïs in taste, *à l'antique*, elegant and simple. Coates, Dance, Wilson, &c., as usual.'

Mary Moser decorated an entire room with flowers at Frogmore for Queen Charlotte, for which she received 900*l.*: the room was called Miss Moser's room. After her marriage she practised only as an amateur: she died at an advanced age in 1819. When West was reinstated in the chair of president of the Royal Academy, in 1803, there was one voice for Mrs. Lloyd, and when Fuseli was taxed with having given it, he said, says Knowles, his biographer, 'Well, suppose I did; she is eligible to the office; and is not one old woman as good as another?' West and Fuseli were ill-according spirits.

MOSQUITO COAST. This country, which has now taken a place among the independent countries of the American continent, is situated between 11° and 16° N. lat., and between 83° and 86° W. long. Along the coast of the Caribbean Sea it extends from the mouth of the Roman River (15° 57′ N. lat. and 85° 46′ W. long.) to Punta Gorda and the mouth of the Rama River (11° 30′ N. lat. and 83° 47′ W. long.). The sovereign of the country also claims the country farther south, lying between Punta Gorda and the Chiriqui Lagune, but the states of Costarica and Nicaragua dispute these claims. The line which separates the territories of the Mosquito Coast from the states of Honduras, Nicaragua, and Costarica, is not well determined; it is however presumed that it runs along the chain of mountains which traverse this part of America from south-east to north-west, and which is very imperfectly known. In such circumstances we must presume that the estimate of the area of the country, which without the disputed parts is stated to be 26,000 square miles, or nearly equal to Ireland in extent, and including the disputed districts, 34,000 square miles, is only to be considered as a vague approximation to the truth.

The most northern portion of the coast-line of this country, or that which extents from the Roman River to Point Patook, is high, but the remainder of the shore is low. Along this low line of coast a series of keys occur from ten to thirty-five miles from the shore. They are somewhat dangerous to inexperienced navigators, but shelter that narrow part of the sea which lies between them and the mainland from the oceanic swell, so that it can be navigated without danger by coasting vessels, as the depth of water varies between seven and fourteen fathoms. Vessels sailing from Jamaica to Cape Gracias a Dios pass between the islands of Old Providence and St. Andrews, and enter the above-mentioned channel by the wide opening in those parts between the keys.

From the mountain-range which forms the western boundary of the country several lateral branches run off, which terminate at the distance of eighteen to twenty-four miles from the sea. They do not appear to rise higher than from 1000 to 1500 feet above the sea-level, but they are very imperfectly known, with the exception of the most northern, which comes close up to the shore between the Roman River and Cape Patook. In these parts are several high peaks, as Carib Peak, which is about 4000 feet, the Poyas Peak, 3500 feet, and the Sugar-Loaf, 2000 feet above the sea-level.

Along the low coast the country is a level plain, slightly elevated above the sea, but on proceeding farther inland it rises in terraces, and here the plain is frequently interrupted by depressions and by elevated tracts which are connected with the mountain ranges. The terraces are furrowed by valleys scooped out by the currents of the rivers. The lower portions of the country are savannahs, without trees and frequently without bushes, but where the country rises and forms hills, it is overgrown with trees. In the vicinity of the sea the soil of the savannahs is light and lies on a layer of sea-sand, but nevertheless it produces excellent grass, which is ascribed to the waters which inundate this part of the country during the rainy season. Farther inland these plains have a richer soil, which consists of a light loam intermixed with a large proportion of black mould. The higher ground, especially near the banks of the river, and the lagunes, have a large mixture of sand, and these tracts are mostly overgrown with pitch-pine. But in other places they are composed of clay intermixed with mould, and in the woods which cover them a large number of mahogany-trees, cocoa-trees, caoutchouc, and other valuable trees are met with. The whole country, as far as it is known, presents a continual alternation of wooded lands and prairies.

The Mosquito Coast is drained by numerous rivers, which south of Cape Gracias a Dios run mostly to the east-south-east, but north of it they run north-east. Many of them are navigable to a considerable distance from their mouths, and it appears that rapids are only found near their sources. But the navigation is frequently impeded by the trees which are brought down during the rains, and when the waters decrease they are lodged in the bends of the river, where they are accumulated so as to form a dyke across the current. They are partly removed by the freshets, but are soon replaced by other trees. Most of the embouchures of the rivers form harbours, which however are only accessible to small vessels, as all those which do not fall into lagunes have bars across their mouths, on which at low-water there are in general only from three to four feet water during the dry season. In the rainy season the bars are partly removed, but the easterly trade-winds soon throw them up again, when the rivers have sunk to their lowest level, and the diminished force of the current cannot carry the matter far into the sea. Blewfields River, which falls into the lagune of the same name (12° N. lat.), and is said to run upwards of ninety miles, rises within the state of Nicaragua. Wanks or Segovia River also rises in Nicaragua, where it passes near the town of Matagalpa and Segovia. It is said to run 250 miles. Its mouth is near the Bay of Cape Gracias a Dios, and has a bar; but the river may be entered by a canal which unites it to the bay. It is said to be navigable to the boundary-line of Nicaragua.

The lagunes are a peculiar feature of this country. They are not shallow, stagnant collections of water, but deep lakes, connected with the sea by one or more straits, by which the tide enters them. They generally receive one stream, frequently several streams, and therefore a current is always observable, which sometimes runs strongly. Near the entrance of the lagunes the water is brackish, but in the interior, and especially near the mouths of the rivers, it is quite sweet. These sheets of water always extend parallel to the coast, and frequently approach one another, so that the natives in their light boats can travel to great distances, by hauling the boats over the narrow tracts of land which separate the lagunes. The lagunes form good harbours, but towards the middle of the dry season bars are found across the entrances, which however have much more water than the bars of the rivers. Owing to this circumstance, and because the lagunes do not exhale any dangerous vapours, the settlements have generally been made on their banks. The most extensive, from south to north, are Blewfield Lagune, into which the Blewfield River falls,—this lagune is upwards of fifty miles long, and from eight to fifteen miles across, and has from three to four fathoms water on its bar; Pearl Key Lagune, which is sixty miles long, and from sixteen to twenty miles wide; the bay at the Cape Gracias a Dios, which is of small dimensions, being only four miles long and three wide, but which forms a good harbour, with 22 feet water at the entrance and 17 feet in the interior, and excellent anchoring-ground; and Carataska Lagune, west of Cape Gracias a Dios, which is thirty-six miles long and from eight to ten wide, and from two to three fathoms deep: the bar across its mouth has only eight feet water, but close to the tongue of land which separates the lagune from the sea is a narrow channel, from two fathoms to two and a half deep. Four rivers of moderate size fall into this lagune.

The climate of the Mosquito Coast resembles that of Jamaica, in having two wet and two dry seasons, but they do not occur exactly in the same months, and differ somewhat in character. The autumnal rains, which in Jamaica occur in October and November, continue on the coast for four months, from November to February. They are heaviest in December, but even in that month only descend in showers: continual rains for twenty-four hours are of rare occurrence. In the middle of February these rains cease. Then follows the first dry season, which continues to the middle of June, and in which only slight showers are experienced, especially during the night. This season is succeeded by the summer rains, which continue to the end of July. They are not so heavy as in Jamaica, where they sometimes continue for several days and nights without intermission. On the coast the rains are heavy, but very short; they are however attended with heavy thunder-storms. From the commencement of August to the middle of October is the second dry season, in which only light showers occur at the beginning and towards the end of the season. The rainy months are November, December, January, and July; the dry months March, April, May, August, and September; and those in which showers alternate with dry weather, October, February, and June. The annual amount of rain which falls has not been ascertained, but it is certain that it exceeds the average of Europe, though the number of rainy days is not so large. In the coldest months (from September to February) the temperature varies between 66° and 70°, but descends occasionally to 62°, and even to 60°. In the three following months it varies between 70° and 80°, and rarely rises higher. In summer the thermometer ranges between 75° and 84°, sometimes rising to 86°. In autumn the range is between 72° and 84°. The difference between the temperature of the air in the day and night is very small. The eastern trade-winds, not being stopped by mountain-ranges near the shore, but passing over the inclined plane without impediment, impart to the air the same degree of heat which exists on the sea. To this circumstance, and to the absence of stagnant waters, the comparatively great salubrity of the climate is to be attributed, which is confirmed by all modern travellers who have resided for any length of time in the country, though contrary statements have been made by modern writers. During the long rains (November to February) northern winds prevail, but from the middle of February they decline to the east, where they constantly settle at the end of March, and during the three following months they blow with considerable force. In August and September they are light, variable, and interrupted by calms; and in October the wind passes between east and north, until it settles entirely in the last quarter. Dew is not frequent, and never heavy, but the thunder-storms are sometimes terrific. Hurricanes are not experienced, nor does it appear that earthquakes, even of a slight kind, have occurred, though most of the surrounding countries are frequently visited by them, especially Guatemala.

Vegetation is as vigorous as in any country between the tropics. The grasses with which the savannahs are clad often attain a height of five or six feet. The number of vegetables which are cultivated with success is great; the most common are plantains, bananas, arrow-root, Indian corn, yams, cacao, sugar-cane, rice, maize, tobacco, sweet potatoes, cotton, cassava or mandioc. Coffee, cocoa-nut trees, palm-oil trees, and orange and lime trees are planted; the woods contain a great number of trees whose fruits are edible, or which afford timber and cabinet-woods, or are useful in other respects. Such are the pine-apple tree, cabbage tree, fan palm tree, caoutchouc tree, avocado pear, pimento tree, live oak, sapotill tree, papaya tree, calabass tree, mameì tree, guajava tree, mangrove tree, cacao tree, silk cotton tree, mahogany tree, cedrele, yellow-wood tree, iron-wood tree, dog-wood, ebo tree, cashew tree, lassa tree, guaiaco tree, pock wood, rosewood tree, the castor-oil plant, brasilletto tree, and a few others. In the woods the indigo plant is found wild; vanilla and sarsaparilla are gathered, the last mentioned to such an extent as to afford a considerable article of export.

Cattle are very numerous and of a large size; horses abound, but they are not large; asses, sheep, and goats are not kept, but hogs are abundant. Fowls are numerous. Several kinds of monkeys are found in the woods on the banks of the rivers, where also the jaguar and the tiger-cat are met with. Other animals are the racoon, the opossum, grey squirrels, deer, and the manati. Alligators are found near the embouchures of all the rivers; lizards are common; the iguana is distinguished by its size, and is eaten by the natives. There are several kinds of snakes, four of which are stated to be poisonous. The land-turtles belong to the species Testudo tabulata, and are sometimes more than a foot long, but their flesh is less esteemed than that of the sea-turtles, of which great numbers are always to be met with on the keys opposite the coast, to which many boats from Jamaica and the Caymans resort, where they take especially green turtles (Chelonia midas) and hawks-bills (Chelonia caretta). The birds are imperfectly known. Among them are different kinds of parrots, the yellow-tail (Cassicus Montezuma, Less.), humming birds, the black vulture or John crow (Cathartes fœtens), and several kinds of pigeons. Several kinds of ducks and the pelican (Pelecanus fucus) have been noticed. Fish is abundant in the lagunes and rivers. Fifteen species are caught in the sea, thirteen in the lagunes, and perhaps more than ten in the rivers. The shark and the saw-fish (Pristis antiquorum) are frequent in the sea and the lagunes, and along the coast the flying-fish abounds. No shell-fish are noticed, except oysters. Crabs, crawfishs, and some kinds of lobsters are frequently met with. Honey is frequently used as sugar. Mosquitos are not common, which is ascribed to the strong winds that generally blow. Sand-flies, sand-fleas, and centipedes (Scolopendra morsitans) are common.

The majority of the inhabitants do not materially differ from the other savage tribes of America. But the ruling tribe, called Sambos, show evidently a strong mixture with the negro. The colour of the other tribes is a clear brown; but that of the Sambos is much darker, approaching sometimes to black; and whilst the black hair of the former is lank, that of the Sambos is curly, in some cases resembling wool. The Sambos have also thicker lips, and are stronger built. There exists a tradition, that a vessel containing a great number of negroes was cast away on this coast, that the negro males were killed by the natives, who married the negro women. Among them are also a few Caribbees, probably the descendants of those who, in 1797, were sent from the island of Dominica to that of Roatan, and who afterwards emigrated to the continent of America. They are shorter in stature than the other tribes, but stronger built, have a somewhat convex nose, and are distinguished by greater vivacity and industry. All the tribes, though they speak different dialects, distinguish themselves from other nations by the name of Misskitos, which the Europeans have changed into Mosquitos. The natives of this country live mostly on the produce of their fields, on which they cultivate maize, cassava, yams, plantains, pine-apples, cocoanut-trees, and some other fruits; but they eat also large quantities of fish, and the flesh of the wild animals which they kill, or of their cattle. They show considerable skill in making canoes, of which the larger kind, called dories, are frequently six or eight feet wide, and from thirty to forty feet long. They are made of a single trunk of a tree. Though in general very indolent, the natives are good seamen, and have frequently earned the praise of English naval officers, who have employed them and their canoes. They have also acquired some skill in weaving cotton-stuffs.

The commerce of the Mosquito Coast is carried on by a few English families which are settled there. They receive European goods for the market, commonly from Belize, but also by vessels sent from Jamaica and other English settlements in the neighbourhood. Vessels from Jamaica and the Cayman Islands to the keys along the coast to catch turtles, also import occasionally a few articles. In this manner the natives are supplied with some coarse linen and cotton stuffs, with very indifferent guns, gunpowder, balls and shot, some cutting instruments, as axes, knives, blades, iron kitchen utensils, fishing-hooks, glass beads, gossamer hats, American tobacco, pipes, flints, girdles, bows, and mugs of earthenware, rum, brandy, and liqueurs. These articles are exchanged for cattle, especially cows, turtle-shell, hides and horns, sarsaparilla, vanilla, caoutchouc, gummi, cacao, pimento, castor-oil-nuts, mahogany, fustic, and some articles from the central American states: as cochineal, silver, gold-dust, and silver and gold coin. Some of the tribes in the more remote districts have some intercourse with Honduras and Nicaragua.

This coast was one of the first places where the Spaniards tried to form a settlement. Alonso de Ojeda and Diego de Nicuessa visited this coast in 1512, with about a thousand adventurers; but the natives resisted the invasion with great perseverance, and the Spaniards were compelled to leave the country after having lost a considerable number of men. When the neighbouring countries Guatemala and Nicaragua had submitted to Davila (1522), and Pedro Alvarado (1523), the Spaniards again tried their arms against the natives; but they were not successful. They sent there in the seventeenth century several missionaries, some of whom died the death of martyrs. All these events increased the hatred of the natives to the Spanish name. When the buccaneers were in power in the seventeenth century, they were received by the Mosquitos with open arms, and resorted to the lagunes of the country as the safest retreat when they were pursued by the Spaniards. By means of the buccaneers it appears these people were brought into connection with the English, and the first protection tho English government granted them was confirmed by a treaty in 1670. The first settlement of Englishmen on this coast dates from 1730, when some families established themselves at Cape Gracias a Dios on Black River and Blewfield's River. As these settlements soon acquired a certain degree of prosperity, especially by smuggling with the inhabitants of the Spanish colonies, the English government sent there some persons invested with authority, and erected a few small forts, in 1741. But by the peace of 1763 England engaged to abandon these forts and to compel the colonists to leave the country. This was done, but several families established on Blewfield's Lagoon did not obey the order of their government, and remained there. It is stated that in 1770 the number of English settled on the Mosquito Coast amounted to 1400 individuals. These people were entirely abandoned by tho peace of 1783, and were obliged to go to Belize. Soon afterwards the Spaniards made the last attempt to conquer the coast, by taking possession of the fort on Black River, which the English had abandoned. But they were totally defeated by the natives. England again took the coast under its protection. In 1823, when the States of Central America acquired their independence, that of Nicaragua claimed the Mosquito Coast as a portion of its territories, but these claims were rejected by England and the king of the Mosquitos. It was then ascertained, that the Spaniards themselves had treated the king as an independent sovereign in 1817, when he paid a visit to the town of Guatemala. It appears that at present the claims of the state of Nicaragua have been given up, with the exception of those which refer to the country lying between Punta Gorda and the Lagune of Chiriqui. Meanwhile the king, whose power is absolute, has ceded different districts with almost sovereign power to some Englishmen, who have formed settlements on Blewfield's Lagune and on the banks of Black River, but other portions have not yet been settled. It is probable that in course of time this country will become an English colony, especially as the native population has lately greatly decreased, nearly half of it having been swept away by the small-pox.

(Henderson's *Account of the British Settlement of Honduras*, &c.; Robert's *Narratives of Voyages and Excursions on the East Coast and the Interior of Central America*; Young's *Narrative of a Residence on the Mosquito Coast during* 1839-1841; and *Bericht über die Untersuchung einiger Theile des Mosquitolandes von der dazu ernannten Commission*, Berlin, 1845.)

MOUFLON. [SHEEP, P. C.]

MOVING POWERS. The means employed to give motion to machinery, independently of the cases in which the force of gravity is applied directly, as in turning the cylinder of a clock, are the strength of men and animals, the pressure of the atmosphere, the expansive force of steam, and the action of wind or water; it is even probable that the recently proposed actions of the galvanic fluid and of fired gunpowder will in time be numbered among motive forces for impelling carriages, vessels, or machines. The first and second of the powers above named have been treated under ANIMAL STRENGTH, P. C. S. and ATMOSPHERIC RAILWAY, P. C. S.; and the force of steam under STEAM-ENGINE, P. C., p. 478 *et seq.*

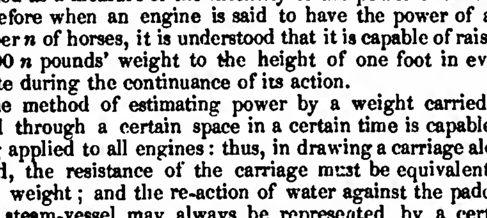
The intensity of a moving power is always estimated by the amount of the resistance which is overcome and the space through which the equivalent of that resistance is conveyed, or raised vertically, in a given time. Thus, in the article on Animal Strength [P. C. S.] it has been shown that a man, a horse, &c., can convey a certain weight, expressed in pounds, through a certain number of miles during a working day; and the continued product of the weight, the distance, and the time has been made to denote the intensity of the power, one pound being the unit of weight, one mile that of distance, and one hour that of time: in estimating, however, the power of an engine or machine it is usual to consider one foot as the unit of distance and one minute as the unit of time, one pound being the unit of weight; the action of the power is, moreover, supposed to be continued during all the time that the machine is at work.

Originally the larger kind of engines, except such as were impelled by wind or water, were moved by the power of horses; and when other agents were employed, the gross effect of the engine was estimated by the number of horses to whose action it was equivalent; but the intensity of horse-power is very variable, and some inconvenience was at first, on that account, experienced in estimating the relative values of engines. In order to establish, conventionally, this dynamical unit, Messrs. Boulton and Watt ascertained from trials purposely made that a strong horse can draw 125 lbs. at the rate of 3 miles per hour during 8 hours: therefore the measure of the power may be expressed by 3000 lbs. ($=125\times3\times8$) drawn or raised one mile in 8 hours; or, multiplying by 5280, the measure is 15,840,000 lbs. raised one foot in an equal time. This product, being divided by the number of minutes in 8 hours, gives 33,000 lbs. for the weight carried or raised one foot per minute continually; and the last number is now universally adopted as a measure of the intensity of the power of a horse. Therefore when an engine is said to have the power of any number n of horses, it is understood that it is capable of raising 33,000 n pounds' weight to the height of one foot in every minute during the continuance of its action.

The method of estimating power by a weight carried or raised through a certain space in a certain time is capable of being applied to all engines: thus, in drawing a carriage along a road, the resistance of the carriage must be equivalent to some weight; and the re-action of water against the paddles of a steam-vessel may always be represented by a certain weight which, if it were lifted by the wheel, would oppose a resistance equal to that of the water. For the useful force of steam-engines in terms of the volume of water evaporated, the pressure of the steam, the length of the stroke, &c., see STEAM-ENGINE, P. C.

Wind and water are employed as prime movers by means of the momentum arising from their velocity; and the latter, occasionally, by the pressure arising from its weight. The manner in which the force of wind is made to act in giving motion to vessels on the surface of water has been fully explained under SAIL, P. C., and, in producing the revolutions of windmill sails, under WIND-SAIL, P. C.; it is intended therefore, in this place, merely to explain the method of forming an equation of equilibrium for the power of an oar in giving motion to a vessel, and to show the force of water on the paddles or float-boards of wheels which are turned by that element.

Let M N represent one side of a vessel, A B the position of the oar when its blade enters the water, and E the fulcrum



or side of the rowlock against which it presses; then since the vessel will move forward during the time that a stroke of the oar is being made, let F be the position of the fulcrum and C D the position of the oar at the end of the stroke: if the vessel had remained at rest, the oar, at the end of the stroke, would have had the position $c\,d$, which may be considered as parallel to C D.

Now, B being the centre of percussion on the blade of the oar, the actual motion of B (supposed to be parallel to the keel of the vessel) may be represented by Bd while the movement of the vessel is E F ($=$ Dd); and therefore B D represents the relative movement of B. The lines B D and Dd being proportional to the velocities of the oar and vessel, which velocities we may represent by v and v'; $v-v'$ will express the relative velocity of the oar, and the effective power of the latter will vary with $(v-v')^2$. Let a, in square feet, be the area of the blade of an oar, and let the pressure of water against a square foot of surface be $1\frac{1}{2}$ lb. when the velocity is 1 foot per second; then $\frac{3}{2}a(v-v')^2$ will denote the force of the oar.

If, for simplicity, the prow of the vessel be supposed to have the form of a wedge with plane faces meeting in a vertical line, or cut-water, on putting a' for the area of the whole prow and θ for the inclination of each face to a vertical plane passing through the keel, we shall have

$$\frac{3}{2}a' \sin.^2\theta \,.\, v'^2$$

for the resistance of the water against the prow. Therefore, n being the number of oars all of which are supposed to act with equal forces; we have, when the vessel has acquired a terminal velocity,

$$n\,a(v-v')^2=a'v'^2 \sin.^2\theta,$$

from which v' may be found. The velocity of a vessel moved by oars is, however, found to increase in a less ratio than the number of oars.

The power of the oar in rowing appears to be diminished by the reaction of the feet of the rowers in pressing against the foot-boards; this has a tendency to force the vessel backwards, but it is compensated by the greater velocity which the centre of percussion in the oar thereby acquires. Some force, however, is lost in overcoming the inertia of the oar, and in bringing it forward against the air; this last force is considerable when the vessel is rowed against a high wind, though it is to a certain degree diminished by the practice of feathering the oars.

The above equation might be used to determine the velocity of a vessel impelled by steam, in which paddle-wheels are employed, if it were possible to determine, nearly, the value of $n\,a$, or the number of square feet of paddle which, on both sides of the vessel, are at every moment acting efficiently against the water: the value of v would be, of course, determined by the number of revolutions which the wheel makes in a given time; and it should be expressed by the number of feet per second which the centre of percussion in the paddle moves through in turning about the axle.

The momentum of water flowing horizontally against a plane, such as a float-board of an undershot wheel, depends on its velocity, on the area of the surface with which it comes in contact, and on the obliquity of that surface to the direction of its motion; and, in estimating the effect of water on such a wheel, it is necessary to determine from the dimensions of the channel and the velocity of the water in it the weight of water which descends vertically through a certain height, as one foot, in a given time. The product of this weight multiplied by the height actually descended, being compared with the product of the number of pounds which the wheel can raise to a certain height in the same time multiplied by that height, expresses the ratio of the power to the effect. From many experiments Mr. Smeaton concluded that, when the quantity of water expended is the same, the useful result varies nearly with the head of water, or with the square of its velocity.

The power of an overshot wheel is estimated by the product of the weight of water expended in a given time multiplied by the whole weight of its descent, that is, by the sum of the diameter of the wheel and the height of water in the reservoir above the top of the wheel. The useful effect of an overshot wheel is said to be nearly double that of one which is undershot.

In determining the power of water on breast-wheels, it is customary to consider such a wheel as one compounded of an undershot and of an overshot wheel; and its effect is conceived to be equivalent to that of an undershot wheel whose head of water is equal to the difference in height between the surface of the water in the reservoir and the point at which the water impinges on the wheel, together with the effect of an overshot wheel whose height is equal to the difference between the point of impact and the level of the tail-water.

MUCID ACID. [CHEMISTRY, P. C. S.]

MUCIUS SCAEVOLA. [SCAEVOLA, P. C.]

MU'CUNA, a genus of plants belonging to the natural order Leguminosæ. The calyx is campanulate bilabiate, with two very caducous bracteoles as long as the tube; the upper lip broad, entire, and obtuse; the lower lip trifid, with acute segments. The corolla is papilionaceous, with a cordate vexillum incumbent on the wings, much shorter than the wings and the keel, and without callosities. The stamens are diadelphous, with five of the anthers oblong, linear, and the other five ovate and hairy. The seeds oval, roundish, or reniform, with a narrow, oblong, or linear hilum. The species are climbing herbs or shrubs, with pinnately trifoliate leaves and axillary racemes, which hang down when bearing fruit.

M. prurita, Cowitch, has purple flowers in compact ovate racemes, leaflets hairy beneath, the middle one rhomboidal and obtuse, the lateral ones dilated on the outer edge. The legumes are oblong, curved, compressed, not keeled, and covered all over with a thick coating of erect, white, stinging hairs, which turn black in drying and brown when ripe. It is a native of the hedges and banks of the East Indies.

M. pruriens, Common or Stinging Cowitch, has entire ovate acute leaflets, smooth above, hairy beneath, the lateral ones oblique at the base, the middle one slightly rhomboidal

The racemes are from 1 to 1½ feet long, lax, and many-flowered. The calyx is hairy, pink, with narrow lanceolate segments. The flowers have a disagreeable alliaceous smell; the vexillum is flesh-coloured, the wings purple or violet, and the keel greenish white. The legumes about 3 inches long, the thickness of the finger, closely covered with strong brown stinging hairs. The seeds oblong, variegated with a white hilum. A mixture of the hairs of these two species form the Cowitch of commerce. The ripe pods are dipped in syrup, which is scraped off with a knife, and when the syrup has attained the thickness of honey, by means of the hairs becoming mixed with it, it is used as a medicine, and is considered a good anthelmintic, as it occasions no uneasiness. It is given from a tea-spoonful to a table-spoonful in the morning, fasting. The hairs, when applied to the skin, produce an intolerable and painful itching. A vinous infusion of the pods, twelve to a quart, is said to be a certain remedy for dropsy. A strong infusion of the roots, sweetened with honey, is used by the native practitioners in India in cases of cholera morbus. It is likewise considered a powerful diuretic.

M. urens has racemose flowers and legumes clothed with stinging bristles; the leaflets have a shining tomentum beneath. The flowers are large, white or yellow, with the lower edge of the wings red. The seeds, from their resemblence to an eye, are called by the French *Yeux bourrique*, or ass's-eyes, and for the same reason the seed has the name *ox-eye-bean* in our colonies in the West Indies, where the species is a native.

A rich soil suits these plants, and they are easily raised from cuttings, but are not worth the trouble of cultivation, excepting for botanical gardens.

(Don, *Gardener's Dictionary*; Lindley, *Flora Medica*; Burnett, *Outlines of Botany*.)

MULE, MULE-JENNY. [COTTON SPINNING, P. C., p. 96; COTTON MANUFACTURE, P. C., p. 98.]

MULGEDIUM, a genus of plants belonging to the natural order Compositæ, the suborder Liguliflore, the tribe Cichoraceæ, and subtribe Hieraciæ. It has many-flowered heads, a double involucre, the inner of one row, the outer of short lax imbricated scales; the fruit compressed, constricted above, and terminating in a ciliated disk; the outer rows of the pappus rigid and brittle. There are several species of this genus.

M. alpinum, has glabrous, lyrate at the base, arrow-shaped leaves, the terminal lobe large triangular-hastate acute; the stem simple, heads racemose, bracts, peduncles and involucres glandular, hairy; the fruit oblong, not attenuated, with many ribs. This plant has blue flowers in small numerous heads, with a stem about three feet high. It is a remarkably handsome plant, and is the only British species of the genus. It is the *Sonchus cæruleus* of Smith in the English botany. The only locality in which it grows in Great Britain is the mountains of Scotland.

M. floridanum is a native of America, and on account of its excessive bitterness, is called Gall of the Earth.

(Babington, *Manual*; Lindley, *Vegetable Kingdom*.)

MULIER. [BASTARD, P. C.]

MULINA'RI, or MOLINA'RI, STE'FANO, an Italian engraver, known for his numerous prints, after drawings by the early Italian masters. He was born at Florence towards the middle of the eighteenth century, and was the pupil of A. Scacciati, whom he assisted in a series of engravings after the most beautiful drawings in the Florentine Collection. Forty-one only were executed during Scacciati's life: the remaining fifty-nine were executed entirely by Mulinari. These were succeeded, in 1775, by a collection of prints after drawings of the earliest masters, from Cimabue to Pietro Perugino, under the title 'Istoria Pratica dell' Incominciamento e Progressi della Pittura, o sia Raccolta di 50 Stampe estratte da ugual numero di disegni originali esistenti nella Galleria di Firenze;' which was followed, in 1780, by a still more interesting work on the five great Italian schools of painting, 'Saggio delle Cinque Scuole di Pittura Italiana.' Mulinari died near the close of the eighteenth century, aged about fifty-five. Among the above-mentioned works are four after L. da Vinci, five after Michelangelo, twenty-two after Raphael, eight after Julio Romano, six after Polidoro da Caravaggio, twenty-six after Parmegiano, five after Daniele da Volterra, eight after Barocci, seven after Cesare Procaccini, three after Guido, three after Sacchi, thirteen after Guercino, and many others. Nagler has given a list of about two hundred of them in his *Künstler Lexicon*.

MÜLLER, the name of two very celebrated German engravers, father and son.

JOHANN GOTTHARD VON MÜLLER, the elder, was born at Bernhausen, near Stuttgart, in 1747. His father, who held an official situation under the government of his native country, wished to educate Müller for the church, but the youth showed so much ability for art in the (1761) newly established Academy for the Arts at Stuttgart, that the Duke himself urged him to follow art as his profession. Accordingly, in 1764, Müller, under the immediate patronage of the duke, entered the school of the court painter, Guibal, who recommended him to follow engraving, which he pursued for six years (1770-76), at Paris, under Wille, with such success that, in 1776, he was elected a member of the French Academy. He was recalled in the same year by the Duke Carl to Stuttgart. His last work in Paris was a good portrait of his master, J. G. Wille. The first work which he completed at Stuttgart was Alexander, Conqueror of Himself, after Flink, which he took, in 1781, to Paris to be printed, not venturing to work off so valuable a plate at the then inexperienced copper-plate press established by himself in Stuttgart. In 1785 he was invited to Paris to engrave the portrait of Louis XVI., painted in 1774 by Duplessis; but the picture from which Bervic engraved the same king was painted ten years later, and Bervic's is accordingly a more characteristic portrait of what he eventually was. In 1802 Müller was made professor of engraving in the academy at Stuttgart, where he instructed several of the best engravers of Germany, during the earlier part of the nineteenth century, among whom his own son, Christian Frederick, is the foremost. He was elected successively a member of the principal German academies; was presented in 1808, by the King Frederick of Würtemberg, with the Order of Civil Merit; and in 1818 was made a Knight of the Würtemberg Crown by Frederick's successor, King William. He died at Stuttgart in 1830, and in the same year a biography of him was published in the 'Schwäbische Merkur,' No. 71.

Müller engraved only thirty-three plates, a small number, but some of them are large and elaborate works; they are, however, chiefly portraits. His principal works, besides those already mentioned, are—the Battle of Bunker's Hill, after Trumbull, engraved in 1799; the Madonna della Seggiola, for the Musée Français, engraved in 1804, by many considered superior to the print of the same subject by Raphael Morghen; a St. Catherine, with two Angels, after L. da Vinci; and the portrait of Schiller, after A. Graf.

CHRISTIAN FRIEDRICH VON MÜLLER surpassed his father, but, owing to the extreme shortness of his career, his prints are even less numerous than those of the elder Müller. He was born at Stuttgart in 1783, and he died at Pirna, near Dresden, in 1816, aged only thirty-three. He was carefully educated by his father in all those branches of the arts which, by his own experience, he knew to be requisite to constitute an excellent engraver; and in 1802 he sent him to complete his studies in the great world at Paris, where at that time the majority of the finest works of art in Europe were collected together in the Louvre. Here, in 1808, Müller engraved the St. John about to write his Revelations, after Domenichino, in which the eagle brings him his pen; and Adam and Eve under the Tree of Life, after Raphael. He was commissioned shortly afterwards by Rittner, a printseller of Dresden, to engrave his last and greatest work, the most sublime of all the paintings of Raphael, the Madonna di San Sisto, in the Dresden Gallery. He was wholly occupied for the remainder of his short life on this plate, which he just lived to complete, but he never saw a finished print from it. He removed to Dresden in 1814, and was appointed professor of engraving in the academy there. His existence seems almost to have been wrapped up in the execution of this plate: he was occupied with it day and night, and, always of a sickly constitution, the infallible result of such constant application and excitement soon made its appearance; he was in vain advised to desist for a while from his work. He completed the plate and sent it to Paris to be printed; but with his plate the artificial excitement which supported him departed also: he had just strength enough left to admit of his being carried to the Sonnenstein, near Pirna, where he died in 1816, only a few days before the proof of his plate arrived from Paris. It was suspended over the head of his bier as he lay dead, thus reminding us of the similar untimely fate of the great master of the original, above whose head, as he lay in state, was hung also his last work, the Transfiguration. Müller left a wife and two young children.

Christian Müller engraved only eighteen plates, but the Madonna di San Sisto is in itself a host, and exhibits him at least the equal, if not the superior, of Raphael Morghen, to whose Transfiguration it serves as a good pendant: there are several lithographic copies of it. His other works are nearly all portraits: among them are—Jerome Bonaparte, Schiller, Jakobi the poet, Professor Hebel, Dr. Hufeland, William, King of Würtemberg as Crown Prince, and a medallion of Napoleon.

(*Kuntsblatt*, 1830; Nagler, *Allgemeines Künstler-Lexicon.*)

MÜLLER, CARL OTTFRIED, one of the most learned scholars of modern times, was born in 1797, at Brieg, in Silesia, where his father at the time held the office of preacher to a division of the Prussian army. Müller received his early education in the gymnasium of Brieg, and in 1813 he entered the university of Breslau, where he devoted himself to the study of philology. From 1815 to 1817 he studied at Berlin, and as soon as he had taken his degree and had given evidence of his mythological studies and researches in a little work entitled 'Aegineticorum Liber' (Berlin, 1817), he was appointed teacher of the antient languages in the gymnasium (called the Magdalenum) of Breslau. While engaged in teaching, he employed all his leisure hours in mythological inquiries, endeavouring to analyze the various mythical cycles and trace them to their earliest and simplest elements. The great work containing the results of these researches is a history of Hellenic races and cities ('Geschichte Hellenischer Stämme und Städte'), of which the first volume, on Orchomenos and the Minyans, ('Orchomenos und die Minyer') appeared at Breslau in 1820, 8vo.). It was in consequence of the advice of Heeren and a recommendation of A. Boeckh, that in 1819 Müller was invited to a professorship in the university of Göttingen, with the special object that he should lecture on archaeology and antient art. His activity created a new æra in the history of Göttingen, and under his and Dissen's auspices the study of philology and antient literature received an impulse, which was soon felt in all Germany, and was extended over a great part of Europe by the valuable works published by Müller in rapid succession. In order to acquire a more intimate knowledge of antient works of art than could be acquired from mere descriptions, he spent in 1819 some time at Dresden, and in 1822 he visited France and England. But although his attention was more particularly directed to antient art, he never lost sight of the fact that the arts of the antients represented only one side of their intellectual activity, and formed only one source among the many from which a complete knowledge of antiquity is to be derived. In order to show fully the connection of religion, manners, polities, and history, in the case of one of the Greek races, Müller wrote his work on the Dorians ('Die Dorier,' Breslau, 1824, 2 vols. 8vo.), which forms the second and third volumes of his 'Geschichte Hellenischer Stämme und Städte,' and was translated into English by H. Tuffnell and G. C. Lewis, Oxford, 1830, 2 vols. 8vo., with additions and corrections furnished by the author. A new edition of the 3 vols. of the whole work has been published since Müller's death by F. W. Schneidewin, Breslau, 1844, and a new edition of the English translation of the 'Dorians' appeared in 1840. Müller intended to continue this series of works by a history of Attica, but certain scruples induced him to defer the execution of this task, and it has unfortunately never been executed. The year after the publication of the 'Dorians' Müller published his Introduction to a scientific system of Mythology ('Prolegomena zu einer wissenschaftlichen Mythologie,' Göttingen, 1825, 8vo.), of which an English translation by J. Leitch was published in London, 1844, 8vo., and another work on the early history of Macedonia ('Ueber die Wohnsitze, die Abstammung und die ältere Geschichte des Makedonischen Volkes,' Berlin, 1825). These productions were soon followed by a great work on the Etruscans ('Die Etrusker,' Breslau, 1828, 2 vols. 8vo.), and a manual of the history of antient art ('Handbuch der Archaeologie der Kunst,' Breslau, 1830; a second edition appeared in 1835). This last work was the first of the kind that had been produced in Germany. About the same time he was requested by the Society for the Diffusion of Useful Knowledge, to compose a history of Greek Literature, of which the first volume appeared in 1840; of the second only a portion was published: since Müller's death all that had appeared in England has been published in Germany under the superintendence of his brother Julius Müller. Besides these greater works Müller also wrote 'Minervae Poliadis Sacra et Aedem in Arce Athenorum illustravit,' &c., Göttingen, 1820; 'De Phidiae Vita et Operibus,' Göttingen, 1827, and a great number of articles in periodicals and encyclopediac works. The only correct edition of Festus that we have is that of Müller (Leipzig, 1839, 4to.), and his edition of Varro's work 'De Lingua Latina' (Leipzig, 1833, 8vo.), and of the Eumenides of Aeschylus, are equally valuable.

In 1840 Müller, who had long desired to see the countries to the investigation of whose history, literature, and art his whole life had been devoted, resolved to visit Italy and Greece, partly to convince himself of the correctness of the results at which he had arrived, and partly to collect new materials. His activity in Greece was very great; one hot day in July, 1841, while engaged in making some excavation at Delphi, he was seized with a fever, in consequence of which he died soon after he had returned to Athens. He was buried in the Antient Academy at Athens, the most appropriate place for a scholar like Müller that could have been devised.

Müller was a man of the most extensive and varied acquirements, and of a keen and penetrating judgment. He acquired a European reputation at a comparatively early age. His numerous works, however, are not all of equal merit, and the two faults more particularly to be noticed are his great haste in the composition of his works, and a tendency to theorize and generalize on insufficient grounds. But in extent of knowledge and reading there scarcely ever was a scholar who surpassed him.

(*Neuer Nekrolog der Deutschen* für 1841; F. Lücke, *Erinnerungen an Karl Otfried Müller*, Göttingen, 1841, 8vo., which contains an admirable delineation of Müller's personal character.)

MÜLLER, WILLIAM JOHN, one of the best of the English landscape and costume painters, was born of a German father at Bristol, in 1812: his father was curator of the Bristol Museum. Müller's first instructor in art was the landscape painter J. B. Pyne, likewise a native of Bristol, but he owed his excellence to his own perception and powers of industry, and his great teacher was nature: he found an early and valuable patron in Mr. Acraman, of Clifton, for whom he painted many pictures. In 1833 and 1834 he made a tour upon the Continent, in Germany, Switzerland, and Italy, and made many admirable sketches. Sketching from nature was a department of art in which Müller had extraordinary power; nearly all his more considerable works of this class are in themselves complete; they require no elaborated copies to make them presentable as pictures; he did indeed elaborate very few of them into pictures, and some of these rather lost than gained by the process.

In 1836 he exhibited a picture of Peasants on the banks of the Rhine waiting for the Ferry-boat, but it was a piece of no pretensions, and attracted little notice.

In 1838 he started upon a long and arduous tour through Greece and Egypt: he went beyond the cataracts of the Nile, and visited the mummy-caves of Mahabdies, of which and many other interesting places in Greece and Egypt he made masterly drawings. He returned to England towards the close of 1839, took up his abode in London, and exhibited several admirable pictures of the remarkable scenes that he had sketched during this his first oriental tour. He had in the exhibition of 1840 Athens from the Road to Marathon, and the Memnon, or Ruins at Gornou in Egypt at Sunset, both pictures of the highest degree of merit, but in different styles. The Memnon, though hung high up in the dark octagon room in the Academy, commanded the attention of every one who could see so high; it is a master-piece of colour and effect, and is certainly a work of high poetic art. The view of Athens is equally excellent in its class; the picturesque, and at the same time the historical associations connected with the place make it an additionally interesting work: this picture, for which Müller received only thirty guineas, for his works had not yet attracted a moiety of the attention which they deserved, was lately purchased by a picture-dealer for nearly ten times the amount. The Memnon was sold for twenty-four guineas: ten times the amount is nearer its present value also.

In 1843 Müller joined on his own account Sir Charles Fellowes on his last expedition to Lycia, to remove to London the Xanthian marbles, now in the British Museum. He returned to London in 1844 with some dozens of very interesting and masterly sketches, which elicited the unqualified admiration of all who saw them at a meeting of the Graphic Society shortly after his return. About three hundred sketches and other works were lately sold by auction by Messrs. Christie and Manson, and they realized the enormous sum of

4360*l.*: a small sketch of his own apartment at Macri alone brought sixty-five guineas. These are curious facts: he himself receives only thirty guineas for his picture of Athens, a finished master-piece; he dies shortly afterwards, and a few months subsequently a small water-colour sketch of his own apartment, which probably he himself would not have valued at much more than thirty pence, is sold for more than double the number of guineas. The living artist would appear to be scarcely worth the shadow of his own body when dead.

The pictures, the fruits of Müller's second oriental tour, which were exhibited at the Royal Academy in 1845, appear to have been the primary causes of his early and unexpected death, though the fatal results of their bad hanging on the Academy walls betray an extraordinary degree of sensibility in the painter. He appears from his own words to have anticipated much honour and proportionate benefit from the exhibition of these works in the Academy; far indeed however was the result from the anticipation. Müller sent the following five pictures to the Academy exhibition of last year (1845):—Great Cannon formerly belonging to the Knights Templars, Rhodes; Head of a Cingari, Xanthus; The Burial-ground, Smyrna; Tent Scene, Cingaries playing to a Turkish family, Xanthus; and Turkish Merchants with Camels passing the river Mangerelii, in the valley of Xanthus. These works were, with one exception, what is called hung out of sight; that is, either so much below or so much above the line, that they could not be easily seen, and would very probably be altogether passed over by the majority of visitors to the exhibition. Müller felt this *condemnation* excessively, and notwithstanding his own professed resignation to his fate, he was evidently prostrated; he was seized with a severe illness in the month of May, which ended fatally at Bristol, on the 8th of September following. He died from enlargement of the left ventricle of the heart; and several of his friends have not hesitated to declare that the *hanging committee* of 1845 killed William Müller. In his own complaint however he was more moderate; he wrote as follows to his friends in the month of May, after the opening of the Exhibition:—'A man honourably leaves his country, he risks other and distant climates, spends large sums of money, and, after labour and fatigue, he returns to his home, and produces pictures acknowledged to be superior to his former works. His ambition leads him not to expect too high a reward—only places where his pictures may be seen. Such had been my hope; and I find my Turkish Burial-ground and Xanthian Tent Scene on the very top, (at least the first named) of the large room, conspicuously obscure. My large picture is not so badly hung (six feet or more above the ground), but in such a place that one may expect but little from it.' . . . . 'Such has been the reward I have received for the expenditure of large sums, of great labour, the risk of health, breaking up for a time a connection, &c., the fatigue and exhaustion of a long journey—such are the rewards, or post of honour, *a protected body* afford to the young English artist! the *top row* of the large room.' These and other extracts from Müller's letters are published in the 'Art Union Journal,' in which are also several letters written by him while in the East, containing a short account of his proceedings, and some interesting details relating to the ruins, and the customs of the people, in Asia Minor, illustrated with several sketches.

Müller exhibited several pictures at the British Institution, among which were, in 1845, a View of Rhodes with the Pasha's Palace, and a Dance at Xanthus. He exhibited also many excellent landscapes in the early part of his career at Bristol; and, besides what have been already mentioned, the following works at the Royal Academy:—In 1841, Sketch of an Egyptian Slave-market; Convent, Bay of Naples; and the Sphinx: in 1843, Arabs seeking Treasure; Prayers in the Desert; and Welsh Mill on the Dolgarey. He published in 1841 a beautiful work entitled 'Picturesque Sketches of the Age of Francis I.' A select series of his Sketches in the East will also shortly be published.

MUN, THOMAS, is the name of an English writer on political economy, who lived in the earlier part of the seventeenth century, but of whose personal history scarcely any thing appears to be known. His best known work, a small octavo volume, published at London in 1664, is entitled 'England's Treasure by Foreign Trade; or, the Balance of our Foreign Trade is the rule of our Treasure. Written by Thomas Mun of London, merchant, and now published for the common good by his son John Mun of Bearsted, in the county of Kent, Esquire.' This title-page comprehends nearly all the particulars we have been able to discover respecting Mun. The book is dedicated to Thomas, Earl of Southampton, in an address in which Mun's son says:—'It was left me in the nature of a legacy by my father, for whose sake I cannot but value it as one of my best moveables, and as such I dedicate it to your lordship. He was in his time famous amongst merchants, and well known to most men of business for his general experience in affairs, and notable insight into trade; neither was he less observed for his integrity to his prince, and zeal to the common-wealth. The serious discoveries of such men are commonly not unprofitable.' A passage which occurs in the body of the work may give some indication of the nature and extent of Mun's dealings. Having observed that Ferdinand I., the Grand Duke of Tuscany, was very rich in treasure, and enlarged his trade by lending to merchants great sums of money at a low interest, he adds:—'Myself had 40,000 crowns of him *gratis* for a whole year; although he knew that I would presently send it away in specie to Turkey, to be employed in wares for his country; he being well assured that in this course of trade it would return again, according to the old saying, with a duck in the mouth. By his thus encouraging of commerce, within these thirty years the trade of his port of Leghorn is so much increased, that, of a poor little town, as I myself knew it, it is now become a fair and strong city.' Ferdinand I. died, after a reign of twenty-two years, in 1609; it is strange, therefore, that Mr. Macpherson, who quotes this passage in his 'Annals of Commerce,' should place it under the year 1630, remarking that 'probably Mr. Mun was in Leghorn about this time, and may have written his book about 1660.' The conjecture of Mr. M'Culloch ('Principles of Political Economy,' p. 30), that the book was probably written about 1635 or 1640, is likely to be much nearer the truth. Mun, being, as we have seen, a foreign merchant of the highest eminence before 1609, can hardly have been born later than 1580, and most probably was dead long before 1660. His 'England's Treasure,' is addressed to his son, and begins:—'My son, in a former discourse I have endeavoured, after my manner, briefly to teach thee two things: the first is piety; . . . . the second is policy; . . . so am I now to speak of money.' But whether this former discourse was even published we do not know. Mun, however, has always been understood to be the writer of a work entitled 'A Discourse of Trade from England to the East Indies, by T. M.' 4to. London, 1621.

The object of this last-mentioned work is to defend the East India trade from the charge brought against it of exhausting the national wealth by occasioning an annual exportation of treasure, or of gold and silver. Mun does not deny, or for a moment doubt, that the true profit of the country upon any branch of commerce is to be measured by the balance of money which it annually brings into the country; but he contends, that, although the trade with the East Indies, considered by itself, would upon this principle be a losing trade, yet it became in reality profitable in consequence of the exportation of certain commodities which it enabled us to make to other European countries, from which in this way we drew back every year a much larger amount of treasure than wo sent out to India. The reasoning is the same that was afterwards employed by Sir Josiah Child in his anonymous pamphlet, 'The East India Trade, a most profitable Trade to this Kingdom,' published in 1677. The same doctrine is also expounded in Mun's other work, his 'England's Treasure by Foreign Trade,' the fourth chapter of which, principally relating to the East India trade, is headed, 'The exportation of our monies in trade of merchandize is a means to increase our treasure.' The fundamental principle of that work is stated in the second chapter:—'The ordinary means to increase our wealth and treasure is by foreign trade, wherein we must ever observe this rule—to sell more to strangers yearly than we consume of theirs in value.' Perhaps the principle of what has been called the mercantile or balance of trade system had scarcely before been so distinctly avowed, at least by any English economist. The work, which extends to 220 pages, contains twenty-one chapters in all. It was long looked upon as a great authority, and was reprinted at London in 1669, in 1698, in 1700, and in 1713; and a last edition was produced at Glasgow in 1755. A copy of the first edition in the British Museum, which is marked by its former possessor as 'E dono filii auctoris,' contains a few brief manuscript annotations on the margin, in general however expressing merely the writer's agreement or dissent.

MUNDAY, ANTHONY, must, according to his epitaph, have been born in 1553. His early life is almost totally unknown; but he was at one time abroad, and describes himsel' as having been 'the Pope's scholar in the seminary at Rome.' In 1582 he was one of the instruments in the detection of the Popish conspiracy; he was a witness against some of the prisoners; and he published 'A breefe and true Reporte of the Execution of certain Traytours at Tiborne the 28th and 30th days of May, 1582; gathered by A. M., who was there present.' He had, it appears, held a dispute at tho foot of the gallows with one of the victims. This pamphlet was not Munday's first publication. His tract called 'The Mirror of Mutabilitie' had appeared in 1579; and he published, after this date, a large number of pieces in prose and verse, originals and translations. Lists will be found in the 'British Bibliographer' and elsewhere. His dramatic productions are now more interesting than any of the others. He is said, but on equivocal authority, to have been a player and an unsuccessful one: ho was at any rate a frequent writer of plays, and also of pageants for the corporation and companies of London. Ben Jonson, in 'The Case is Altered,' written early in 1599, ridicules him and his city-shows, in his character of Antonio Balladino, making this personage to say of himself, that he 'supplies the place of pageant-poet to the city of Milan when a worse cannot be had,' and that he 'uses as much stale stuff as any man does.' Perhaps Ben's critical acumen was a little sharpened by the fact that Munday had just been called 'our best plotter' in Meres' 'Palladis Tamia,' in which Jonson's own name is not mentioned. Mr. Collier enumerates fourteen plays which Munday wrote or assisted in writing, desiring however to add to this list the recently discovered play called 'The Two Italian Gentlemen,' which he attributes to Munday, and infers to have been acted about 1584. The following other plays of Munday have been printed. 1, 2, 'The Downfal of Robert Earl of Huntingdon,' by Anthony Munday; 'The Death of Robert Earl of Huntingdon,' by Anthony Munday and Henry Chettle, both acted in February, 1598, and printed in 1601. Both are reprinted in Mr. Collier's 'Supplementary Volume to Dodsley's Old Plays.' They are rude and irregular pieces, possessing much vigour of painting, and presenting, in the scenes with Robin Hood's band in Sherwood Forest, some pleasing poetry. 3, 'The Widow's Charm,' acted in July, 1602; and supposed to be the comedy of 'The Puritan, or the Widow of Watling Street,' which was printed in 1607, and has been absurdly attributed to Shakspere. 4, 'The First Part of the Life of Sir John Oldcastle,' by Anthony Mundsy, Michael Drayton, Robert Wilson, and Richard Hathwaye; published twice in 1600, one of the editions attributing it to Shakspere. Munday died on the 10th of August, 1633, and was buried in the church of St. Stephen, Coleman-street.

MURAT. CAROLINA MARIA ANNUNZIATA BONAPARTE, sister of Napoleon, born at Ajaccio, in 1782, married in 1802 General Murat, then aide-de-camp to the First Consul, and became Grand Duchess of Berg, and afterwards Queen of Naples in 1808. She was the only sister of Napoleon who became a queen. She took a considerable part in the public affairs of the kingdom of Naples, and was several times regent in the absence of her husband, who was obliged to follow Napoleon in his never-ending wars. She displayed mnch ability, prudence, and firmness; she encouraged education and learning, and founded several useful institutions, among others one for the education of young ladies at Naples, which still remains. She had at various times a difficult task in acting the part of a conciliator between her spirited but imprudent husband and her imperious brother. After seven years of reign, during which she showed herself worthy of the crown, she was obliged, through the reverses of her husband in 1815, to leave Naples on board of an English man-of-war, and to retire to Austria, where she lived for many years under the title of Countess of Lipano (the anagram of 'Napoli'). After the tragical death of her husband, she busied herself with the education of her four children. In course of time the two sons went to settle in America, one daughter married the Italian Count Rasponi, and the other Count Pepoli of Bologna. Madame Murat made a journey to Paris after 1830 for some family interests, and was well received by Louis-Philippe and his family. She afterwards went to Italy, and died at Florence, in May, 1839. Napoleon had a very favourable opinion of his sister Caroline.

(Lesur, *Annuaire*.)

MURÆNA, an apodal malacopterygious fish of the family *Murænidæ*, and resembling the eel in form. It has no pectoral fins. The orifices of the gills are small and open, one on each side. In each jaw there is a single row of teeth. The dorsal and anal fins are very low, and are united. The *Muræna Helena* is the type of the genus. It is found in the Mediterranean and Portuguese seas, and in ono instance has been taken on the coasts of Britain. It grows to the length of between four and five feet, and even more. The body is smooth and glossy, beautifully mottled with salmon colour, yellow, and purple. Tho head is large and swollen, which gives the fish a disagreeable aspect. It is excellent eating, and was highly esteemed by the antients, who reckoned it among the best of fishes for the table, and kept the *Muræna* alive in *vivaria*.

MURPHY, ROBERT. No obituary has yet appeared, as far as we know, of this distinguished mathematician: and this, with tho interest attaching to so remarkable a rise by force of talent alone, may justify us in giving the facts we have been able to collect at length. The materials for his early life have been communicated by J. Dillon Croker, Esq., of Mallow, one of his first patrons.

Robert Murphy was the third of the seven children of a shoemaker, parish clerk of Mallow in Ireland: he was born in 1806. His father intended to have brought him up to his own trade; but the son's destination was changed by an accident which nearly cost him his life. When eleven years of age, while playing in the streets of his native town, he was run over by a cart, and lay on his bed for twelve months with a fractured thigh-bone. During this confinement, his family supplied him with such books and newspapers as they could procure; and among them there happened to be a Cork almanac, containing some mathematical problems. These attracted the child's attention, and made him desirous of possessing Euclid and a work on algebra. The books were procured with some difficulty, and before he was again able to walk, and before he was thirteen years of age, young Murphy was an extraordinary instance of a self-taught mathematician. A gentleman of the namo of Mulcahy, of Cork, who was the tutor of most of those from the south of Ireland who got fellowships at Dublin College, was in the habit of proposing problems (or *cuts*, as they are called in Cork) in the newspapers. At a certain time, he began to receive answers by return of post, from Mallow, without any signature. Surprised at the extraordinary talent displayed in these answers, Mr. Mulcahy went to Mallow to find out his unknown correspondent. After some difficulty, ho found that the asserted author of the answers was a boy on crutches, so young that he could not believe the story. A few minutes' conversation, however, put it beyond a doubt. On coming away, in amazement, he happened to meet the gentleman to whom we are indebted for this account, to whom he said, with natural exaggeration, 'Mr. Croker, you have a second Sir Isaac Newton in Mallow: pray look after him.' It was then agreed that the boy should give up learning his father's trade, and pursue his studies. Mr. Hopley, who kept a classical school in Mallow, had the generosity to take him as a pupil without any charge: and he, in after life, had the satisfaction of transmitting to the widow of his teacher, then reduced to poverty, the sum which an ordinary pupil would have paid.

When he attained the age of seventeen, great exertions were made to get him entered as a student of Trinity College, Dublin, but without success. The examinations for sizarships being classical, he had no chance: and some mathematical papers—which were sent to the authorities as the productions of a boy who had never had a teacher, and which, to judge by what we shall presently see, must have been of no common merit—received no attention. At this time Mr. Mackey, a Roman Catholic priest, published a duplication of the cube, the plausibility of which attracted attention, and, it is said, even obtained the assent of the teachers at Maynooth. Young Murphy, then eighteen years of age, answered this duplication in a pamphlet, entitled 'Refutation of a pamphlet written by the Rev. John Mackey, R. C. P. entitled "A method of making a cube double of a cube, founded on the principle of elementary geometry," wherein his principles are proved erroneous, and the required solution not yet obtained; by Robert Murphy, Mallow, 1824' (20 pp.). The matter and style of this production are really extraordinary under the circumstances: with the exception of a little too much acerbity of expression, and a mere slip in a point of history, a critic would not find anything to attack in it, even as the work of an educated person of mature age. The young author had a confusion in his head between Lord Brounker and Dr. Brinkley, when he says that 'Dr. Brounkley,' had expressed the circumference of a circle by a continued fraction.

The gentleman to whom we have several times referred now determined to try to get young Murphy sent to Cambridge. He applied to the clergyman who presented tho boy with his Euclid and algebra, Mr. Brown, who was then employed in a parish of which Mr. McCarthy, a Cambridge Master of Arts, was the proprietor. This last-named gentleman, being then about to visit England, promised to take some of Murphy's papers with him, and to do what he could to induce his old tutor, Professor Woodhouse [WOODHOUSE, P. C.], to interest himself in the matter. The first answer was not very encouraging. Mr. Woodhouse would say no more than that if they would send the boy he would look after him. On being requested to look over the papers, he declined, saying, that he had no time, and made it a rule not to do so. He desired that the papers might be taken away, and on being requested to allow them to remain, to meet the case of his possibly being able to look at them, he predicted for them the fate of waste paper, and the interview ended. In six weeks from that time, however, Mr. Woodhouse wrote a hurried letter to Mr. McCarthy, stating that at the moment when he was about to tear the papers, in fulfilment of his prophecy, his attention was struck by something that was almost new to him—that on turning page after page, he saw with delight so much talent that he was really unable to say how long he remained fixed to the subject that he intended should occupy him but a moment—that suddenly, recollecting it was the last day for entrance, he hastily went and placed the name of the writer on the boards of Caius College. He concluded by promising that if his friends would send him with fifty or sixty pounds in his pocket, he would take care that they should not be called on again: and this promise was faithfully kept. Mr. Croker immediately obtained about seventy pounds by subscription, and Mr. Murphy began his residence at Caius College, in October, 1825. During his residence, the college supplied him with money, in addition to the proceeds of his scholarship. In 1829 he took the degree of bachelor of arts, and came out third wrangler. The highest place is sometimes not to be gained by any amount of genius and industry, unaccompanied by strict attention to the University course of reading: and Mr. Murphy's time was much occupied by speculations of his own, which would not turn to much account in an examination. In May, 1829, he was elected Fellow of Caius; he shortly afterwards took deacon's orders (he did not proceed farther), and was made dean of his college (the dean is, at Caius, an officer who, under the master, regulates the chapel discipline) in October, 1831.

Of what he did in mathematics we shall presently speak: we could wish there were nothing more to say of his private life. He gradually fell into dissipated habits, and in December, 1832, left Cambridge, with his fellowship under sequestration for the benefit of his creditors. There is much excuse for a very young man, brought up in penury, and pushed by the force of early talent into a situation in which ample command of money is accompanied by even more than proportionate exposure to temptation. His college admitted the excuse to its fullest extent: and though it could not tolerate the continued residence of an officer who had shown such an example, yet it was understood that his ultimate promotion to one of the more valuable fellowships would take place, on the amendment of his excesses. After living some time among his friends in Ireland, he came to London in 1836, to begin life again as a teacher and writer. Among other things, he obtained from the Useful Knowledge Society an engagement to write the work on the Theory of Equations presently mentioned. In October, 1838, he obtained a small permanent income by his election to the examinership in Mathematics and Natural Philosophy in the University of London; but burdened as he was with debt, this was rather an addition to the instalments of his creditors than an increase of his own means of comfort. He submitted with resignation to the effects of his own misconduct, and showed himself most willing to make every exertion, though well knowing that many years must elapse before he could, by any effort, redeem the ground he had lost. He died March 12, 1843, of a disease of the lungs.

Mr. Murphy's writings were as follows:—*Cambridge Philosophical Transactions:* vol. iii. part 3, General Properties of Definite Integrals; vol. iv. part 1, On the Resolution of Algebraic Equations; part 3, On the Inverse Method of Definite Integrals, with Physical Applications; vol. v. part 1, On Elimination between an Indefinite Number of Unknown Quantities; part 2, second memoir on the Inverse Method of Definite Integrals; part 3, third memoir on the same; vol. vi. part 1, On the Resolution of Equations in Finite Differences. *Philosophical Transactions:*—1837, part 1, Analysis of the Roots of Equations; part 2, First Memoir on the Theory of Analytical Operations. *Separate works:*—Elementary Principles of the Theories of Electricity, Heat, and Molecular Actions, part 1, On Electricity, Cambridge, 1833, 8vo.; A Treatise on the Theory of Algebraical Equations, London, 1839, 8vo. (Library of Useful Knowledge): to these must be added some brief communications to the Philosophical Magazine, and various articles on subjects of physics in the Penny Cyclopædia, beginning with the letter D.

Mr. Murphy's character as a mathematician is too well known to require any comment of ours; while the facts of his life, and in particular those of his removal to Cambridge, have not been recorded: we have therefore preferred to devote our space to the insertion of the latter. What he might have been if the promise of his boyhood had not been destroyed by the unfortunate circumstances we have described, it is difficult to say: for he had a true genius for mathematical invention. Before however he had more than commenced his career, his departure from Cambridge, and the necessity of struggling for a livelihood, made it impossible for him to give his undivided attention to researches which, above all others, demand both peace of mind and undisturbed leisure.

MURRAY, LINDLEY, was born in 1745, at Swetara, near Lancaster, in the state of Pennsylvania, North America. His parents belonged to the Society of Friends, and he was the eldest of twelve children. He received the rudiments of education at Philadelphia, in the academy of the Society of Friends. In 1753, his father, who was an enterprising merchant, removed with his family to New York, where Lindley was sent to a good school. At an early age he was placed in his father's counting-house, in order to be trained up to the mercantile profession, but having taken a decided dislike to it, he prevailed on his father to allow him to have a private tutor to instruct him in classical learning, and afterwards to place him under an eminent lawyer, in order to receive instruction in the law, to which profession he had resolved to devote himself. John Jay, afterwards governor of the state of New York, was his fellow-student. About the age of twenty-one he was called to the bar, and having obtained a good practice he soon afterwards married. He was sedulous in his application to his business as a lawyer, and very successful till the disputes commenced between Great Britain and America. The law then ceased to be lucrative, and he entered into the mercantile profession, with such success that about the time of the establishment of American independence he had acquired sufficient property to allow him to gratify his wish of retiring from business.

Lindley Murray purchased a beautiful seat on the banks of the river about three miles from New York, but before he removed to it he had a severe attack of illness, which left him in a very debilitated state of body; the tone of his muscles was so much impaired that he could walk but little, and his debility continued to increase, in spite of change of scene, bathing, and every other means of remedy to which he had recourse. In 1784 he embarked for England, with his wife, in hope that a climate where the summers are more temperate and less relaxing than they are in the United States, might contribute to the restoration of his strength. He purchased a house and garden at Holdgate, a small village about a mile from the city of York, where he resided during the remainder of his life. For a short time his muscular strength increased, but afterwards diminished till he could no longer take exercise except in a carriage, or in a vehicle in which he was drawn about his garden, but for many years before his death he was entirely confined to his room. In the sedentary state to which he was reduced he occupied himself by reading and the composition of works chiefly intended for the instruction of youth.

Lindley Murray's first work, 'The Power of Religion on the Mind,' was published anonymously in 1787. It is a selection of passages from various authors, and was very favourably received. The first edition of his 'English Grammar' was brought out in 1795. A second edition was soon required, and the book was revised and enlarged by the author, and then reprinted. 'Exercises,' to correspond with the Grammar, and a 'Key' to the Exercises, were published in 1797, in which year he also published an Abridgment of the Grammar for the use of minor schools and those beginning the study of grammar. The four volumes were adapted to each other; and were soon introduced into many schools. The sale of them has been very large, and still continues to be so. Murray's Grammar and Exercises however are entitled to little praise beyond the care with which the materials have been arranged; they do not even approximate to a high standard in point of clearness of exposition, and are besides based on a wrong principle, that of teaching the pupil how to write good English by placing before him specimens of bad English. Definitions are given, which are frequently very obscure, and rules are laid down without explanation of the principles on which they are founded, and if the pupil commits the definitions and rules to memory, believes in them, and can apply them, his grammatical education, as far as these works are concerned, is considered to be complete. But grammars of this class ill supply the wants of the present age, even for the purposes of common school instruction, and ought to be superseded by others of a better kind, in which the principles of the language should be explained, as well as illustrated by specimens selected from the best writers. Murray's Grammar is altogether deficient in the etymological part, and the student can derive from it no knowledge of the true forms of words and their historical deduction from the early state of our language. His next publication was a series of extracts called 'The English Reader,' to which he soon afterwards added an 'Introduction,' and a 'Sequel;' the three volumes containing respectively selections suited to pupils of different degrees of maturity. The success which attended these publications induced him to publish the 'Lecteur François' in 1802, and in 1807 an 'Introduction au Lecteur François.' In 1804 he published a Spelling-Book. For the copyright of all these works he received a liberal price, and as he had no children, and his property was as much as he and his wife required, the entire sum was devoted to charitable purposes. All these editions were in 12mo. In 1808 he published an enlarged edition of the Grammar and Exercises, in 2 vols. 8vo., designed for the use of persons who might deem it worthy a place in their libraries. He also published a 'Selection from Horne's Commentary on the Psalms,' 12mo., and a little work, published in 1817, 'On the Duty and Benefit of a daily Perusal of the Holy Scriptures.'

Lindley Murray, though subject for so many years to bodily infirmity as well as to some severe attacks of disease, continued to live till his eighty-first year. He died Feb. 16, 1826, with the reputation of being an exceedingly kind and good man. His wife survived him.

(*Memoirs of the Life and Writings of Lindley Murray, in a Series of Letters written by himself; with a Preface and Continuation of the Memoirs*, by Elizabeth Frank, York, 8vo. 1826; *Journal of Education*, vol. viii. (1834), p. 308, &c.)

MURRAY, JOHN, publisher, born November 27, 1778, died June 27, 1843. His father, originally an officer of Marines, whose name was MacMurray, purchased (1768) the business of Paul Sandby, 32, Fleet-street. John Murray was educated at several schools—at the High School of Edinburgh, at Kensington, at Dr. Burney's at Gosport, where he lost the sight of an eye by the accident of the writing-master's penknife running into it, and finally at Loughborough House, Kennington. At the age of fifteen he lost his father, a great misfortune, as it left him without control and direction; his mother married again, and his guardians neglected him. He had commenced business as a medical bookseller, in partnership with Mr. Highley, but having dissolved the partnership in 1803, he soon devoted his attention to a wider field of literary business. The son of an old friend and neighbour, Dr. Rennell, Master of the Temple, Mr. Stratford Canning, with some other youths at Eton, had commenced a periodical called 'The Miniature,' which brought them some fame, but left them under loss. Mr. Murray, with a good-nature which always distinguished him, and with something of that tact which enabled him, in his subsequent career, to seize upon occasions of cultivating powerful friends, on hearing of their situation took the copies off their hands, paid their expenses, and, though he found little demand for the work, offered to print a new edition. Through the friends thus made, he became known to Mr. Canning. In September, 1807, he wrote to that gentleman opening to him the plan of the 'Quarterly Review,' as a means of counteracting the political influence of the 'Edinburgh.' While maturing his project—the most important undertaking of his life—it chanced that a severe criticism on Scott's 'Marmion' (condemning the author for writing for money) appeared in the 'Edinburgh Review.' Mr. Murray instantly started for Scotland, was introduced to Scott at Ashiestiel, in September, 1808, found in him a warm supporter of his intended review, and with Scott's co-operation and that of his friends, the Hebers, George Ellis, Canning, Barrow, and Mr. Gifford, the editor, the publication commenced in 1809, and soon attained a circulation of 12,000 copies.

The closest alliance of business and friendship long subsisted between Mr. Murray, and Constable of Edinburgh, and the Ballantynes; but he early perceived the result of the reckless mode of business to which they had resorted, and foregoing the great advantages of the connection, after repeated and strong warnings and remonstrances, he separated from them. He published, however, 'The Tales of My Landlord,' and had no difficulty in discovering the real author of 'Waverley,' nor did he ever entertain any doubts on the subject.

In 1810 he sought and made the acquaintance of Lord Byron, giving 600*l.* for the two first cantos of 'Childe Harold,' which had been refused by another publisher. In 1812 he removed to Albemarle Street, where, increasing the number of his friends and literary connections, he soon surrounded himself with a circle of distinguished literary characters. In the afternoon might be found in his drawing-room, Scott, Byron, Campbell, Wm. Spencer, R. Heber, Gifford, D'Israeli, Mr. Ward (Lord Dudley), Canning, Hallam, Croker, Barrow, Madame de Staël; and, a few years later, Crabbe, Southey, Belzoni, Washington Irving, Lockhart, and many more.

His acquaintance with Byron extended over a period of more than ten years, and the poet's correspondence with him is printed in Moore's Life of Byron, where will be found more than one proof of his liberal mind. Having heard in 1815 that Lord Byron was in pecuniary difficulties, he sent him a draft for 1500*l.*, promising another for the same amount in the course of a few months, and offering to sell the copyright of Byron's works for his use, if that were not sufficient. He abandoned the publication of Lord Byron's Autobiography, at a considerable sacrifice, because it was thought that parts of it might hurt the feelings of the living, and not do credit to the dead. The MS. and the only existing copy of it were consequently committed to the flames in 1824. Soon after Mr. Murray commenced printing a series of cheap works in parts, consisting of 'Modern Voyages,' the publication of which was delayed by circumstances;—a specimen however given by him to Captain Basil Hall was taken to Edinburgh, and suggested to Constable the notion of his Miscellany. In 1826, trusting to others more sanguine than himself, and allowing his own good judgment, perhaps, to be misled by partiality for the projector, he commenced 'The Representative,' a daily newspaper—almost the sole undertaking of his life which proved a failure. It was attended with considerable loss, which fell entirely on him, and was soon given up. Among his valuable and successful publications were the expeditions of Mungo Park, Belzoni, Parry, Franklin, Denham, and Clapperton—the Family Library, begun April, 1829—the Domestic Cookery, of which nearly 300,000 copies have been sold, the fortunate title having been suggested by himself—Markham's Histories—the Sketch Book—and Deathbed Scenes. The three last works, originally published by others, proved failures until Mr. Murray, perceiving their merits, took them into his own hands.

Further particulars redounding to his credit as a liberal-minded man of business and a gentleman, will be found in the Lives of Byron, Scott, and Crabbe, and especially in his modest 'Answer to the Calumnies of Captain Medwin,' appended to Byron's works.

The 'Quarterly Review,' always the object of his pride and solicitude, was conducted from 1809 to 1825 by Mr. Gifford, since which, with the exception of one year (March to December, 1825), during which Mr. (now Justice) Coleridge was editor, it has been directed by Mr. Lockhart. Although the principles on which it was established and conducted, excluded the publisher from any interference in its management, yet his tact and perseverance in catering for it, in suggesting subjects for review, and in enlisting contributors, tended much to its popularity. He was an excellent man of business; and, when he really applied, could get through more work than most men. No one better understood how to measure the calibre of an author's genius, or the extent of his popularity, and few could be more skilful in timing a publication, so as to secure its favourable reception. His eminent merit—that which distinguishes him above the majority of his class—was that he dealt with the commercial department of literature in a spirit far above that of the mere dealer and chapman. Had he thrown away his capital and his talent upon the idle scheme of patronising every literary adventurer—a design which some think the especial duty of every publisher—a few years would have conducted him to ruin. But he did better than this. He indirectly encouraged all literary effort by dealing honourably and generously with authors whose reputation was established, or of whose success there could be no doubt. This was not patronage, but equitable distribution of the rewards of the capitalist and the labourer. He was distinguished too, by his careful avoidance of the low arts of puffing; he published, for the most part, books of worth, and his imprint alone gave a recommendation to a book which raised it above the necessity of advertising quackery. Mr. Murray continued to take an active share in his business until within a short time of his death. Although his health had been in a precarious state for some months preceding it, no danger was apprehended until two or three days before this occurred. Mr. Murray married in 1807 the daughter of Charles Elliot, bookseller, of Edinburgh, by whom he left one son, who continues his business, and three daughters.

MUSCA, a genus founded by Linnæus for the reception of the Dipterous insects, commonly known as Flies. The Linnæan genus has been broken up by subsequent entomologists into many genera and even families. Of the typical family *Muscidæ* no fewer than 1700 European species have been described by Meigen, and nearly as many more extra-European have been described by Robineau Desvoidy in a quarto volume of 812 pages, devoted entirely to this subject.

Many of the *Muscidæ* are interesting on account of their habits. Some of the species of *Myobia* deposit their eggs in the nests of Hymenoptera, so that their larvæ when hatched may feed on the stores of provisions there collected. The larvæ of *Tachina* are parasitic on other larvæ. Those of some other genera are only found in the dead bodies of particular species of animals, as *Cynomyia*, which reside in the carcasses of dead dogs. The blue-bottles and blow-flies, species of *Lucilia* and *Calliphora*, lay their eggs in meat, which becomes fly-blown. *Anthomyia* deposits its eggs in manure or in the roots of vegetables, and *Tephritis* in growing plants. The cheese-maggot is the larva of an insect of this family named *Piophila casei*. *Drysophila cellaris* deposits its eggs in fermented liquors.

Most of these flies are extremely prolific; the ovaries of the female flesh-fly (*Sarcophaga carnaria*) have been found to be arranged in spiral fashion and to contain as many as 20,000 eggs.

(Westwood, *Introduction to the modern Classification of Insects;* and the writings of Meigen, Haliday, Desvoidy, and Macquart.)

MUSCA'RI, a genus of plants belonging to the natural order Liliaceæ. It has a globose or subcylindrical perianth narrowed at the mouth and 6-toothed. The stamens are inserted at about the middle of the tube, the filaments not decurrent.

M. racemosum, Grape Hyacinth, is the only British species of this genus. It abounds in Suffolk near Pakenham, and is found in some other parts of Great Britain. It has ovate nodding crowded flowers, the upper ones nearly sessile, abortive; the leaves linear, flaccid, and recurved. The flowers are of a dark blue colour. It grows most abundantly in sandy fields.

The bulbs of *M. moschatum* are, according to Lindley, emetic.

(Babington, *Manual of British Botany;* Lindley, *Vegetable Kingdom.*)

MUSCOVADO SUGAR. [SUGAR, P. C.]

MUSCULAR TISSUE. [TISSUES, ANIMAL, P. C. S.]

MUSEUM OF ECONOMIC GEOLOGY. This institution owes its origin to the suggestions of Sir H. T. De la Beche, who in 1835 submitted to the Chancellor of the Exchequer, that the persons employed in the Ordnance Geological Survey had constant opportunities afforded them of collecting specimens illustrative of the application of geology to the useful purposes of life, and of the mineral wealth of the kingdom. The advantages which would arise from such a collection, and its exhibition to the public, under the care of the Board of Public Works, were also briefly pointed out.

The Museum now occupies the houses Nos. 5 and 6, Craig's Court, Charing-Cross, the former containing the Mining Record Office, and the latter the specimens; the establishment is open daily to the public, between the hours of ten and four in summer, and ten and five in winter. The principal officers to the establishment are Sir H. T. De la Beche, already named as the Director, Mr. Richard Phillips, Curator, who is also chemist to the Museum, conjointly with Dr. Lyon Playfair; Mr. Robert Hunt is keeper of the Mining Records.

The objects contemplated in the arrangements which have been effected were—to obtain specimens of the various mineral substances used for the construction of public works or buildings, or for road-making; of such as are employed for useful or ornamental purposes in the arts, or from which the useful metals are extracted; these being arranged with reference to the instruction of those to whom such knowledge would be advantageous, either in a scientific or practical point of view.

With respect to building-stones it may be observed in illustration of the utility of the establishment, that there exists in it a collection, described by appended tickets, of the various specimens of building-stone, procured by the commissioners appointed in 1838, to visit the quarries and examine the qualities of the stone to be used in building the New Houses of Parliament. These specimens, with the very elaborate report in which their properties are described, cannot fail to be a source of great and lasting utility to the architect who seeks for information.

In addition to these specimens there are also exhibited numerous polished granites, porphyries, and marbles from various parts of the kingdom: some of the specimens are turned into columns, and others formed into vases.

Another object intended to be effected by the formation of the Museum is the promotion of improvements in agriculture, by exhibiting sections of strata, with specimens of soil, subsoils, and the rocks from the decomposition or disintegration of which they have been produced. It is intended, by this department of the Museum more especially, to exhibit the relations of geology to agriculture by imparting such a knowledge of the material composing the substrata as may suggest the means of permanent improvement on the surface. As constituting a large and most important proportion of the mineral riches of the empire, the Director has been especially careful in collecting specimens of coal from every part of the kingdom, and the public have liberally contributed to this and indeed to every part of the institution.

An annual grant is voted by Parliament for geological sections of railway cuttings, a service of much importance, especially in the mineral districts.

The Museum contains an extensive collection of the various metalliferous ores of Great Britain, with specimens of the results of the metallurgic processes by which the metals are extracted, accompanied with illustrations of many of the purposes to which the metals are applied.

The application of various earths and metallic oxides to enamelling, and the manufacture of glass and of porcelain, is illustrated by specimens of the art of different ages.

It is to be further observed that a laboratory forms another department of the Museum; in this the analysis of soils and minerals is performed for the public on very moderate terms, and pupils are admitted into the laboratory for instruction in analytical and metallurgic chemistry.

In the Mining Record department are deposited plans and sections, and models of mines, and of the machinery by which they are worked; it also contains workshops in which many of the models have been constructed; and collections of mining tools used in several of the different countries are also exhibited. This department having for its objects matters which concern particular parties, rather than the public generally, is, from the nature of its contents, not open to indiscriminate admission, but every reasonable facility is afforded to all operative miners as well as the owners or agents of mineral properties, by application to Mr. R. Hunt.

In concluding this brief sketch of the Museum, we may observe that, owing to the great liberality with which it has been supported by the government and by the public, it has been for some time past impossible to exhibit the accumulated specimens for want of room. It is understood that, on this account, Government is building a larger and more commodious house for the purpose, which will extend from Piccadilly through to Jermyn-street.

MUSHROOM. [AGARICUS, P. C.]

MUSIS, A DE. [VENEZIANO, AGOSTINO, P. C.]

MUSOCA'RPUM, a genus of fossil plants, the fruits only known. From the coal measures of Lancashire. (Brongniart.)

MUSSOWA, or MASSOWA. [ABYSSINIA, P. C. S., p. 24.]

MUTI'LLIDÆ, a family of Hymenopterous insects corresponding to the Linnæan genus Mutilla. These bees belong to Latreille's division *Fossores*, and some of the species are remarkable for the power of their stings.

MUZIA'NO, GIRO'LAMO, an eminent Italian painter, was born at Acquafredda near Brescia, in 1528. He was first instructed by G. Romanino at Brescia; he then turned his attention to the colouring of Titian, and particularly to his landscape backgrounds. About 1550 he went to Rome, where he first attracted notice as a landscape-painter, and he was known there as the Giovane de' Paesi, or Girolamo de' Paesi, 'landscape Jerome.' He however soon showed that he was equally capable not only in all departments of painting, but in other kindred arts likewise; and he became one of the first painters of his time, and even in the characteristic grand style of the Roman school he obtained a place in the ranks of the greatest masters. Michelangelo himself pronounced Muziano to be one of the first painters of the age, when he saw his large picture of the Resurrection of Lazarus, which he painted for the church of Santa Maria Maggiore. This picture was afterwards removed to the Appartamento de' Principi in the Quirinale, or papal palace of Monte Cavallo, where it still was, according to Titi, in 1763, but it was not seen there by Ramdohr a few years afterwards. There was a Resurrection of Lazarus by Muziano in the Orleans Gallery at Paris, but as this piece was engraved by S. Vallée for the 'Cabinets de Crozat,' in 1729, as a part of the Orleans collection, it cannot be the picture so much approved of by Michelangelo, unless the account of Titi is incorrect. When the part of the Orleans collection, of which it was one, was sold by auction in London in 1800, it fetched only fifty-six guineas: who the purchaser was, or where it is now, is not publicly known.

There are many of Muziano's works in the churches and palaces of Rome, in oil and in fresco; there are also works by him in the cathedrals of Orvieto and Foligno, and in the church of the Madonna at Loreto. There is likewise a very celebrated picture by him of Christ washing the feet of his disciples, in the cathedral of Rheims: it has been engraved by L. Desplaces. Muziano painted many historical landscapes, or landscapes with historical personages or events so introduced into them as to be secondary objects, and of little service beyond affording subject for a title to the landscape. Several of these pictures have been engraved by C. Cort, who executed also some prints after other works by Muziano.

Muziano superintended the Roman mosaic-works, and executed some parts of pictures himself in this style. He performed great services in the art of working in mosaic: what was merely a crude and ornamental art of inlaying coloured stones, he brought almost to the perfection of painting. As an architect, he built the Capella Gregoriana, or the chapel of Gregory XIII. in St. Peter's, in which are two of his best pictures, which however he did not live to complete; they were finished by his most distinguished scholar Cesare Nebbia, a painter of Orvieto. Muziano also completed the series of drawings which Giulio Romano had commenced from the sculptures of the Colonna Trajana at Rome, and the first prints of these bassi-rilievi were made from these drawings: the prints of Bartoli were engraved from drawings by himself. The foundation of the Academy of St. Luke at Rome is also due chiefly to the exertions of Muziano: he procured the brief of its establishment from Gregory XIII., and it was confirmed by Sixtus V.

Muziano died at Rome in 1590, according to Baglione (Ridolfi says 1592), and was buried in the church of Santa Maria Maggiore, near the spot where his picture of the Resurrection of Lazarus was placed. His style was severe, and more than ordinarily correct for his time, though he may be reckoned among the imitators of Michelangelo, whose anatomical display seems to have had its due share of influence on the taste of Muziano. Many of Muziano's works have been engraved by some of the best engravers of the seventeenth and eighteenth centuries, and by his contemporaries Ch. Alberti and C. Cort.

(Baglione, *Vite de' Pittori*, &c.; Titi, *Pitture, &c. di Roma;* Ramdohr, *Mahlerei und Bildhauerarbeit in Rom;* Lanzi, *Storia Pittorica*, &c.; Waagen, *Kunstwerke, &c. in England.*)

MY'GALE, a genus of spiders, the species of which have their eyes placed closely together at the anterior extremity of the thorax. They spin their webs in the form of tubes, in which they reside concealed in holes in the ground, or under stones, or the bark of trees. In consequence of the representations of Madame Merian, some kinds of *Mygale* have become celebrated as bird-catching spiders. Mr. W. S. Macleay has however shown that Madame Merian's drawing is not to be trusted, since the *Mygale* there figured is a subterranean spider, and makes no net in which to entrap small birds. The same distinguished naturalist has observed a spider belonging to the genus *Epeira* eating a young bird of the genus *Zosterops*, which had been entangled in its net in a garden in Sydney, New Holland. In a communication of Mr. Macleay's, published in the 'Annals of Natural History' for 1842, he remarks on the subject of bird-catching spiders as follows:—'My conviction is that Madame Merian has told a wilful falsehood respecting *Mygale*, or rather has painted a falsehood; and that her followers have too hastily placed confidence in her idle tales. My conviction is that no *Mygale* can catch birds in its net; for, as I have said in the paper printed in the Zoological Transactions, it makes no geometrical net. Nay, further, I have proved that the genus *Nephila*, which lives in a geometrical net, does not catch birds either here or in the West Indies; and moreover, I have ascertained that birds are not the proper food of this New Holland *Epeira.*' The *Mygale Ionica*, a Grecian species, forms a very ingenious trap-door with which to close up the mouth of its tube.

MYOSU'RUS (from μῦς, a mouse, and οὐρά, a tail, the seeds being seated on a long receptacle 'which looks exactly like the tail of a mouse'), a genus of plants belonging to the natural order Ranunculaceæ. It has a calyx of 5 sepals, prolonged into a spire at the base; the petals 5, with a filiform tubular claw; the capsules closely imbricated upon a long filiform receptacle, not bursting; the seed pendulous; the embryo inverted with the radicle superior. The only species of this genus is *M. minimus*, which has a simple leafless single-flowered stem 2 to 5 inches high. It has a very long receptacle, numerous carpels, and linear leaves. It grows in damp places and in fields. It is a native of Europe and America. The American plant has been described as *M. Shortii*, but there is every reason to believe it is the same as the British and other European plants.

(Babington, *Manual.*)

MYOSO'TIS (from μῦς, a mouse, and ωτ, the crude form of οὖς, an ear), a genus of plants belonging to the natural order Boragineæ. It has a 5-parted calyx, the corolla salver-shaped, contorted in æstivation; the throat closed with scales, the limb 5-fid, obtuse; the stamens included, with filaments very short; the style simple, the nuts smooth, externally convex, keeled within, attached by a minute lateral spot near their base. This genus is distinguished from all the other Boragineous genera, by the possession of a contorted æstivation of the corolla. The species are annual or perennial, rough or smoothish plants, with blue flowers in terminal racemes, which are revolute before expansion. About fifty species have been described, which inhabit the more temperate parts of Asia, Africa, and America, and are found abundant in Europe. Eight species are found in Great Britain.

M. palustris, Great Water Scorpion-Grass, or Forget-me-Not, has the calyx open when in fruit, and shorter than the pedicel, with straight adpressed bristles; the teeth short, triangular, the limb of the corolla flat, longer than the tube, the lobes slightly emarginate, the pubescence of the stem spreading. It is a native throughout Europe, and also of Asia and North America. In Great Britain it is found in humid meadows, bogs, banks of rivers, rivulets, and ditches. This plant has a large bright blue corolla with a yellow eye. It is a beautiful plant, and when once seen will be seldom forgotten. It is probably on this account that it has obtained its common name Forget-me-Not. Amongst the young it is regarded as emblematical of true affection. A variety is described with white flowers.

The following are the remaining British species of this genus:—

M. repens, Mouse Ear, with narrow lanceolate teeth; lobes of the corolla slightly emarginate, the pubescence of the stem spreading. Found in boggy places.

M. cæspitosa with narrow lanceolate teeth; the limb of the corolla equalling the tube, the lobes entire, the pubescence of the stem adpressed. Found in watery places.

M. suaveolens has an attenuated calyx; the limb of the corolla longer than the tube, the root-leaves on long stalks pointed. Only found in Scotland on the summits of the Breadalbane mountains.

M. sylvatica has a calyx rounded below, deeply 5-cleft, closed when in fruit; the limb of the corolla longer than the tube, flat; the root-leaves bluntish. Found in shady places.

M. arvensis, Field Scorpion-Grass, has the calyx half 5-cleft; the limb of the corolla equalling the tube, concave. Grows in cultivated land and thickets.

M. collina has the calyx open and ventricose when in fruit. Found on dry bank·

M. versicolor has the calyx closed and oblong when in fruit. It has small flowers, at first pale yellow, afterwards blue. Found in meadows and on banks.

None of the species are used in medicine or the arts. The British species are most desirable for cultivation, especially *M. palustris* and *repens*. All the perennial species require moist situations, as the edges of ponds or ditches. Some of the species may be grown in pots among other alpine plants. The annual species will grow in a dry sandy soil or on old walls, where the seed may be sown. The other species may be propagated by dividing the roots.

(Babington, *Manual of British Botany*; Don, *Gardener's Dictionary*.)

MYRIACA'NTHUS, a genus of fossil fishes, from the lias of Dorsetshire. (Agassiz.)

MYRIANI'TES, a genus of fossil Annelida, from the lower silurian strata of Lampeter, in South Wales. (Murchison.)

MYRICA (the Greek μυρίκη), a genus of plants the type of the natural order Myricaceæ. It has its flowers in catkins, which are composed of concave scales; 4 to 8 stamens. The fruit a 1-celled 1-seeded drupe, and no perianth. There are several species of this genus, which are shrubs or small trees.

One species, *M. Gale*, the sweet Gale or Box Myrtle, is a native of Great Britain. It has lanceolate serrate leaves broader upwards, with a shrubby stem. It is a bushy plant, about 4 feet in height; the catkins are sessile and erect; the fruit is covored with resinous glands, and the leaves are fragrant when bruised. This plant is found on the Continent of Europe, and also in North America, under the same circumstances as in Great Britain. The leaves, on distillation, yield a yellow æthereal oil, of a feeble odour, and mild taste, which after a little time becomes slightly warm. The leaves were formerly used as a remedy against the itch, and when bruised are placed amongst furs for the destruction of the moth. In decoction they are employed for the destruction of bugs and other vermin. In Sweden they are used as a substitute for hops in brewing.

M. cerifera, Wax-myrtle or Bay-tree, has cuneate lanceolate leaves, sometimes entire, but more frequently toothed, particularly toward the end, somewhat pubescent, a little paler beneath, and generally twisted or revolute in their mode of growth; has a branching half evergreen stem, from one to twelve feet high. The small flower is formed by a concave rhomboidal scale, containing 3 or 4 pairs of roundish anthers, on a branched footstalk. The pistilliferous catkins which grow on a different shrub are less than half the size of the staminiferous ones, and consist of narrower scales, with each an ovate ovary, and two filiform styles. To these catkins succeed clusters or aggregations of small globular fruits, which are at first green, but finally become nearly white. They consist of a hard stony covering, which incloses a dicotyledonous seed. The hard covering is studded on its outside with small black grains, and over these is a coating of hard white wax, fitted to the grains, and giving to the surface of the fruit a granulated appearance. This plant is a native of woods in the United States of America. The bark of the root of this plant is acid and astringent; in large doses it produces vomiting, accompanied by a burning sensation in the throat. It is used as a stimulant and astringent. The wax of the fruit is collected and purified, and used for many of the purposes for which bees-wax and candles are employed. The wax has been occasionally used in pharmacy in the same way as common bees-wax.

The fruit of *M. sapida*, a native of Nepal, is about the size of a cherry, and is pleasantly acid and eatable.

(Lindley, *Flora Medica*; Lindley, *Vegetable Kingdom*; Babington, *Manual of British Botany*.)

MYRIOPHYLLI'TES, a genus of fossil plants, from the coal measures. (Artis.)

MYRIOPHYLLUM (from μυρίος, numerous, and φύλλον, a leaf), a genus of plants belonging to the natural order Halorageæ. It has monœcious flowers; a 4-parted calyx; 4 petals fugitive, longer than the calyx in the staminiferous flowers, small and reflex, or none in the pistilliferous flowers; the stamens 8, styles 4, villose; the fruit tetragonal, separable into 4 hard nuts. The species are floating aquatic herbs, rising above the water to blossom. The leaves are finely cut opposite or verticillate; the flowers are small, disposed in axillary whorls or in whorled spikes, the upper leaves being almost all abortive.

M. verticillatum, verticillate water milfoil, has the flowers all axillary whorled, the bracts pinnatifid. It is a native of Europe, in ponds, ditches, pools, and lakes, but never in running water. It is found in Great Britain, but is a rare plant.

M. spicatum, spiked water milfoil, has the flowers whorled, forming a leafless spike, the bracts small entire, the spike erect when in bud. It is a native of Europe and North America, in ditches, lakes, and pools, never in running water; it is found abundantly in Great Britain.

M. alternifolium has the spike drooping when in bud, and the fertile flowers in axillary whorls. It is found in ponds and ditches in Europe, in Great Britain rarely.

About ten other species of this genus from various parts of the world have been described. There are none of them employed in medicine and the arts, and they are only worth cultivating in botanical gardens. When it is wished to grow the tropical species, G. Don recommends that small parts 'should be taken up in the autumn, planted in a pan of water and then to be placed in the stove in order to preserve them in a living state during the winter, and in the course of the April or May next season, may again be returned to the pond in the open air, where they will thrive much better than if grown all the year round in pans of water or cisterns in a hothouse.'

(Don, *Gardener's Dictionary*; Babington, *Manual of British Botany*.)

MYRIPRISTIS, a genus established by Cuvier for certain tropical fishes of the family of Perches.

MYRME'LEON, a genus of large neuropterous insects, the larvæ of which are remarkable for their habit of entrapping their prey by means of pitfalls. Among the many accounts which have been published of their operations, one of the best and most recent is that given by Mr. Westwood, in the 'Magazine of Natural History' for 1838, and in his Introduction. 'Some larvæ of the common species, *Myrmeleon formicaleo*,' writes that naturalist, 'which I brought alive to this country from France, afforded me ample opportunities for watching their proceedings. It is in very fine sand that the larva makes its pitfall. When placed upon the surface, it bends down the extremity of the body, and then pushing or rather dragging itself backwards by the assistance of its hind legs, but more particularly of the deflexed extremity of its body, it gradually insinuates itself into and beneath the sand, constantly throwing off the particles which fall upon, or which it shovels with its jaws or legs upon its head, by suddenly jerking them backwards,

Ossaque post tergum magnæ jactata parentis.

Proceeding in this manner, in a spiral direction, it gradually diminishes the diameter of its path, and by degrees throws so much of the sand away as to form a conical pit, at the bottom of which it then conceals itself, its mandibles widely extended being the only parts that appear above the surface; with these any luckless insect that may happen to fall down the hole is immediately seized and killed. When the fluids of the victim are exhausted the ant-lion, by a sudden jerk, throws the dry carcass out of the hole: should, however, the insect by chance escape the murderous jaws of its enemy, the latter immediately commences throwing up the sand, whereby not only is the hole made deeper, and its sides steeper, but the escaping insect is probably hit, and again brought down to the bottom of the pit. It is chiefly upon ants and other soft bodied insects these larvæ feed. They are however capable of undergoing long fasts, for one of my larvæ remained from October till March without food. Previous to assuming the pupa state, the larva forms a globular cocoon of less than half an inch in diameter of fine sand, glued with silken threads spun from a slender telescopic-like spinneret, placed at the extremity of its body, and lined with fine silk. The pupa is small, not being half-an-inch long, inactive, and with all the limbs laid at rest upon the breast. When ready to assume the perfect state, it uses its own mandibles, which are quite unlike those of the larva and imago, to gnaw a hole through the cocoon, and pushes itself partly through the aperture in which it leaves the pupa skin. Immediately on assuming the perfect state, the abdomen is almost immediately extended to nearly three times its previous length.'

(See also the writings of Rösel, Reaumur, and Bonnet and Guilding.)

MYRON, one of the most celebrated artists of antient Greece, and the sculptor of the Discobolus, or Quoit-thrower, of which that among the Townley Marbles in the British Museum is supposed to be an antient marble copy, was born at Eleutheræ in Bœotia about 480 B.C. Myron was the fellow-pupil of Polycletus under Agelades; he was therefore in the prime of life at about the time that Phidias died; and he lived at the height of his fame in Athens, where he was domiciliated, at the commencement of the Peloponnesian war.

Pliny gives the following account of Myron:—he first obtained reputation by a brazen heifer, much celebrated by the poets, which gives Pliny occasion to reflect that men derive more good from the wit of others than from their own. He made also a dog; a quoit-thrower; Perseus killing Medusa; and, as Böttiger explains *pristæ*, sea-monsters; also a satyr admiring a flute; Minerva; Delphic pentathletes; pancratiasts; a Hercules which was in the temple of Pompeius in the Circus Maximus; and also a statue of Apollo which Marcus Antonius brought from Ephesus, and Augustus restored to the Ephesians, being warned to do so in a dream.

Myron is said to be the first who represented in sculpture Nature in her multiplicity of forms: he represented man and animal with equal success; he almost, says Petronius (*Satyric.* c. 88), gave the souls of men and animals to brass. He was, says Pliny, more numerous and various than Polycletus, but was not so exact in his proportions: he was curious in all corporeal detail, but paid little regard to expression: whether Pliny means this or not by the words 'ipse tamen corporum tenus curiosus, animi sensum non expressisse,' it is a characteristic which would very probably distinguish a sculptor who was excellent in representing animals, a quality indicating a strong love of the variety of forms. Myron seems to have adhered in the head and face to the earlier type, as rendered sacred by age, for he kept the hair, beard, and features in the formal manner of the earlier artists, which he much more probably did from taste than from any want of perception, as Pliny seems to imply.

From an observation of Pliny's, Winckelmann placed Myron back to the time of Anacreon and Erinna: Pliny supposed that an epigram of Erinna spoke of a monument to a grasshopper and a locust by Myron; this epigram is in the Greek Anthology, and is ascribed to Anyte, but the Myro, not Myron, there spoken of, says Sillig, is a virgin whose charms were sometimes fatal to her rivals. Myron executed many works besides those mentioned by Pliny, though some of them were preserved at Rome. Augustus placed four oxen in the portico of the temple of Apollo on the Palatine Mount, and a statue of Hercules is mentioned by Cicero as one of the works plundered by Verres. A statue of Apollo also, with the name of Myron on the thigh in silver letters, was plundered by Verres from the temple of Æsculapius at Agrigentum, where it had been consecrated by Publius Scipio: Pausanias mentions the Perseus killing Medusa. A great work by Myron was a group in the Heræum at Samos, of Jupiter with Minerva and Hercules, one on each side, of which the figures were colossal: it was removed to Rome by M. Antonius, but the Minerva and Hercules were restored to their place again by Augustus: the Jupiter he placed in the Capitol. A Bacchus is mentioned by Pausanias, which, he says, after his Erectheus, was Myron's best work at Athens. The Athletes by Myron must have been very numerous, as he was particularly distinguished for works of this class; there is mention of several in Pausanias and other antient authors; as Ladas, a celebrated Lacedæmonian runner; two of Lycinus, a Lacedæmonian charioteer, at Olympia; Timanthes of Cleonæ, a pancratiast; Philippus of Pallene, a juvenile pugilist; and one supposed to be Chionis of Lacedæmon, also an Olympic victor, but denied by Pausanias to be Chionis (vi. 13).

All the above works were executed in bronze of Delos; Polycletus used the Ægina bronze. But Myron was also a sculptor in marble, a carver in wood, and an engraver of metals. Pliny mentions a celebrated marble statue of a drunken old woman, at Smyrna, by Myron; and Pausanias describes by him a single-bodied Hecate with one head, in wood, which he saw on the island of Ægina: she was the chief divinity of the Æginetans according to Pausanias (ii. 30).

The most celebrated of all Myron's works was his Cow, lowing, and according to some suckling a calf; there are no less than thirty-six epigrams on this work in the Greek Anthology. No human figure has attracted so much notice, and doubtless much of the admiration this work excited was owing to its novelty. Athens was full of gods and men, but bronze animals were certainly rare, and this Cow may have been the first good work of its class that was set up at Athens: the horses of Phidias were mere bassi-rilievi placed under a colonnade and of a small size, and, however excellent, would have little effect compared with an isolated bronze, perhaps gilded, figure of the natural size, and fixed upon a marble pedestal in the centre of a public place. So according to Cicero it still stood in his time, though it was removed before Pausanias visited Athens, for he did not see it: in the time of Procopius it was in the temple of Peace at Rome. Ausonius wrote the following beautiful epigram on this work:

> Bucula sum, cælo genitoris facta Myronis
> Ærea; nec factam me puto, sed genitam.
> Sic me taurus init; sic proxima bucula mugit;
> Sic vitulus sitiens ubera nostra petit.
> Miraris quod fallo gregem? gregis ipse magister
> Inter pascentes me numerare solet. (*Epig.* 58.)

The same idea is still more happily expressed in an old Greek epigram, incorrectly attributed to Anacreon; the following English version of it is from an old translation of Anacreon printed by Curl, and is adopted by Fawkes:—

> This heifer is not cast, but rolling years
> Hardened the life to what it now appears:
> Myron unjustly would the honour claim,
> But Nature has prevented him in fame.

Sonntag has collected all the numerous epigrams on this work of art. The Discobolus by Myron was one of the most celebrated works of antient art: the original was in bronze, but there are still several antient copies of it in marble, though not one entire: one in the Campidoglio, one in the Vatican, and a third was in the Villa Massimi at Rome; that in the British Museum was found in the villa of Hadrian near Tivoli, in 1791, and passed into the possession of Mr. Townley through the hands of Mr. Jenkins, a well-known dealer in works of art of that time. Some other trunks of antient statues, which have been variously restored, are also said to be marble imitations of this work of Myron. The Townley copy according to some critics has been incorrectly restored, and the head is said not to belong to it. In Lucian's description of the Discobolus of Myron the head is noticed as being turned and looking back, as it does in some other of the reputed copies of this celebrated work. It must be observed however that there is no proof whatever that any of these marbles are copied from the celebrated Discobolus of Myron. The Abbate Fea appears to have been the first to suggest the identity, which occurred to him from the similarity between the Massimi Discobolus found in the Villa Palombara in 1782, and a Discobolus by Myron as described by Lucian and in part by Quintilian. Quintilian (ii. 13) merely alludes to its distorted position and elaborate execution; Lucian (Philopseudes 18.) describes it more in detail: he says—'The Discobolus, in the twisted posture with the hand reversed and one knee bent, as if about to vary his attitude and rise with his throw, his head being turned to τὴν or τὸν δισκοφόρον—the quoit-bearer,' which Fea interprets by 'the hand in which he has the quoit.' These words are however sometimes rendered 'the girl or boy who holds the quoit;' implying that the thrower was not yet in action, having only assumed his position, turned his head back, and extended his hand to receive the quoit from the bearer in attendance, who is implied only by the attitude of the Discobolus, not expressed. The Townley marble is however throwing the quoit, both knees are bent, and the toes of the left foot, on which the figure partly rests, are turned back: the action is perfectly momentary, and he is already giving the impetus to his throw. Barry preferred the forward direction of the head, as in this statue, to the turn spoken of by Lucian and seen in other statues of this subject, as much more consistent with the necessary impetus of the throw: he says—'The position of the head, hanging down in the same direction as the body, is very remarkable in Mr. Townley's figure, as it is a deviation from the original of Myron, as described by Lucian, and consequently from the Massimi copy, which corresponds perfectly with that description. In all other respects these figures agree, and this deviation appears to have been not unwisely made, as in this way all ambiguity in the intention of the figure, by the direction of the eyes (which are not wanting in the action), is ingeniously avoided; and in finishing the action, at least an equal acceleration of impetus is produced by the head shooting upwards and forward, along with the other extremities.'

Myron had a son Lycius who was likewise a sculptor. He is mentioned by Pliny, and Pausanias (i. 23.) says he saw in the Acropolis at Athens a brazen boy holding a laver, by Lycius the son of Myron (Kühn and Amasaeus read Λυκίου instead of Λυκίου in this passage): Pliny calls Lycius the pupil of Myron.

(Pliny, *Hist. Nat.* xxxiv. 8. 19; xxxvi. 5. 4; Junius, *Catalogus Artificum;* Sillig, *Catalogus Artificum;* Sonntag, *Unterhaltungen für Freunde der alten Literatur*, &c., i. 100-119; Winckelmann, *Werke*, vol. vi.; Böttiger, *Allgemeine Ueber-*

sichten und Geschichte der Plastik bei den Griechen, in his *Andeutungen zu Vorträgen über die Archaeologie;* Göthe, *Propyläen;* Barry, *Works*, vol. i. See also *Specimens of Antient Sculpture, published by the Society of Dilettanti*, vol. i., and vol. i. of *The Townley Gallery* of the Society for the Diffusion of Useful Knowledge, in both of which the Discobolus is engraved.)

MYRRHIS, a genus of plants belonging to the natural order Umhelliferæ, and to the tribe Scandicineæ. It has an obsolete calyx; obcordate petals, with an inflexed point; the fruit not beaked; the carpel covered with a double membrane; the outer membrane with elevated keeled ridges hollow within, the inner one close to the seed; no vittæ. The species have leaves three times decomposed, the leaflets pinnatifid; the involucrum wanting; the involucels of many lanceolate ciliated leaves, the central flowers of the umbel staminiferous; the petals white.

M. odorata, Sweet Cicely, or Great Chervil, has the leaves downy beneath, the leaflets of the partial involucres lanceolate acuminate. This plant has a stem 2 or 3 feet high, round, leafy, and hollow. It is a native of Middle and South Europe and Asia, from Spain to Asia Minor, also of Germany, Switzerland, Austria, the South of France, and the North of Italy. In Great Britain it is found in pastures and hilly districts. This plant was formerly much used in medicine. It yields a volatile oil, which has a pleasant odour. The young leaves and seeds were used in salads, and the roots were boiled or eaten cold, or in tarts or in a variety of sauces. In Germany the seeds were added to soups, and in the North of England they are employed for polishing and perfuming old oak floors and furniture. *M. sulcatum* has hoary leaves, and is a native of Spain. Both species may be grown in any common garden soil, and propagated by seeds or division of the roots.

(Babington, *Manual of British Botany;* Burnett, *Outlines of Botany.*)

MYRTUS (Greek, μύρτος), a genus of plants, the type of the natural order Myrtaceæ. It has the calyx-tube somewhat globose, with the limb 5- or very rarely 4-partite; the petals 5, or very rarely 4; the stamens distinct; the berry 2- or 3-celled, somewhat globose, crowned with the segments of the calyx; several seeds in each cell, or very rarely solitary; uniform, with a bony testa; the embryo curved, cotyledons semicylindrical, very short, the radicle twice the length of the cotyledons. The species are shrubs with opposite quite entire pellucid-dotted leaves; peduncles axillary 1- or rarely 3-flowered.

M. communis, Common Myrtle, has solitary 1-flowered pedicels about the length of the leaves, bearing 2 linear bracteoles under the flowers; the calyx 5-cleft; the leaves ovate, lanceolate, or acute. This beautiful plant is a native of the south of Europe; it is found wild in France about Marseilles, and extends from that city along the sea-coast to Genoa, and throughout Italy. In these districts it forms thickets which sometimes grow within reach of the spray of the sea. This plant has been in all ages a great favourite in Europe. It was called by the Greeks μύρτος. Μυρσίνη is the name under which Hippocrates refers to this plant (*Morb. Mul.* i. 599). Theophrastus also uses this word and μυρρίνη and μυρρίς, in speaking of the myrtle. The Romans knew this plant by the name of 'Myrtus' (Plin. 12-13). This name has been adopted in most European languages: it is *Myrto* in Italian and Spanish; *Murte* in German; *Myrter* in Danish; *Myrten* in Swedish; *Mirte* in French; *Murta* in Portuguese.

The leaves of the myrtle, like the whole order, contain a volatile oil which possesses medicinal properties, and they were used as stimulants by the antients. The buds and berries of this plant also contain volatile oil, and were used by the antients as a spice, and are at this day, in Tuscany, employed as a substitute for pepper. The Tuscans also prepare a kind of wine from the myrtle called myrtidanum. The berries are used at the present day in Greece as a remedy in the diarrhœa of little children. The mode of administering them is to soak them in red wine. The flowers of the myrtle have an agreeable scent, and when distilled they form the perfume sold in France under the name of 'Eau d'Ange.' In addition to a volatile oil the myrtle contains tannin, so that in medicine its various parts have an astringent action, and have been used for this purpose. In Greece, Italy, and the South of France, the bark is used for tanning.

The myrtle is a half-hardy plant in this climate, although many individuals have lived and borne our winters for above a hundred years. The myrtle appears to have been introduced into England in the sixteenth century. There are at the present time many fine myrtle-trees in Great Britain and Ireland. At Cobham Hall, in Kent, there are several specimens 30 feet high. In the Isle of Wight it forms the hedges of many gardens. It cannot however be relied on, but may be easily cultivated by protection during the winter. Several varieties of the Myrtus communis are found in gardens, of which the following, from Don's 'Gardener's Dictionary,' may be regarded as the principal.

M. melanocarpa (D. C. Prod. iii. p. 239), fruit blackish. This variety of myrtle is frequent in the south of Europe and in gardens, where there are varieties of it with double flowers and variegated leaves.

Var. α. *Romana* (Mill. p. t. 184. p. 1), leaves ovate; pedicles longer. The common broad-leaved or Roman myrtle. It is sometimes called flowering myrtle, because it flowers more freely in England than any other variety.

Var. β. *Tarentina* (Mill. Dict.), leaves ovate; berries rounder. The box-leaved myrtle. Flowers small, and open late in the autumn. Leaves small.

Var. γ. *Italica* (Mill. Dict.), leaves ovate-lanceolate, acute; branches more erect. The Italian or upright myrtle.

Var. δ. *Bœtica* (Mill. Dict.), leaves lanceolate, acuminated. The orange-leaved myrtle.

Var. ε. *Lusitanica* (Lin. Op.), leaves lanceolate ovate, acute. (*M. acuta*, Mill. Dict.) The Portugal myrtle. The nutmeg myrtle appears to be only a variety of this.

Var. η. *Belgica* (Mill. Dict.), leaves lanceolate acuminated. The broad-leaved Dutch myrtle. Leaves crowded; dark green. The double flowering myrtle appears to be of this variety.

Var. θ. *mucronata* (Lin.Op.), leaves linear, lanceolate, acuminate. *M. minima* (Mill.), rosemary or thyme-leaved myrtle.

M. leucocarpa (D. C. Prod. iii. p. 239). Fruit white. Native of Greece and the Balearic Isles. The fruit of this is rather large, edible, with a grateful taste and smell.

The above varieties are constant; but there are others in the garden which are more variable. It will suffice to give the names of a few of these.

1. Gold-striped broad-leaved myrtle.
2. Broad-leaved Jew's myrtle. This variety frequently has its leaves in threes, on which account it is said to be in esteem among the Jews in their religious ceremonies.
3. Gold-striped leaved orange-myrtle.
4. Silver-striped Italian myrtle.
5. Striped box-leaved myrtle.
6. Silver-striped rosemary-leaved myrtle.
7. Silver-striped nutmeg myrtle.
8. Cockscomb, or bird's nest myrtle.
9. Spotted-leaved myrtle.

About forty other species of myrtle besides those of the old genus myrtus now referred to the genera Myrcia, Syzygium, Eugenia, &c., have been described. None of them yield products used in arts or medicine, and only a few of them have been cultivated.

M. tomentosa is a native of Cochin China. It is a handsome shrub, and has been found to grow well against walls in the south of England.

M. nummularia is a creeping species found at the Straits of Magellan; and *M. myrsinoides*, a native of the colder parts of Peru, would probably be found to be half-hardy in this climate.

The species of the genus Myrtus grow well in sandy loam and peat; and cuttings readily strike root either in sand or mould.

(Don, *Gardener's Dictionary;* Loudon, *Arboretum Brit.;* Fraas, *Synopsis Floræ Classicæ;* Burnett, *Outlines of Botany;* Lindley, *Flora Medica.*)

MYTENS, DANIEL, a native of the Hague, where he was born about 1590, was the best portrait-painter in England during the reign of James I., and previous to the arrival of Vandyck, to whom he was little inferior. He was in England in the time of Van Somer, but he did not attain to great celebrity until he was appointed one of his court painters by Charles I. in 1625, with a salary of 20*l.* per annum, and in the following year he received in addition 125*l.* for pictures painted for the king. Mytens now executed many portraits of royal and distinguished personages, some of which are at Hampton Court; and he was in great favour until about 1632, when he was so much disconcerted at the favour shown by the king to Vandyck, that he solicited Charles for leave to retire to his own country, but the king, learning the cause of his dissatisfaction, entreated him to remain, and told him that he should have work enough both for him and Vandyck. Mytens remained, but apparently for a short time only, as none of his works in England bear a date subsequent to the arrival of Vandyck. The two rivals however parted apparently on good terms, for Vandyck painted the portrait of Mytens, and it is engraved in the collection of Vandyck's portraits, by Pontius. Mytens returned to the Hague, and was still living there in 1656, when he painted a portion of the ceiling of the town-house of that place. His style was bold, firm, and natural, his colouring mellow and harmonious, and his pictures are frequently enriched by warm landscape backgrounds. There are many of his portraits at Hampton Court, of which the full-length of James, first Marquis of Hamilton, is an excellent picture: there are here also Prince Rupert when a boy, and the dwarf Sir Jeffrey Hudson, who, when seven years old, was served up in a pie at Burleigh, at an entertainment given by the Duke of Buckingham to Charles I. and Henrietta, and was presented by the duchess to the queen, who kept him as her dwarf. Hudson was then only eighteen inches high; he grew, after he was thirty, to the height of three feet nine inches. Mytens introduced this dwarf in a large portrait of Charles and his queen, which was in the possession of the Earl of Dunmore. Sir Jeffrey died a prisoner in the Gate-house, Westminster, in 1682, aged sixty-three: he was imprisoned upon suspicion of being concerned in the Popish Plot.

(Walpole, *Anecdotes of Painting*, &c.)

MYXI'NE, a genus of cartilaginous fishes, of the order *Cyclostomi*. It is synonymous with the *Gastrobranchus* of Bloch. The *Myxine glutinosa*, or glutinous Hag, is the type. This curious animal is shaped like an eel, and measures when full grown about one foot and a half. The head is scarcely distinguishable from the body, and is obliquely truncated in front, terminating in a large round mouth, the frame work of which is a membranous maxillary ring, furnished above with a single tooth. The tongue is furnished on each end with two rows of strong teeth. Eight filaments surround the mouth. In the middle of its superior margin there is a single round spiracle. It has no eyes. The branchial openings are two, and are estimated at about one-fourth the length of the body, below the mesial line. The skin is naked, and very slimy. Along each side of the belly there is a row of pores, which furnish the mucous secretion. An obscure fin runs along the hinder portion of the back, is continued round the compressed tail, and beneath the anal opening, which is placed near the tail. It is of a dark bluish brown colour above, and whitish beneath. The *Myxine glutinosa* is not uncommon in the Scandinavian seas, and is frequently taken off the north-east coast of Britain. It enters the mouths of fishes caught in the lines of the fishermen, and eats up all the fleshy parts of their bodies, leaving only the skin and bones.

The very anomalous characters of this fish have at different times caused naturalists to place it in more classes than one. Thus Linnæus classed it among *Vermes*; Modeer, among *Amphibia*; and O. F. Muller among *Mollusca*. That it is a true fish, though very low down in the series, has now been placed beyond doubt. It has furnished the subject of many elaborate essays. The most valuable is the celebrated memoir on the Anatomy of Myxinoideæ, by Professor John Müller, published in the Transactions of the Berlin Academy for 1834, illustrated by admirable anatomical drawings.

In that memoir the author proposes the following arrangement of the cartilaginous fishes, in which the exact position of *Myxine* and its allies in the series is well shown

CHONDROPTERYGIA.

Skeleton cartilaginous, cranium without sutures.

1st Order, BRANCHIOSTEGA.

1st Family, *Cataphracta*. Cartilage of the cranium, and skin of the trunk covered at intervals with cartilaginous tubercles.

Sturiones. Genus 1. *Sturio*.

2nd Family, *Nuda*. Body without tubercles.

Spatulariae. Genus 2. *Spatularia*.

2nd Order, HOLOCEPHALA.

Genus 1. *Chimaera*.

Genus 2. *Callorhyncus*.

3rd Order, PLAGIOSTOMATA.

1st Family, *Squali*. The bronchial apertures not attached to the head.

Genus 1. *Squalus*.

Subgenera.

Scyllium.	*Notidanus*.
Carcharias.	*Selache*.
Lamna.	*Cestracion*.
Galeus.	*Spinax*.
Mustelus.	*Centrina*.
Scymnus.	

Genus 2. *Zygaena*.

Genus 3. *Squatina*.

Genus 4. *Pristis*.

2nd Family, *Raiae*. The bronchial apertures attached to the head.

Genus 1. *Rhinobatus*.

Genus 2. *Torpedo*.

Genus 3. *Raia*. (Subgenera *Raia*, *Trygon*, and *Anacanthus*.)

Genus 4. *Propterygia*.

Genus 5. *Myliobates*, (subgenera, *Myliobates* and *Rhinoptera*).

Genus 6. *Cephaloptera*.

4th Order, CYCLOSTOMATA.

1st Family, *Hyperoartia*, palate imperforate.

Genus 1. *Petromyzon*.

Genus 2. *Ammocaetis*.

2nd Family, *Hyperotreta*, with the palate perforate. *Myxinoidea*.

Genus 1. *Myxine*.

(Müller enumerates only one species, the *Myxine glutinosa* of the northern seas. A representative species has since been made known from the Antarctic seas.)

Genus 2. *Bdellostoma*. (The fishes of this genus differ from the *Myxine* in having eyes, and more than one bronchial spiracle.)

(Müller enumerates four species as certain, viz.: *B. hexatrema* and *B. heterotrema* from the Cape of Good Hope; *Heptatrema* from the South Seas, and *Forsteri* from New Zealand. *B. Dombeyi* is regarded as doubtful.)

INDEX TO THE LETTER M.

VOLUME II.

N.

NAGPOOR, a district formerly included in the province of Berar, in Hindustan, but now in the adjoining province of Gundwana, of which the city of Nagpoor is the capital. Ellichpoor is the capital of Berar. The palace and seat of government of the raja of Berar is at Nagpoor, and hence he is as frequently styled the raja of Nagpoor as the raja of Berar. The state of Berar, or Nagpoor, is one of those over which the British authorities hold full political sway, with right of interference in case of mismanagement of the public revenue; and they have a political agent resident at Nagpoor. The British government is bound by treaty to protect the raja of Nagpoor, and he is bound to pay the British an annual subsidy of 80,000*l.*, to maintain five regiments of infantry and four regiments of cavalry, and a contingent force of 1000 cavalry to co-operate with the British in case of war. The area of the state is about 64,000 square miles, the population about 2,500,000, and the estimated revenue 350,000*l.* That portion of Berar which lies to the west of the river Wurdah is included in the territory of the Nizam of Hydrabad; and the title of raja of Nagpoor is consequently now perhaps a more appropriate title than raja of Berar, a large portion of the territory of Berar having been transferred to the Nizam after the termination of the Mahratta war.

(Hamilton's *East India Gazetteer;* Malcolm's *Central India;* Appendix to *Report on East India Produce.*)

NAIL. The use of nails being illustrated under JOINERY, P. C. S., p. 121, it will be sufficient here to notice the various modes by which they are manufactured.

Until a comparatively recent period almost every kind of nail was produced by hand-labour: each nail, however minute, was separately forged from a thin rod of iron, a process which is still followed in the production of what are technically known as *wrought* nails; and as nails so formed possess certain advantages, for particular kinds of work, over those formed either by casting, or by cutting or stamping out of rolled sheet metal, there is no reason to anticipate the total abandonment of this process, notwithstanding the continual improvement of nail-making machinery.

The making of wrought nails, which retains, in most places, the character of a domestic manufacture, forms the employment of a peculiar class of blacksmiths called nailors, who are very frequently assisted by the female members of their families. The nailor receives his iron in the form of narrow square rods, of various sizes, according to the kind of nail to be forged from them. Putting the ends of three or four such rods into the forge-fire at once, the nailor commences his work by withdrawing one when it is properly heated, and forging its end upon a small but very firmly bedded steel anvil to a tapering point. The pointed end is then cut off to the proper length, which is adjusted by a gauge, by laying it across a fixed chisel or *hack-iron,* and giving it a smart blow with the hammer. In some cases, as in making the kind of nail used for fixing horseshoes, this operation completes the nail; but in most cases a subsequent process is necessary to form the head. For this purpose the red-hot spike just cut off from the nail-rod is taken up and dropped, point downwards, into one of the holes of an instrument called a *bore,* which is a piece of iron, ten or twelve inches long, with a perforated knob of steel at each end. The holes of this instrument are made to fit the upper or thicker part of tho nail, and so countersunk at their upper ends as to form a kind of mould for the head of the nail. When dropped into one of these holes, a few well-directed strokes of the hammer upon the thick projecting end of tho spike or nail converts it into a head of any required shape. In making small nails it is sometimes practicable to forge and cut off two lengths from the nail-rod with one heating; but where this is not the case the nailor is enabled to proceed with his work without interruption by the convenient plan of having several rods in the fire at once, so that as soon as one is cool another is ready to his hand. In many cases, for tho sake of economy, two or three nailors work at one hearth, using the same fire and the same bellows in turn; and Holland, who, in his treatise on 'Manufactures in Metal,' in Lardner's 'Cabinet Cyclopædia,' vol. i. pp. 192-218, gives much curious information on the nail manufacture, describes a very simple, cheap, and convenient circular forge, patented in 1824 by Mr. Spencer, of Belper, around which five or six persons may work at the same time, and which possesses the further advantages of allowing the use of pure wood charcoal, by which the quality of the iron heated in it is improved, of having no back, and of having a grating to keep the fire clean, and to prevent the accumulation of clinkers. Though adapted also for some other purposes, this forge is especially intended for the use of nailors. The hammer used by nailors is larger or smaller, according to the size of the nails to be formed, and its usual form, according to Holland's description, is 'the frustum of a cone, the smaller end being the base, which, instead of forming a horizontal plane, as in the case of an ordinary round hammer, is inclined or sloped considerably towards the handle.' 'The degree of this obliquity, the weight of the hammer head, the size and shape of the handle,' &c., he adds, 'are matters of nice consideration, one nailor being rarely able to work comfortably with another man's hammer;' and hence, he observes, 'as they are somewhat given to tramping from place to place, each workman generally carries with him a favourite hammer, which, like the fabled mallet of Thor, is both the symbol and the agent of the owner's power.' Of the astonishing dexterity of some of this class of operatives Holland quotes a remarkable illustration from the 'Mechanics' Magazine' for 1828, in the case of a nailor who undertook and accomplished the task of making, in each of two successive weeks, seventeen thousand (1200 to a thousand of 20 lbs.) of double flooring nails; in performing which task, as each nail required about twenty-five strokes of the hammer, which weighs about two pounds, he made, including the cutting up of the nail-rods into convenient lengths, and re-uniting them when they became too short, no less than 1,033,656 strokes, and moved to and from the fire at which the rods were heated 42,836 times. This task is, Holland states, allowed to have been as much as three ordinary men could perform without difficulty.

For some purposes nails formed by the much cheaper process of casting have been long used instead of those wrought in the manner above described. Common cast nails are, however, so clumsy and so brittle that they can only be used for a few coarse purposes, as in plasterer's work, and in the nailing up of fruit-trees. By the introduction of great improvements in the manufacture, however, a very useful kind of cast nail, of an exceedingly pure material called malleable cast iron, has been successfully introduced for certain descriptions of woodwork. Nails of this kind are very neat and regular in their appearance, being cast with great accuracy; and they are annealed to such perfection that the metal will bear far more bending than ordinary wrought-iron without injury. This extraordinary degree of tenacity is, however, obtained at the expense of rigidity, such nails being often nearly as soft as copper, and therefore quite unsuitable for use in hard woods.

The comparatively high price of wrought nails, owing to the great amount of manual labour required in making them, and the insufficiency of cast nails as a substitute for them, has led to the introduction of many highly ingenious machines for forming nails by cutting, stamping, or compression, out of plates or rods of rolled-iron, and with such success that, for the ordinary purposes of the carpenter and joiner, cut-nails, varying in size from the smallest tack or brad up to spikes of six inches or more in length, have almost superseded those wrought by hand. According to Barlow's 'Treatise on Machinery and Manufactures,' in the 'Encyclopædia Metropolitana,' the earliest machine for nail-making was that contrived by Mr. French, of Wimborne, Staffordshire, in 1790, in which no material departure was made from the ordinary process of making nails by the hammer, but labour was saved by working hammers by water-power, so that women and children might perform work which would otherwise have required men. Barlow describes several contrivances of later date, in which the various processes of rolling, pressing, stamping and cutting are introduced; but for the details of such machinery we must refer to his work, that of Holland, above quoted, Dr. Ure's 'Dictionary of Arts,' and Hebert's 'Engineer's and Mechanic's Encyclopædia.' Dr. Ure attributes the invention of cut nails to the citizens of the United States, observing that, according to a report by the secretary of the state of Massachusetts, so long since as the year 1810 they possessed a machine which performed the cutting and heading at one operation, with sufficient rapidity to turn out more than 100 nails per minute. In the process now most commonly followed nails are cut from sheet-iron of suitable thickness, which is first reduced, by cutting transversely, into strips or ribands of a breadth equal to the intended length of the nails. These strips are then applied to a machine in which a chisel-shaped cutter descends with sufficient force to cut off from the end of the strip, at each downward stroke, a narrow piece sufficient to form one nail. As the nails are required to be of a tapering form, the cutter must be so fixed as to form a slightly oblique angle to the direction in which the strip is pushed into the machine, and this obliquity must be reversed or varied between each stroke, by means similar to those adopted in comb-cutting machinery. [COMB, P. C. S., p. 398.] If the nails are to be of any of the kinds to which the term *nail* is specifically applied, as distinguished from *brad*, the action of the cutter is simply reversed, so as to reduce the strip of iron into long wedge-shaped pieces, and the pieces thus separated are subsequently headed by pressure or stamping, so as to form finished nails; but if the nails are to be of the *brad* kind, the action of the cutters must be so modified as to produce cuts alternately at right and oblique angles with the edges of the strip. Nails of this kind need no subsequent heading, but are completed by the action of the cutter. The accuracy with which this operation is performed may be seen by laying together side by side, heads and points alternately, a number of cut nails or brads, when it will be found that they range exactly, so as to compose a regular strip. In some machines the cutters do not vibrate or vary their position, but the strip of iron is turned between each cut, so as to produce the same effect. Brads are frequently cut out of hoop-iron instead of transverse strips of sheet-iron, as above described; but the practice is much to be deprecated, although the brads so formed have a rather neater appearance than others; for it is evident that as, in the operation of rolling, the fibres of the iron are laid longitudinally in the strip, they must lie across instead of along the nails cut transversely from it, thereby rendering them very weak and brittle. The advantage derived from the superior squareness of cut nails, as compared with wrought, is alluded to under JOINERY, p. 121; and another peculiarity of considerable importance is that, as such nails are usually tapered in one direction only, their points are somewhat chisel-shaped, and, though sharp, as broad as the body of the nail. If, therefore, such a nail be placed with its chisel-shaped point across the grain of a piece of soft wood, it may be driven in without boring, and without the risk of splitting, which would arise if the nail were, as most wrought-nails are, tapered on every side.

In some of the coarser operations of carpentry nails are secured by *clenching*, or bending down their points with the hammer, after they have been driven completely through what they are intended to hold together. Hebert notices a very neat and secure substitute for this rather clumsy expedient, which consists in placing on the projecting end of the nail a little perforated plate of iron called a *rove*, resembling a very small nut, and then clenching or riveting the end of the nail down upon it. He states that this mode of fastening appears, though without reason, to be almost entirely confined to boat-building.

Nails of iron with ornamental brass heads are much used for hanging pictures upon, and for other purposes in which the heads of ordinary nails would be unsightly; and nails wholly formed of brass, copper, or metallic alloys, are used in ship-building, and for a few other purposes. For the mode of coating small iron nails or tacks with tin, for use in cases where rusting would be injurious, see TINNING, P. C., p. 482.

NAKHITCHEVAN. [EKATERINOSLAF, P. C.]

NANTEUIL, ROBERT, a celebrated French engraver and draftsman, was born at Rheims, in 1630, and was the pupil of his brother-in-law, N. Regnesson. He engraved chiefly portraits, in which class he is one of the most distinguished engravers, though he generally engraved the head only, without accessories; but he frequently executed them of the size of life. He also took portraits from the life in pastel in a very able manner; but as he used these chiefly to engrave from, few of them have been preserved. He engraved in line and in stipple, and generally combined both styles, stippling the middle tints; and he contrived to express colour to a considerable degree in his prints. Nanteuil died in 1678, and though he lived to the age of forty-eight only, he has engraved nearly 300 plates, almost exclusively portraits, and comprising many of the princes of Europe, and most of the celebrated men of France during the reign of Louis XIV., of whom alone he engraved nineteen portraits, all in different periods of his life. His master-pieces are J. B. van Steenberghen, after Duchatel, known as l'advocat de Hollande, 1668; M. de Pomponne, after Le Brun; F. M. la Mothe le Vayer, 1661; and Marshal Turenne, besides some others.

(Watelet et Levesque, *Dictionnaire des Arts*, &c.; Huber, *Manuel des Amateurs*, &c.)

NARDOSTACHYS, a genus of plants belonging to the natural order Valerianaceæ. The limb of the calyx is 5-parted; the lobes ovate, oblong, acute, leafy, somewhat toothed and permanent. The corolla is regular, ecalcarate, obtusely 5-lobed and bearded in the throat. There are four stamens, which are attached to the bottom of the corolla. The species are herbs with sweet-scented perennial roots, which are beset with erect fibres at the neck.

N. Jatamansi is a dwarf herbaceous plant with a long hairy tap-root. The stems are perennial, very short, and simply divided into a number of shaggy, scaly crowns, from which the leaves are produced. The branches erect, downy, and a few inches high. Leaves obovate, lanceolate, 5-ribbed, downy; those at the base acute, the upper ones obtuse. The flowers are of a pale pink colour, clustered in the axils of the upper leaves, which form a kind of involucre for them. It is native of Nepaul, on the Himalaya mountains, and in Delhi, Bengal, and Deccan. This species is the true Spikenard of the antients, and is esteemed not only as a perfume, but as a stimulant medicine. Oriental writers give it as a remedy for a multitude of diseases, and it seems to be really valuable in cases of epilepsy and hysteria.

N. grandiflora has a glabrous stem, oblong glabrous leaves, with solitary terminal flowers. The capsule is downy, and the lobes of the calyx evidently denticulated. It is native of Nepaul and Kumaon.

These plants should be grown in pots, in a mixture of loam, peat, and sand, and placed among other Alpine plants. They may be propagated by dividing at the root, or by seed.

(Don, *Gardener's Dictionary*; Lindley, *Flora Medica*.)

NARTHECIUM, a genus of plants belonging to the natural order Juncaceæ. The perianth is partly coloured, of 6-lineal lanceolate persistent leaves. The filaments are woolly, and the style undivided. It has a simple obtuse stigma. The capsules pyramidal, 3-celled and 3-valved. The placenta extends only a short distance up the inner edge of the dissepiment. The seeds have a long filiform appendage at each end.

N. ossifragum, the only British species, has lineal sword-shaped leaves, pedicels with one bract at the base, and another above their middle. The perianth longer than the stamens, and considerably shorter than the capsules. The flowers are bright yellow. This species is distinguished especially by its seeds. It is found in turfy bogs.

(Babington, *Manual of British Botany*.)

NASIREANS. [NAZARENES, P. C.]

NASMITH, DAVID, was born in Glasgow, on the 21st of March, 1799, of respectable parents, who educated him with a view to his entering upon a course of college study at the University of that city. Finding, however, that he was averse to the study of the learned languages, this intention was abandoned, and he was early placed in a mercantile establishment. In 1813 he commenced the efforts by which he subsequently became so eminently distinguished, by taking an active part in the formation of a Youths' Bible Association at Glasgow, of which he became secretary; and at the age of sixteen he made a public profession of religion by joining the church in Nile-Street, under the pastoral charge of the late Rev. Greville Ewing. He shortly afterwards made great exertions to prepare himself for the Christian ministry; but as his friends did not encourage the attempt, he returned to secular employment, but engaged with great zeal in Sunday-school teaching, in the establishment of adult-schools, the religious instruction of prisoners, and other philanthropic efforts. In the autumn of 1821 an event occurred which, by affording enlarged scope for his benevolent desires for the religious and temporal welfare of his fellow-men, led to the fuller development of a character which, for disinterested devotedness, has been rarely equalled. 'The conductors of the various religious and benevolent societies in Glasgow,' observes Nasmith's biographer, 'with a view to concentration, economy, and efficiency, had procured a large and commodious edifice, which was divided into rooms and offices, suitable to their respective objects;' and the completion of their plan required the services of an active secretary, who should be common to them all. In answer to an advertisement for such an officer, Nasmith offered himself, and was elected at the low salary, for the first year, of sixty pounds, though the interests of twenty-three societies thus dovolved upon him. In this office he was brought into frequent communication with committees composed of ministers and laymen of all sects and parties, in religion and politics, and bo gained the personal esteem of many of the most eminent men of Glasgow; and the remarkable course of mental training thus afforded had the effect of fitting him for the singular career he was subsequently to pursue. To it his biographer attributes 'the free, easy, and noble air' by which he was distinguished in after life, and to which he appears to have been largely indebted for his influence over men who were strangers to his person, and who, in many cases, were inclined to regard his projects with prejudice and distrust. 'Even on the first interview,' observes Dr. Campbell in the 'Memoirs' upon which this article is chiefly based, 'no stranger could escape the impression that he was a man of extraordinary integrity and sagacity, piety and benevolence.' 'Mr. Nasmith,' observes Mr. Asthury, 'was a man of consummate ability and tact in the formation of societies.' 'It was,' he remarks, 'his great talent;' and it was manifested in his power of 'directing a committee without assumption on his own part, patiently attending to the various opinions of members of provisional committees in the discussion of rules, &c., and gently intimating his own judgment, which, being founded on great experience, was generally adopted.' In this office he also, to return to Dr. Campbell's account, 'obtained a very deep insight into the true condition of city society, and thus discovered its wants; he saw directly before him the amount and character of the agency provided for the supply of those wants; and hence he ascertained how much of those wants remained still unsupplied.'

While faithfully discharging his onerous duties in connection with the existing philanthropic societies of Glasgow, Nasmith applied himself also to the formation of such new associations as appeared needful for the moral and religious welfare of that and other populous places. Young Men's Societies, or associations for promoting the religious interests of young men, for protecting them from the temptations incident to a residence in large towns, and for directing their united energies into channels of benevolent exertion, occupied then, as in his later years, a large share of his attention; and in a letter upon the subject addressed by him to Professor Buchanan in February, 1826, he states that he had been the means of forming about seventy such societies, in the United Kingdom, France, and America, since the close of the year 1823. A still more important project, and one which has proved far more extensively successful in practice, was the formation of city and town missions, or societies for carrying religious instruction, by means of lay agents wholly devoted to the work, into the homes of the neglected poor, and even into the very haunts of vice and dissipation. Attempts had been previously made in a few instances, and on a small scale, to accomplish this object; but the difficulties of the task, especially those arising from the mutual jealousies of various sections of the Christian Church, had impeded their success. In spite of such difficulties, Nasmith succeeded in establishing, at the commencement of 1826, the 'Glasgow City Mission,' which, though commenced by the congregation to which he belonged, was constituted on so catholic a footing that, before the end of its first year, eight evangelical denominations of Christians were united in its management, and eight missionaries were employed. The success of this society encouraged Nasmith to print and circulate widely, not only in the British Islands and America, but also in France and other parts of the continent of Europe, a brief account of its design, with testimonials of its usefulness. In the same year Nasmith married Miss Hartridge, a native of Kent, who was then residing in Glasgow, and who became a most valuable coadjutor in his benevolent designs. In 1828, his health being impaired by the arduous duties of his office, Nasmith resigned his connection with the Institution House at Glasgow, and from that time until his death he devoted himself wholly to the exercise of what he deemed his peculiar vocation, that of a kind of moral agent or missionary, travelling from place to place to promote the establishment of city and town missions, young men's societies, and other kindred associations. The self-denial and moral courage necessary for such an undertaking was of no ordinary character, since it involved the relinquishment of any settled means of obtaining a livelihood, and of all prospect of attaining a station to which his talents entitled him; while he had no property on which to rely even for travelling expenses, nor any society on which to fall back for support. His first removal was to Dublin, where he succeeded in establishing a prosperous city mission. Having subsequently visited London, and his wife's family in Kent, he returned to Glasgow, and thence again to Dublin, where he formed a society for promoting the establishment of local missions in Ireland, and whence, in 1829, he proceeded on a tour through the south of Ireland, establishing missions in Cork, Limerick, Waterford, and several other places. In the following year he performed a similar journey, with the like results, in the north of Ireland, after which he returned to Glasgow, and prepared for a voyage to the United States on the same benevolent errand. Arriving at New York in September, 1830, he formed a city mission there, and performed a journey of about three months' duration, visiting and establishing similar societies at many towns in the United States, after which he returned to New York, sailed to New Orleans, made some stay in Philadelphia, and afterwards, pausing for a third time at New York, proceeded to Canada. How completely disinterested Nasmith was in these travels may be seen from the fact that while his necessary expenses from May, 1828, when he first left his native country for Ireland, to December, 1831, when he returned from America, where he travelled about 3000 miles, amounted to rather more than 671*l.*, a sum wonderfully moderate when it is considered what he accomplished during the three years and seven months over which the expenditure was spread, the sums received by him from friends who took an interest in his efforts amounted only to 439*l.*, leaving a deficiency of 232*l.* to be provided from his own very scanty resources. Pecuniary difficulties, however, could not repress his ardour, and it was not long before he visited Paris and established a city mission there, and set on foot a similar institution at Hâvre. He subsequently resided for some time in Glasgow, and in March, 1835, fulfilled a long-cherished intention of removing his residence to London, for tho purpose of establishing a city mission. 'His enterprise,' observes Dr. Campbell, 'to all but himself, seemed hopeless, if not preposterous.' Many of the best friends of the object at which he aimed deemed it utterly hopeless to effect that object by the union or co-operation of different sects, and especially by the joint efforts of churchmen and dissenters. Nasmith, who was of too catholic a spirit to care to what section of the Christian Church his fellow-labourers belonged, so that they were real Christians and united in the desire to impart the highest benefits to their fellow-men, and who, indeed, in answer to inquiries respecting himself, would say 'I am a Catholic Christian,' neither suffered objections or difficulties or impediments to deter him from his aim, nor to induce him to lessen its moral grandeur by identifying it with sect or party. The London City Mission was therefore commenced in conformity with the design of its founder, but without the active support of many influential individuals, who shortly afterwards, finding their fears groundless, heartily united to carry it on. Operations were commenced with only four missionaries, with salaries amounting in the whole to 297*l.* per annum; but so rapid has been the progress of the institution that in 1845, at the date of the tenth annual report, the number of missionaries employed was 121, and the expenditure in salaries alone for the preceding year had been 7400*l.*, exclusive of all other expenses incident to the mission. In the same year the number of domiciliary visits, and visits to hospitals, asylums, and other places where the poor and ignorant are congregated together, paid by the missionaries, amounted to 544,089, of which 39,469 were to the sick and dying. In a large majority of the latter class of visits the agents of the city mission were the only individuals by whom religious instruction and consolation were carried to the bed-side of the sufferers. The distribution of Bibles and religious tracts, the holding of religious services in neglected neighbourhoods, and various other benevolent operations, are also carried on by the missionaries, and special provision has been made, by the appointment of agents suited to their peculiar necessities, for the spiritual wants of cab-drivers, and of the numerous Lascars, Germans, and other foreigners in the metropolis. By gaining the confidence even of the most wretched and abandoned, the missionaries have obtained access, and often with the best results, to haunts of misery and vice which no other agency has been able to reach. They therefore constitute a kind of moral police, of the efficacy of which the reports of the society and the documents published monthly in the 'London City Mission Magazine' afford abundant proof. One missionary alone, in Clerkenwell, has, according to the report above quoted, succeeded either in marrying or separating no less than 74 couples who had lived, some of them for many years, in a state of illicit cohabitation. The establishment of so noble an institution might have been supposed sufficient to satisfy the desires even of Nasmith; but such was not his feeling. He could not rest without desiring further means of usefulness, and therefore he set on foot several kindred societies, of which perhaps the most important is the 'London Female Mission,' a society which has begun to operate successfully upon the condition of prostitution in the metropolis, both by reclaiming women, and by preserving destitute females from degradation. The 'English Monthly Tract Society' and the 'Adult School Society' also appear on the long list of philanthropic institutions established by him; but that to which he appears to have been most personally devoted in his latter years was a society originally called the 'British and Foreign Mission,' and intended to promote the establishment of city missions and other similar associations. The name was afterwards altered to 'The British and Foreign Town Mission,' but which has latterly, under the modified title of the 'Town Missionary and Scripture Readers Society,' chiefly confined its efforts to the establishment of local missions. In connection with this society Nasmith visited and formed missions at Cambridge, Birmingham, Manchester, Leeds, Bradford, Halifax, Huddersfield, Wakefield, and York; and subsequently visited Scotland for the same purpose. He afterwards travelled in Wales, re-visited Dublin, and made several other tours in various parts of England, of which Dr. Campbell gives full particulars. During these efforts he was supported, but in a very humble and precarious way, by the contributions of a few friends who appreciated his character and services, but he was often reduced to great pecuniary difficulties, the effect of which, coupled with incessant exertion, undermined his health; and at length he was seized at Guildford, whether he had gone with the intention of establishing a Town Mission, with a sudden illness, of which he died on the 17th of November, 1839. His body was brought to London, and interred in the presence of a large assemblage of ministers and others of various denominations, in Bunhill-Fields burying-ground; and a subscription of 2420*l.* was very shortly raised by his friends for the benefit of his surviving widow and children. A very full account of his extraordinary career, accompanied by remarks which tend to throw light upon a character which cannot be correctly judged by ordinary rules, is given in Dr. Campbell's 'Memoirs of David Nasmith; his labours and travels in Great Britain, France, the United States, and Canada,' 8vo., 1844, to which volume a portrait of Nasmith is prefixed, and in which will be found testimonials from many eminent men of various religious sects, respecting the disinterested efforts to which he devoted his life.

NASMYTH, ALEXANDER, a distinguished Scotch landscape painter, was born at Edinburgh, in 1758; he came early to London, where he was the pupil of Allan Ramsay, painter to George III. He studied afterwards several years in Rome, where he studied portrait, history, and landscape. He settled in Edinburgh as a portrait painter, and Robert Burns was among his sitters. Having however a decided taste for landscape painting, he ultimately confined himself to this branch; but much of his time was occupied in teaching, in which he was very successful. He died at Edinburgh, in 1840, aged eighty-two. His landscapes are very numerous; Italy was one of his most favourite themes. His style is picturesque and simple, and though 'some of his competitors may have far excelled him in the heroic grandeur of landscape composition, in that sweetness and beauty which depend upon a skilful selection of subject, combined with a minute and artistlike execution, at once elaborate and simple, no one has surpassed him.'

(*Art-Union Journal*, May, 1840.)

NASMYTH, PETER, son of Alexander Nasmyth, was born in Edinburgh in the year 1786. He showed an early decided predilection for landscape painting, and his zeal in the pursuit of his favourite art left him little opportunity of acquiring other instruction. Early in life he injured his right hand, and learned to use the pencil and brush with his left. At the age of twenty he went to London, and his productions soon became very popular, obtaining for him the designation of the English Hobbima. It cannot be said however that he had much in common with the great Flemish master, excepting the minuteness of his details in landscape scenery. He had not the same firmness of touch as Hobbima, producing his results by an apparent multiplicity of detail. He improved on the style of his father, and his pictures have less of the spotted chalky character, which, from its having been followed by other members of this clever family, is characteristic of what is called 'The Nasmyth School.' Notwithstanding a certain air of feebleness, Peter Nasmyth's landscapes are eminently pleasing. Though he often painted Scottish scenes, and his works are perhaps more admired in his native country than elsewhere, the character of his landscapes is eminently English. His style was not sufficiently massive properly to represent the wild mountain scenery and striking atmospheric peculiarities of Scotland. Light clouds, sunshine, smooth water, or small pattering brooks, meadows, gentle rising ground, and green trees, are the objects which his style was best calculated to represent. He died in lodgings in South Lambeth, London, on the 17th of August, 1831, during a memorable thunder-storm, which—his ruling passion for the contemplation of natural objects 'strong in death'—he was lifted up in his bed to behold. (*The dates and incidents are taken from Memoir in Lit. Gazette*, 1831.)

NASTURTIUM. [TROPÆOLUM, P. C.]

NAU'CLEA, a genus of plants belonging to the natural order Rubiaceæ. It has a calyx with an oblong tube and a short truncate or 5-toothed limb. The corolla is funnel-shaped, with a slender tube, a naked throat, and 5 spreading oval oblong lobes. Tho anthers are inclosed, and always shorter than the lobes of the corolla. The capsules are 2-celled, sessile upon the receptacle, but gradually attenuated to the base. The seeds numerous, imbricate, winged, fixed to oblong placentæ, which are adnate to the dissepiment. The embryo is invested in a fleshy albumen. The leaves are opposite or 3-4 in a whorl, petiolate, or sessile. The bracts wanting at the base of the head of flowers, but with linear paleæ among the flowers, which are crowded and sessile. The species are unarmed trees, rarely shrubs, and natives of India and Africa.

N. Cadamba has brachiate branches, petiolate, coriaceous, ovate leaves, triangular stipules, terminal solitary peduncles, usually shorter than the heads, which are globose. The flowers are orange-coloured, collected into heads about the size of a small apple. The style is white and exserted. The seeds not winged, the leaves from 5 to 10 inches long.

Kudumba is the native name of the tree; it flourishes about Calcutta and Malabar, where it grows to be a very large tree, and is ornamental and very useful from the extensive shade it affords.

N. parvifolia has petiolate obovate obtuse leaves, oval stipules, and terminal solitary peduncles; sometimes the peduncles are in triplets, when the middle one is the shortest. It is native of the East Indies and all the coast of Coromandel, but chiefly in the mountains of the Philippines. The flowers are light yellow, and globular, about the size of a plum. The wood is of a pale chesnut colour, firm, and close-grained; it is useful for purposes where it can be kept dry, but when exposed to wet it soon decays.

N. cordifolia is prized on account of its wood, which is light and durable where it can be kept dry. It answers well for furniture. There are thirty-seven species of this genus enumerated, all of which are natives of the East, but do not possess any peculiar qualities which entitle them to particular notice. They are of easy culture. A mixture of loam, sand, and peat is the best soil for them, and they readily take root under a hand-glass in the same kind of soil.

The Nauclea Gambia of Hunter (*Linnæan Transactions*, vol. ix.) is now Uncaria Gambia. [UNCARIA, P. C.]

(Don, *Gardener's Dictionary*; Lindley, *Flora Medica*.)

NAU'CRATES, a genus of fishes of the mackarel tribe having fusiform bodies, tails heeled at the side, and two free spines before the anal fin. The *Naucrates ductor* is popularly known as the Pilot Fish, and is remarkable for its habit of following vessels often for many hundred miles. Mr. Crouch, in the 14th volume of the 'Linnean Transactions,' has recorded an instance of two individuals of this species which accompanied a ship from the Mediterranean to Falmouth, where they were taken by a net. The *Naucrates ductor* is about a foot in length, and is remarkable for the beauty of its colour, being of a silvery pale blue banded by broad and deep transverse dark blue belts.

NAUCY'DES (Ναυκύδης), a Greek sculptor, who was born at Argos, and was in repute, according to Pliny, about Ol. 95; he was the son of Mothon and the brother and master of the younger Polycletus of Argos, and, says Thiersch, was one of the most important artists between Alcamenes and Praxiteles. Pliny mentions a Mercury, a Discobolus, and a man sacrificing a ram, by him. Pausanias notices six other of his works: a Hebe, in ivory and gold, placed near the celebrated chryselephantine statue of Juno at Mycenae by Polycletus; the rest were in bronze—a Hecate at Argos, and four victors at the Olympic games, one of Eucles at Rhodes, two of Chimon, one of which was at Olympia, the other in the Temple of Peace at Rome, and the fourth of Bacis the wrestler. A tenth work by Naucydes, a bronze statue of Erinna, is mentioned by Tatian. The two statues of Chimon were, according to Pausanias (vi. 9), his best works. He was the master of Alypus of Sicyon. The well-known Discobolus in repose, standing with the quoit in his hand, is sometimes called the Discobolus of Naucydes, but without the slightest foundation.

(Junius, *Catalogus Artificum;* Thiersch, *Ueber die Epochen der Bildenden Kunst unter den Griechen.*)

NAUNTON, SIR ROBERT, a diplomatic statesman, was born in 1563, and was the son of Henry Naunton of Alderston, in Suffolk. He studied at Trinity College, Cambridge. He attended his uncle, William Ashby, when he was sent as ambassador by Queen Elizabeth to Scotland in 1589, and being sometimes trusted with the management of important business connected with the mission, he was thus initiated in diplomatic life. In 1596, he was sent by Essex to France, with letters to Antonio Perez, formerly Spanish secretary, probably with a view of securing the services of that statesman to the English government, or at least of sounding his intentions. Returning home, he was, in the same year, appointed tutor to a young gentleman named Vernon, of whom the Earl of Essex was guardian. He proceeded with his pupil to the Hague, and thence to France, in company with the French ambassador, the Duc de Bouillon; and it is manifest that the object hidden under his appointment, and his journey, was to give Essex the services of so able a man as a spy on the French court. He seems to have been naturally of a candid disposition, which did not easily mould itself into the pliant morality necessary for successfully conducting the flagitious diplomacy of that age. He wrote many complaining letters to his patron. 'The best allowance of credit I can have,' he says in one of them, 'is but in nature of betwixt a pedagogue and a spy; both trades I know not whether more odious or base, as well in their eyes with whom I live as my own.' After the fall of Essex, little seems to be known of him, until 1614, when he reappears as member of Parliament for Helstone, a favourite of King James on account of his scholarship, and one of the persons patronised by Buckingham. He was sworn Secretary of State, on the 8th of January, 1618. Having afterwards opposed the favourite's friend, Gondomar, the Spanish ambassador, he was deprived of office, but he was subsequently appointed Master of the Court of Wards. He died on Good Friday, 1635. His '*Fragmenta Regalia;* memoirs of Elizabeth, her court, and favourites,' was greedily perused in manuscript and frequently copied over, until it was printed in 1641. It has passed through several editions. This little book is remarkable as one of the very few which in that age noticed political events and characters in their relation to the progress of the constitution; a purpose on which the writer brought to bear a sagacious spirit and animated style. (*Memoir prefixed to Fragmenta Regalia*, 1824.)

NEALCES (Νεάλκης), probably of Sicyon, a celebrated Greek painter, contemporary with Aratus of Sicyon, about 213 B.C. Few of his works are mentioned, but he was the most celebrated painter of his time. Pliny mentions a Venus by him, and a battle between the Egyptians and Persians on the Nile. To show the locality of his battle Nealces painted an ass drinking at the side of the river and a crocodile lying in wait for him, an ingenious application of accessories, of which there are also many other examples in the history of Greek painting. Nealces is one of the painters whom tradition represents as having succeeded by accident in painting the foam on a horse's mouth with his sponge.

Aratus, in his zeal against the tyrants, waged war even against pictures, and resolved to destroy all their portraits which were preserved at Sicyon. This he did with one exception; Nealces saved the portrait of Aristratus by Melanthius and Apelles from the common destruction, but only partially. Aristratus was represented standing by a chariot of Victory; Nealces painted out the figure of Aristratus, and substituted a palm-tree in its place. 'The piece was so admirable,' says Plutarch, 'that Aratus could not avoid feeling the art that was displayed in it; but his hatred of tyrants soon overruled that feeling, and he ordered it to be defaced. Nealces the painter, who was honoured with his friendship, is said to have implored him with tears to spare that piece; and when he found him inflexible, said, 'Aratus, continue your war with tyrants, but not with everything that belongs to them. Spare at least the chariot and the Victory, and I shall soon make Aristratus vanish.' Aratus gave his consent, and Nealces defaced the figure of Aristratus, but did not venture to put anything in its place except a palm-tree. We are told however that there was still a dim appearance of the feet of Aristratus at the bottom of the chariot. (Langhorne's Translation.)* Such a dim or faint appearance of the feet here spoken of may have arisen some time after Nealces altered the picture; such accidents frequently happen in painting out, unless a considerable body of colour is used.

Anaxandra, the daughter of Nealces, was likewise distinguished for her paintings; and his colour-grinder, Erigonus, became a painter, and acquired great honour through the celebrity of his pupil Pasias.

(Pliny, *Hist. Nat.*, xxxv. 11, 40; Plutarch, *Aratus*, 13.)

NE'BULÆ. [STAR, P. C., pp. 449, 450.]

NECTANDRA, a genus of plants belonging to the natural order Lauraceæ. It has a 6-parted rotate calyx, deciduous segments, the three outer rather the broadest. There are 9 anthers which are ovate, nearly sessile, with 4 cells, arranged in a curve, and distinct from the tip of the anther, the cells of the interior anthers inverted. The glands are in pairs, globose, sessile at the base of the three interior stamens next their back. The fruit is succulent, more or less immersed in the tube of the calyx, which is changed into a truncated cup. The flowers are panicled or corymbose, axillary lax and pretty ample.

N. cymbarum is a tree nearly 100 feet high, growing in the woods of the Orinoco, near S. Fernando de Atabasso, where it is called Sassafras, and also in the ancient forests of the Rio Negro in Brazil. The branches are smooth, the leaves oblong, lanceolate, papery, and shining above. The cup is large with a double edge. The bark aromatic, bitter, and stomachic. Martius suspects that it is one of the ingredients in the famous Woorary poison of Guiana.

N. Cinnamomoides has oblong leaves tapering into a fine point, acute at the base, between papery and leathery, naked, smooth, and shining above; finely downy beneath, with numerous distinct narrow costal veins. The bark has the smell and flavour of cinnamon, as which it is used in New Granada.

N. Puchury major has oblong or elliptical leaves tapering to a narrow point, smooth, reticulated, and of the same colour on other side. The cup of the fruit is very large and spongy. Martius assigned the Pichurim bean to this plant. In the early months of the year the fruits drop from their cups to the ground, and are collected by the natives, cleaned and dried by a gentle heat. They are prescribed in dysentery, diarrhœa, cardialgia, strangury, &c. The bark has the smell of fennel mixed with cloves.

N. Puchury minor, according to Nees, yields seeds similar in their qualities to the above. Its bark is said to resemble sassafras when fresh, but tasteless and scentless when dry. According to Humboldt it yields the sassafras nuts sold in the London shops. It is a native of the woods of Jabatinga, in the province of Rio Negro in Brazil.

(Lindley's *Flora Medica*).

NECTARINE. [AMYGDALUS, P. C.; PEACH, P. C.]

NECTARY, in Botany, a term used by Linnæus to designate those appendages of the corolla which secrete honey. The term has however, since the time of Linnæus, been used in a general sense to express any organ existing in the flower between the corolla and pistil, and which could not be rightly assigned to these or the stamens. Such parts or appendages of the flower have had many other names applied to them, and some much more commonly than nectary. A common form of appendage of the corolla is called *corona*. This organ is formed at the base of the limb of the corolla, and forms sometimes an undivided cup, as in the Narcissus, when it is called by Haller a *scyphus*. When it is separated into several parts, as in Silene and Brodiæa, it forms the *lamella* of some writers. In Stapelia this organ forms a thick solid mass, covering over the ovary and adhering to the stamens. It is here called the *orbiculus*. When this appendage is accompanied with little projecting processes, they

* These are not the words of Plutarch; he says the feet were under the chariot, and 'as they say' διαλαθεῖν, when the figure was painted out. The exact meaning of διαλαθεῖν is doubtful. Aristratus was not in the chariot: he was standing by it. The old version of Amyot is right. That of North, who translated Amyot, is partly wrong.

are called *cornua*, or horns; the upper end of these is the beak or rostrum, and their back, if dilated and compressed, is called *ala* or *appendix*. Occasionally there is a second set of horns, which alternate with the first, and are called *ligulæ*; the circular space at the top of the orbiculus is the *scutum*. When the lamellæ are small and scale-like, and overarch the orifice of the tube, they are called a *fornix*.

Link proposes to call all appendages which are referable to the corolla *paracorollæ*, or, if they consist of several pieces, *parapetala*, and all appendages referable to the stamens *parastemon*. The peculiar filiform appendages of Passiflora he calls *paraphyses* or *parastades*.

The real nature of these appendages is a point of some interest. In some instances they appear to be simple expansions of the cellular tissue and epidermis of the part on which they are seated, and in others they are evidently abortive stamens or petals. Thus the little bodies found in the claw of the petals of Ranunculus may be regarded as an expansion of the tissue, whilst the filamentary appendages seen in the genus Passiflora are evidently metamorphosed petals. The various forms of corona may be assigned to one or other of the above causes. This subject requires investigation, and it would be well if a more simple and intelligible nomenclature could be applied to these parts of the flower; for, however unimportant at first sight such organs may appear, they nevertheless constitute some of the most valuable distinctive marks for species, genera, and even orders, which the botanist possesses.

The original name, nectary, of these appendages was applied on account of the honey which the tissues of these organs frequently secrete. They were on this account called by Meyen compound glands. It was supposed by Knrr that the function of these glands was vicarious, and that they only secreted honey till the fruit began to develop itself. But that the function of the nectary has no direct relation with the object of the function of the fruit, that is, the development of the seed, is proved in an experiment by Kurr himself, in which he found that the seeds of plants became perfectly maturated, although he had in the early stages of the growth of the flower removed the nectaries. As to what may be the determining cause of the secretion of sugar in these organs any more than in other parts, no examination of their structure has hitherto pointed out. They do not however possess the power of secreting sugar and other secretions in any greater degree than the petals and other parts of the flower and fruit.

(Lindley, *Introduction to Botany*; Schleiden, *Grundzüge der Wissenschaftlichen Botanik*; Meyen, *Pflanzen Physiologie*.)

NEEDLE-ORE. [MINERALOGY, P. C. S.]

NEGOTIABILITY. [BILL OF EXCHANGE, P. C.]

NEJD, or NEDJD. [ARABIA, P. C. and P. C. S.]

NELUMBIUM, a genus of plants belonging to the natural order Nymphæaceæ. It has many distinct carpels, half immersed in the profoundly honey-combed, obconical, elevated torus, each bearing a style with a solitary seed in each carpel, which is exarillate, and destitute of albumen. The flowers are large and showy, white, red, or yellow. Both leaves and flowers rise from the surface of the water.

N. speciosum, Pythagorean Bean, has a polypetalous corolla and anthers drawn out beyond the cells into a club-shaped appendage. It is native in slow running streams and tranquil waters, in the warmer parts of Asia. The flowers are very beautiful, smelling of anise, and generally of a rose colour, seldom white. A variety of this species, *Tamara*, has its outer stamens sterile, dilated at the top, winged, obcordate, the appendage rising from a notch at the apex. It is native of Malabar. The fruit resembles an instrument once used in play by the French, called Lotos, and is one of the plants supposed to be the celebrated Lotos of antiquity, formerly found in Egypt. It was known to the Greeks, and is mentioned as growing in Egypt by Herodotus (ii. 92), Theophrastus, and others. Although not now to be mot with in that country, there can be no doubt as to its having actually existed there, either naturally or in a cultivated state, for these authors speak of it in clear and decisive terms, and their accounts are confirmed by the sculptures still preserved, which testify that this species, as the proper Lotos, has obtained religious reverence. It is spoken of as having been used as food by the Egyptians. Both roots and seeds are esculent, and are accounted cooling and strengthening, and to be of service in extreme thirst, diarrhœa, vomiting, &c. In China it is called Lieuwha, and the seeds and slices of the hairy root, with the kernels of apricots and walnuts, and alternate layers of ice, were frequently presented to the British ambassador and his suite, at breakfasts given by the principal mandarins. The roots are laid up by the Chinese in salt and vinegar for winter use. Thunberg says this plant is held sacred in Japan, and is considered pleasing to the deities, the images of which are frequently made sitting on its large leaves. The seeds are somewhat of the size and form of an acorn, and of a taste more delicate than that of almonds.

N. luteum has a polypetalous corolla, and greatly resembles *N. speciosum* in structure. It is native of North America, in lakes and ponds: it has been naturalized as far as Philadelphia. The flowers are yellow, and resemble a double tulip. The seeds are very agreeable to eat, and are much relished by the Indians and children.

The species of this beautiful aquatic genus should be grown in cisterns, tubs, or large pots, in a rich loamy soil; they require a strong heat to flower to perfection. The pot they are in should be kept full of water while they are growing, but may be allowed to get dry when the flowering season is over. They may be increased by dividing the roots, but are obtained more readily from seeds, which vegetate freely. None of the species have flowered in this country excepting the *N. speciosum*; they all require a very warm situation in a stove.

(Don, *Gardener's Dictionary*; Burnett, *Outlines of Botany*.)

NEMACA'NTHUS, a genus of fossil fishes from the oolite and liassic strata. (Agassiz.)

NEMERTI'TES, a genus of fossil Annelida, from the lower silurian strata of Lampeter, in South Wales. (Murchison.)

NEMO'CERA, the first family of Dipterous insects in the arrangement of Latreille, includes such species as have antennae composed of many joints, an exserted head, a a sheathed sucker, and either simple or toothed tarsal hooks. It includes the species of *Culex* and of *Tipula*, the names given by naturalists to the Mosquitoes and Craneflies. These Linnean genera are now greatly subdivided.

NEO'TTIA (νεοττία, 'a nest with the young in it,' 'the young themselves'), a genus of plants belonging to the natural order Orchideæ. It has a hooded perianth, a deflexed 2-lobed lip saccate at the base; the stigma transverse; rostellum flat, broad, prominent, entire, and without an appendage.

N. Nidus-avis, bird's nest orchis, is the only British species of this genus. The whole plant is of a pale reddish-brown; the root formed of many thick fleshy fibres, from the extremities of which young plants are produced. The stem is about a foot high, with sheathing brown scales. It has no leaves. The spikes are dense, cylindrical, and many-flowered. It is the original *Neottia* of Linnæus, and is native of Great Britain in shady woods.

(Babington's *Manual of British Botany*.)

NEPA, a genus of hemipterous insects of the family *Hydrocorisa*, the species of which are popularly known as water-scorpions. Their bodies terminate in two long setæ, by means of which they acquire a supply of air for respiration, when immersed in the water or mud.

NE'PETA, (a name used by Pliny from *nepa*, scorpion, being supposed to be efficacious against the bite of a scorpion, or from Nepe or Nepete, a town in Tuscany,) a genus of plants belonging to the natural order Labiatae, and the tribe Nepeteae. It has diverging anther cells, a ringent corolla, the upper lip flat, straight, emarginate, or bifid. The calyx is 5-toothed.

N. Cataria, catmint, has stalked cordate acute leaves, deeply crenated and clothed with a whitish pubescence beneath, dense many-flowered whorls, smooth and glabrous nuts. The stem is from 2 to 3 feet in height, downy or mealy. It is native throughout the whole of Europe and middle Asia, and is plentiful in Britain. The corollas are white, with a tinge of red spotted with purple. The whole plant has a strong smell between mint and pennyroyal. Cats are said to be fond of it, and hence it derives its name; they roll themselves on it and tear it to pieces apparently with much pleasure. Ray noticed that the plants he removed from the field into his garden were always destroyed by cats, unless he protected them with thorns until they had come into flower; but they never meddled with plants raised from seed; hence the old saying 'if you set it the cats will eat it, if you sow it the cats won't know it.' Ray accounts for this from the fact that by transplanting the leaves become bruised, and the powerful odour is exhaled which attracts the cats to it. It appears to act as a real aphrodisiac upon cats. Sheep are said to eat it, but all other domestic animals refuse it.

N. Glechoma (*Glechoma hederacea*, Smith), Ground Ivy, has uniform cordate crenate leaves, axillary stalked whorls, ovate aristate teeth, and oblong nuts with impressed dots. The corolla is a light bluish grey, three times as long as the calyx. It is native of Europe and the north of Asia, in hedges and ditches, in woods and waste places, and is plentiful in Britain. The leaves of the ground ivy were formerly thrown into the vat with ale to clarify it and give it a flavour; this was called gill ale, Ground Ivy being named Gill or Gell, and Creep-by-Ground in some places. From this use of the plant and the form of the leaf, it has also the names Ale Hoof and Tun Hoof, but it has gradually grown into disuse since the introduction of hops.

N. Nepetella, Small Catmint, is an erect pubescent plant, clothed with hoary tomentum, the leaves lanceolate, crenate, rounded or cordate at the base, clothed with hoary tomentum or pubescence on both surfaces, the racemes many-flowered, nearly simple; the bracts scarcely longer than the pedicels, the calyx tubular, incurved with an oblique mouth, the corolla twice as long as the calyx. It is a native of the South of Europe, and is found in Spain, Provence, Switzerland, and Italy. It is a very variable plant, especially in gardens. Many varieties have been described.

There are about seventy species of Nepeta known to botanists. Some of them have pretty blossoms, and may be cultivated in the garden. They grow well in any garden soil, especially when light and dry. They may be propagated by dividing the root or by sowing the seeds.

(Koch, *Flora Germanica*; Babington, *Manual of British Botany*; Don, *Gardener's Dictionary*.)

NEPHRO'DIUM. [ASPIDIUM, P. C. S.]

NER'ATIUS PRISCUS, a Roman jurist who lived under Trajanus and Hadrianus. Spartianus (*Hadrianus* 4) states that there was a general opinion that Trajanus once intended to make Neratius Priscus his successor in the empire, instead of Hadrianus. However, Priscus was employed by Hadrianus as he had been by Trajanus. A case is mentioned (Dig. 37, tit. 12, s. 5) in which Trajanus acted on the advice of Neratius Priscus and T. Aristo. Pomponius (Dig. 1., tit. 2, s. 2, § 47) states that Neratius was elevated to the consulship, but the year of his consulship is not certain.

Neratius succeeded Celsus the father, and was therefore of the school of Proculus. His writings, which are mentioned in the Florentine Index, are fifteen books of Regulæ, seven of Membranæ, and three books of Responsa. There are sixty-four excerpts from Neratius in the Digest. Neratius is often cited by the subsequent jurists. He is also mentioned by Gellius (iv. 4) as the author of a treatise De Nuptiis, but in place of Neratius some MSS. have Veratius in this passage of Gellius.

NEREI'TES, a genus of fossil Annelida, from the lower silurian strata of Lampeter, in South Wales. (Murchison.)

NERIUM (from νηρός, humid, the habitat of species), a genus of plants belonging to the natural order Apocynaceæ. It has a hypocrateriform corolla, the orifice surmounted by lacerated multifid processes: segments of the limb contorted. The filaments are inserted into the middle of the tube, the anthers sagittate, adhering by the middle to the stigma. It has two ovaries, a filiform style, dilated at the apex, and an obtuse stigma.

N. odoratum has linear lanceolate leaves three in a whorl; the segments of the calyx erect; appendages of the corolla filamentous; the anthers bearded at the point; the flowers red or white with an agreeable musky scent. The bark of the root and the sweet smelling leaves are supposed by native Indian doctors to act as powerful repellants applied externally: the root, taken internally, acts as a poison.

N. Oleander, Common Oleander, has lanceolate leaves, three in a whorl being beneath, the segments of the corona trifid. It is native of the Indies, in humid places, but has now become wild in the South of Europe, by the side of streams and the sea coast. The flowers are rather large and of a bright red colour. This species contains a great quantity of gallic acid, and a decoction of the leaves or bark forms an acrid stimulating wash, much employed by the poor people in the South of France to cure cutaneous disorders. The peasants in the neighbourhood of Nice use the powdered bark and wood of the Oleander to poison rats. Several cases are also recorded of death from having eaten meat roasted on a spit of Oleander wood.

All the species of Oleander are very showy when in blossom; they thrive well in a light rich soil, and cuttings strike root freely in a moist situation. All of them require a good deal of heat to flower well in this country.

(Don, *Gardener's Dictionary*; Lindley, *Flora Medica*; Burnett, *Outlines of Botany*.)

NET AND LACE. [WEAVING, P. C., p. 179.]

NEUTRIA. [COYPOU, P. C.; FURRIERY, P. C. S.]

NEWCASTLE, DUKE and DUCHESS OF. [CAVENDISH, MARGARET, P. C. S.]

NEWGATE, London. [DANCE, P. C. S.]

NEWTON, GILBERT STUART, R. A., was born in 1794, at Halifax, in Nova Scotia, where his father was collector of the customs. He came to England about 1820, and, after making a tour in Italy, entered as a student of the Royal Academy. He adopted Watteau in some degree as his model, and produced several excellent small pictures much in the style of that master as regards the figures, yet at the same time displaying great expression and character. His first works which attracted notice were the Forsaken, and the Lover's Quarrel, engraved in the 'Literary Souvenir' of 1826. He painted the Prince of Spain's Visit to Catalina, for the Duke of Bedford for 500 guineas; it was engraved in the 'Literary Souvenir' for 1831. In 1830 he painted Shylock and Jessica, from the 'Merchant of Venice,' Yorick and the Grisette, from the 'Sentimental Journey,' and the Abbot Boniface from the 'Monastery;' all in the exhibition of the Royal Academy in 1830. In 1831 he exhibited Portia and Bassanio, another scene from the 'Merchant of Venice;' and Lear attended by Cordelia and the Physician. In 1832 he paid a visit to America, and married there; and in the year following, in which he was elected an academician, he exhibited a small picture of Abelard sitting in his study, a work full of expression and sentiment. Besides these he painted the Vicar of Wakefield restoring his daughter to her mother, Macheath, and a few portraits. His Macheath was purchased by the Marquis of Lansdowne for 500 guineas.

His Abelard was the last picture that he exhibited in the Royal Academy, 1833, and it was about this time that he evinced signs of aberration of mind, and these were followed by unequivocal insanity, which however he recovered from four days before his decease, and he died with calmness and resignation August 5, 1835, at Chelsea, aged forty. His wife returned with her child to America a few months before his death. He painted slowly, and was laborious and fastidious in his execution. He was also, says a friend, extremely neat and fastidious about his dress, though 'he was far from paying the same attention to his chambers, for his compositions were scattered carelessly around; the finished and unfinished were huddled together, and broken models and bits of ribbon and withered flowers abounded.' This was in 41, Great Marlborough-street, where his principal works were painted.

(*Gentleman's Magazine*.)

NEY, MICHAEL, Prince of the Moskowa, Duke of Elchingen, and Marshal of France, was born at Sarre-Louis in Lorraine, on 10th January, 1769. At the age of thirteen he was articled to a notary of that town, but this occupation not being suited to his disposition, he enlisted in 1787 in a regiment of hussars. He there soon distinguished himself by his courage and activity, and, after passing through the inferior grades, he became a lieutenant in 1793, and a captain the year following. The skill which he displayed in conducting some partizan warfare in 1794 attracted the attention of General Kleber, by whom he was sirnamed 'The Indefatigable,' and raised to the rank of adjutant-general. In 1796 he greatly contributed to the victory obtained at Neuwied, and distinguished himself in the engagements of Altenkirchen [LEFEBVRE, P. C. S.], Montabour, and Dierdorf, in which last he was made a prisoner. After his exchange he served in 1796 with the army of the Rhine, and after a brilliant exploit at Würzburg, where with a small body of cavalry he took two thousand prisoners, and obtained possession of that town, he was nominated general of brigade. In the course of this campaign his courage was enhanced by his humanity towards the French emigrants who had been taken prisoners, and he enabled them to elude the sanguinary decrees of the Directory. In 1799 he again served as a general of division with the army of the Rhine under General Moreau. We can only enumerate the principal achievements which in this memorable campaign added to his celebrity. They are the capture by surprise of Mannheim (12th March, 1799), the engagements at Worms and Frankenthal, and the seizure of all the enemy's artillery at the battle of Iller (5th June, 1800). He was also present at the battle of Hohenlinden [MOREAU, P. C.], and his bold attack of a column of the Austrians, which he drove back into the forest, greatly contributed to the victory. At the peace of Luneville he returned to Paris, where he was received with distinction by Bonaparte, who, the better to attach him to his interests, caused him to marry Mademoiselle Augnié, a friend of Hortense Beauharnais. In 1803 he was appointed minister plenipotentiary of the French Republic in Switzerland; on leaving that country the inhabitants presented him with a medal in testimony of their esteem for his character and conduct, and the moderation with which he carried into effect the measures of his government. On his return to Paris the command of a division of the army encamped near Boulogne was given him, and in 1804 he was raised to the dignity of a Marshal.

On the renewal of hostilities with Germany in 1805 the direction of the eighth corps of the army was confided to Marshal Ney. A brilliant achievement in this campaign, the capture by storm of the village of Elchingen (October 4th, 1805), in which the Austrians, under General Laudon, lost fifteen hundred men killed and wounded and two thousand taken prisoners, was attended with the most important results. The impetuous courage and persevering skill which this marshal displayed on that occasion had been witnessed by Napoleon, who in commemoration of it afterwards bestowed upon him the rank and title of Duke of Elchingen.

But it was perhaps during the Prussian campaign of 1806 that Ney's military reputation rose to its greatest height. Of the many splendid actions by which he distinguished himself, the chief are, the capitulation of the towns of Erfurt (October 15th, 1806) and Magdeburg (November 11th, 1806) in which 23,000 prisoners were taken and 800 pieces of cannon fell into his possession; the passage of the Vistula, the taking of Thorn, the total destruction of a Prussian corps at Deppen (February 5th, 1807), the combat of Schmoditten, by which the retreat of the Russians on Königsberg was cut off, and, finally, the defeat of the left wing of the enemy at the battle of Friedland [BONAPARTE P. C.], which more than any other movement contributed to the victory. In September, 1808, he was appointed to a command of the army in Spain, and he distinguished himself in the various engagements by which Gallicia and the Asturias were subjected. In Portugal, though under the orders of Marshal Masséna, the merit of the capture of Ciudad-Rodrigo (July 10th, 1810) and of Almeida (August 27th, 1810) have generally been attributed to him. He was also of great assistance to Masséna in conducting his skilful retreat, after his failure in attempting to force the lines of Torres Vedras. [MASSENA, P. C. S.] The different dispositions however of these two great generals soon brought on differences of opinion, which ended in a serious dispute. The result was unfavourable to Ney, who was deprived by Napoleon of his command and recalled to France.

In 1812 he joined the disastrous expedition to Russia, and had the command of the third corps of the grand army. In the course of it he appears to have freely expressed to Napolean his dissatisfaction at some of his movements, and advised him to winter at Smolensko. At the taking of this city (August 17th, 1812), at the combat of Valentina (August 19th), and, above all, at the sanguinary battle of the Moskowa (September 14th), from which he derived his title of Prince of the Moskowa, he eminently proved himself worthy of the sirname by which he was known to the army, of 'Bravest of the Brave.'

But it was during the calamitous retreat of the French army that he rendered it the most important service. The details of it are amply described in the histories of Ségur, Chambray, and Labaume; the first of these, however, though one of the finest models of historical style, should be read in conjunction with the Memoirs of General Gourgaud, who, with military bluntness, and perhaps some personal hostility, corrects several erroneous statements of Ségur. One incident in this retreat is peculiarly characteristic of Ney's intrepidity and perseverance. General Dumas relates that as he was sitting down to breakfast at Gumbinnen, a man in a brown coat, long beard, and a weather-beaten countenance, entered his room, exclaiming, 'I am at last here; General Dumas, do you recognise me?' The general having answered that he did not; 'I am the rear-guard of the grand army,' he continued; 'I have fired the last musket-shot on the bridge of Kowno; I have thrown the last of our arms into the Niemen, and have come here through the woods. I am Marshal Ney.' (Colonel Mitchell's 'Fall of Napoleon,' vol. ii.)

In the campaign of 1813 Ney displayed his usual courage and ability, and was chiefly instrumental in obtaining the victories of Bautzen, Lützen, and Dresden. He met however with some severe reverses, and at the battle of Dannewitz (September 6th, 1813) he was signally defeated by the Prussians and Swedes under Bernadotte, then Crown Prince of Sweden [BERNADOTTE, P. C. S.], with a loss of thirteen thousand men, forty-three pieces of cannon, and three standards. After this disastrous engagement Napoleon had an interview with Ney's aide-de-camp, whom he interrogated respecting the particulars of this misfortune, and explained the causes which led to it to the generals present, without giving expression to any feeling of dissatisfaction at the conduct of his lieutenant. 'The Emperor,' says St.-Cyr, who is quoted by Alison ('Hist. of Europe,' x. 535), 'explained at once lucidly and satisfactorily the causes of the reverse, but without the slightest expression of ill-humour, or any manifestation of displeasure at Ney or any of the generals engaged. He ascribed the whole to the difficulties of the art of war, which he said were far from being generally known. He added that, one day or other, if he had time, he would write a book in which he would demonstrate its principles in a manner so precise they should be within the reach of all military men, and enable them to learn the art of war as they learn any other science.'

After the abdication of Napoleon, in 1814, Ney withdrew from public life and retired with his family to his country-seat. It was there that, on the 6th of March, 1815, he received orders from the Minister of War to join the eighth military division, of which he was commander, and which was stationed at Besançon. Ignorant of the motives of the order, he immediately proceeded to Paris, where for the first time he learned the return of Napoleon from Elba. He then willingly undertook the duty which had been imposed upon him to lend his aid for the purpose of opposing the invasion of his former chief; and on taking leave of Louis XVIII. he assured him that he would bring back Bonaparte in an iron cage. As some doubts have been cast upon the truth of this boastful assertion of Ney, it may be well to state that he himself acknowledged on his trial that he used the expression. On leaving the king he travelled rapidly to Auxerre, where he alighted at the residence of his brother-in-law, the prefect of the department, who had zealously joined the cause of Napoleon, and who made Ney acquainted with all the difficulties likely to attend any support of the Bourbon dynasty, and his own doubts on this subject increased as, advancing towards Lyon, he became more aware of the popular feeling in that part of France. The character of Ney was more fitted for the field of battle than for a political struggle, and it was only in the presence of danger that he showed resolution. Of this Napoleon was well aware, and he skillfully threw the weight of his influence and entreaties into the balance of Ney's already vacillating opinions. An earnest appeal to the early and glorious reminiscences of the prosperous days of the Empire, coming from his antient chief, the creator of his fortunes, completely overcame the pledged loyalty of this marshal. 'In the night of the 13th of March,' said he at his trial, 'down to which time I solemnly declare my fidelity, I received a proclamation drawn by Napoleon, which I signed.' On the ensuing morning this fatal proclamation was publicly read to the troops, who received it with the most enthusiastic approbation. His defection was speedily followed by that of his whole army.

On the 10th of June he joined the army at Lille, and was soon actively but unsuccessfully engaged with the British at Quatre-Bras. His conduct at Waterloo elicited equal praise both from friend and foe. His fruitless but resolute attempts at the head of the columns of the guard to overwhelm the British before they could receive succour from the Prussians, are well known. Five horses were shot under him in this terrible conflict: still, on foot, his clothes pierced with balls, he gallantly headed the impetuous charge. In the disastrous retreat which ensued, he was among the last to leave the field, and, as on the plains of Russia, he was the rear-guard of the last Imperial army.

After the defeat of Napoleon at Waterloo, Ney returned to Paris, and remained there after the capitulation of that city to the allies, considering himself safe by virtue of the twelfth article of that capitulation, which contains the following clause: 'All the individuals who are at present in the capital, shall continue to enjoy their rights and liberties, without being disquieted or prosecuted in any respect, in regard to the functions which they occupy, or may have occupied, or to their political conduct or opinions.' (*Convention*, July 3rd, 1815.) On the 24th of July however appeared a Royal ordinance, in which, among several others, he found himself proscribed as a traitor to his country. To escape the danger he endeavoured to leave France, but was arrested on 5th August, at the château of Bessoms near Aurillac. He was at first cited before a council of war, which declared its incompetency to sit in judgment on a peer of France. His trial was then removed to the Chamber of Peers by another Royal ordinance of 12th November. His defence was most ably conducted by his eloquent advocates, Berryer and Dupin, and chiefly rested on the article of the capitulation above alluded to. The result however was that be was found guilty, and condemned to death by a very large majority of the peers.

On 7th December, 1815, the day after his condemnation, an officer presented himself to Ney to communicate to him the sentence, which was to be carried into immediate execution. On hearing his titles enumerated, he exclaimed, 'Call me simply Michael Ney, now a French soldier, and soon about to be a heap of dust.' A spot in the garden of the Luxembourg was selected for the execution; he there met his fate at eight o'clock in the morning with calm courage. 'He who had fought five hundred battles for France—not one against her—was shot as a traitor.' (Napier, *Hist. of the Peninsular War*, vol. ii. p. 406.)

The reflections of Alison on this event are creditable alike to his impartiality as an historian and his feelings as a man. 'The death of Ney,' he says, 'is a subject which the English historian cannot dismiss without painful feelings. His guilt was self-evident; and never perhaps was the penalty of the law inflicted upon one for a political offence who more richly deserved his fate. The question of difficulty is, whether or not he was protected by the capitulation of Paris. The clause in that treaty has already been given which expressly declares that no person should be molested for his political opinions or conduct during the Hundred Days; and it is very difficult to see how this clause could be held as not protecting Ney, who was within the city at the time of the treaty. Wellington and Blücher concluded the capitulation: their Sovereigns ratified it: Louis XVIII. took benefit from it. How then can it be said that he, as well as the allied sovereigns, were not bound by the treaty, especially in so vital and irreparable a matter as human life—and that the life of such a man as Marshal Ney? It is very true a great example was required; true, Ney's treason was beyond that of any other man; true, the Revolutionists required to be shown that government could punish; but all that will not justify the breach of a capitulation. To say that Louis XVIII. was not bound by the capitulation; that it was made by the English general without his authority; and that no foreign officer could tie up the hands of an independent sovereign, is a quibble unworthy of a generous mind, and which it is the duty of the historian invariably to condemn. This was what Nelson said at Naples, and what Schwartzenburg said at Dresden; and subsequent times have unanimously condemned the violation of these two capitulations. Banished from France, with his double treason affixed to his forehead, Ney's character was irrevocably withered; but to the end of the world his guilt will be forgotten in the tragic interest and noble heroism of his death.' (*Hist. of Europe*, vol. x. p. 975-977.)

(The following works may be consulted for a full detail of the life of Marshal Ney: *Vie du Maréchal Ney, avec Hist. de son Procès*, Paris, 1816; *Biog. des Généraux Français*, par Courcelles; *Hist. de Napoléon et de la Grande Armée*, par Segur; *Hist. de l'Expédition de Russie*, par Chambray; Alison, *Hist. of Europe*, vols. iii. iv. v. ix. x.; *Court and Camp of Napoleon; Mémoires de Rapp;* Napier, *Hist. of the Peninsular War;* Mitchell, *Fall of Napoleon; Examen critique de l'Hist. de Ségur*, par le Gén. Gourgaud. The arguments in favour of his condemnation may be seen in the works of Bellart, the crown prosecutor, *Affaire du Maréchal Ney*, Paris, 1827.)

NIBELUNGEN LIED. [GERMANY, P. C., p. 194.]

NICERON, JEAN-PIERRE, was born at Paris in 1685. He entered the regular order of Barnabites, and devoted himself to the study of languages and biography. He led a life without incident, and died at Paris on the 8th July 1738. He is chiefly known as the author—or in some parts rather the compiler—of 'Mémoires pour servir à l'Histoire des Hommes Illustres dans la République des Lettres,' of which thirty-nine volumes were published by Niceron, and four were added after his death. All who have had occasion to study the earlier literary history of France must be under obligations to this laborious and meritorious work. Its merits are never very high in criticism, philosophy, or the essential elements of spirited and descriptive biography. Niceron was however a curious and laborious reader, and in those instances where he exhibits the fruit of his own original research, his matter is highly valuable. Many of the lives however are mere compilations from other sources, and appear to have been hastily prepared to suit the order of publication. There is little attempt at a proportional distribution of space, secondary authors sometimes receiving notices as elaborate as the most distinguished men of their age. This is a defect sometimes not unpleasing, as it generally attends enthusiasm in some particular walk of literature, and marks the original investigator. Niceron published some translations from the English. (*Mémoires*, tom. xl. 379-396; *Nouveau Dictionnaire Historique*.)

NICHOLAS, ST., situated in 51° 9′ N. lat. and 4° 8′ E. long., is a large and well-built market-town in the province of East Flanders, of the kingdom of Belgium. It has a large market-place surrounded with good houses, a handsome town-hall, a prison, a tribunal of commerce, and a Latin school. The number of inhabitants is about 18,000, who manufacture cotton and woollen goods of various kinds, hats and ribbons; there are tanneries, potteries, dye-houses, brick and tile kilns, soap-works, salt-works, &c. There is a great weekly market for corn, flax and yarn, and horses. St. Nicholas is in fact one of the richest and most flourishing towns, not only of Flanders, but of all Belgium. The surrounding country is highly cultivated.

(Stein, *Lexicon*; Cannabich, *Lehrbuch*; Hassel, *Handbuch*.)

NICI'AS (Νικίας) of Athens, the son of Nicomedes, and the pupil of Antidotus, was one of the most celebrated painters of antiquity. He was, though probably younger, contemporary with Apelles. His particular excellence was in the general effect of the picture: in elegant design, in beautiful colour, and in effective chiaroscuro; in fact in the characteristic qualities of the Bolognese school subsequent to the Carracci. He also excelled in painting females; but this would be the necessary result of his mastery over the instrumental and technical parts of art.

It is remarkable, that though Athens was so long the principal seat of the arts among the Greeks, about two centuries, Nicias and Apollodorus are the only two Greek painters of the greatest fame who were natives of Athens. Yet the case is very similar with modern Rome; of all the great painters of that central city of art, two only were natives—Giulio Pippi, called Romano, and Carlo Maratti.

The most celebrated work of Nicias was the Νεκυία, or the region of the shades, of Homer (*Necromantia Homeri*); from the passage of the Odyssey where Ulysses invokes the shades of the dead. Nicias, says Plutarch, refused to sell this picture to Ptolemy I., of Egypt, who offered him sixty talents for it; he presented it to his native city, Athens. If Plutarch speaks here of the Attic talent, the price offered was enormous, though not unprecedented in antient times—about 15,000*l.* according to some computators of Attic money; but if the Egyptian talent is signified, which is very unlikely, the amount would be diminished to nearly one-fourth.

Nicias must have been old when Ptolemy was king of Egypt; and from his refusal of this offer, probably very rich also, as Pliny says he was. Ptolemy ascended the throne of Egypt in 306 B.C., and Nicias, about half a century earlier, was employed by Praxiteles to colour some of his statues. Pliny intimates a doubt whether the same artist in these two cases is alluded to; and Sillig, in his 'Catalogus Artificum,' has concluded that they cannot be the same. Only one Nicias, however, is known and spoken of by antient authors; and the only reason for doubting the identity of these two is founded on Pliny's method of assigning their dates to artists and their scholars, mentioning only a single year or olympiad for each, which, vaguely expressed as it always is, need not give us the exact time of an artist within half a century. If we consider such a given date as the commencement of his career, we make him probably contemporary with a generation of artists who succeeded him; and if as the end of his career, as probably with one which preceded him; but if we assume such date to be the middle of his career, he may still have been born half a century before it, and may have painted pictures a quarter of a century after it. Thus if we suppose Nicias, when he refused to sell his picture to Ptolemy, to have been about seventy years of age, and he was doubtless old, with such a reputation and such independence, he may very easily have many years before painted the statues of Praxiteles. Praxiteles flourished, according to Pliny, in Olymp. 104; and if this date is to be understood as the beginning of his career, he was essentially the contemporary of Nicias; and if as the middle, he was about one generation his senior. This is in all probability the case;

for it reconciles all the facts recorded of Nicias, and it is much more probable that Praxiteles would employ a young man to colour his statues for him who was only rising in his profession, than a great painter, his equal in age and reputation. Statue-painters, ἀγαλμάτων ἐγκαυσταί, constituted apparently a class of themselves, and Nicias may have been one of these in his youth: this is more probable than that one of the greatest painters of his time should be thus employed. One of Sillig's difficulties in identifying these two as one, is, that Nicias was the pupil of the pupil of Euphranor, who was the contemporary of Praxiteles. It is a mere assumption, however, to suppose that there must necessarily be a generation between master and pupil: the master is frequently only a very few years older than his pupil, and is sometimes even younger. But if we suppose that Nicias was a generation younger than Praxiteles, there is not the slightest difficulty in the way of his having been the pupil of the pupil of a contemporary of Praxiteles.

Nicias painted in encaustic, and besides the one already mentioned Pliny notices the following pictures by him:—an Alexander (Paris), a sitting Calypso, an Io, an Andromeda, and another Calypso, in the hall of Pompey; a Bacchus, a Diana, and a Hyacinthus, in the temple of Concord. The Hyacinthus was brought to Rome by Augustus from Alexandria, and was consecrated afterwards by Tiberius in the temple of Augustus, on account of his great delight in it: it is mentioned by Pausanias (iii. 19), who says that the figure of Hyacinthus was very elegant.

Augustus dedicated and fixed in the wall also a picture by Nicias in the Curia Julia, of Nemea sitting on a lion, holding in her hand a palm twig; and by her side was standing an old man, resting upon his staff; above him was hanging a picture of a Biga. It was brought from Asia by Silanus, and was most probably the same of which a Teutonic ambassador, being asked his opinion, said, according to Pliny, 'That he would not have him even if he were real and living,' alluding to the old man with his staff: entirely overlooking the art which embodied the picture, and measuring the man apparently by his sinews. Lessing (*Laocoon*, p. 280, note) proposes to substitute in the place of the *picture of the Biga*, (*tabula bigæ*) hanging above the man's head, which he supposes to be a corruption of the text, a *name tablet*, called by the Greeks πτυχίον. Nicias wrote on this picture that he had burnt it in, Νικίας ἐνέκαυσεν, that is painted it in encaustic. These words were, in the opinion of Lessing, written upon the small painted tablet which was hanging over the head of the old man—cujus supra caput tabula bigæ dependet. Nicias scripsit se inussisse; tali enim usus est verbo. The passage is obscure; only one picture is spoken of; the words *tabula bigae* may be corrupt; it is certainly difficult to give them a suitable meaning. The Biga, says Lessing, can have no respect to the Nemean games, because in them four-horse chariots were used. (Schmidius, *in Prol. ad Nemeonicas*, p. 2.)

Nicias painted also the interiors of tombs, as that of Megabyzus, high priest of Ephesus, and one at Tritaea. Pausanias says, before you come to Tritaea from Pharae there was a sepulchre of white marble, which was particularly worthy of inspection on account of the paintings of Nicias upon it—a beautiful young woman was represented seated on an ivory chair, and behind her was a female servant holding an umbrella; a beardless youth also was standing near her, dressed in purple; by the youth was an attendant with hunting spears and a leash of dogs (Nicias was, according to Pausanias, the most excellent animal painter of his time); the names of these people were not known: Pausanias supposed them to be man and wife. Nicias was honoured with a public burial, and was interred in the road from Athens to the Academy, the cemetery of all great Athenians: Pausanias notices his tomb there. He appears to have been a very studious and absent man. Aelian says he used to forget to take his meals (*Var. Hist.*, iii. 31).

It has been said above that Nicias painted some of the statues of Praxiteles: this requires some explanation. Pliny relates that Praxiteles being asked which of his marble statues he preferred, answered, 'those which Nicias had had a hand in; so much did he attribute to his *circumlitio*.' This word *circumlitio* has been variously interpreted: Fuseli supposed it signified the outlining of the clay model; but Pliny is speaking of marble statues, and the circumlitio must have been some superficial application, and cannot be applied to a correction of form; the question is also about a process which the marble statues have undergone at the hands of a painter. Cicero has 'Persae mortuos cera circumlitos condunt.' (*In Tusc.*, i. 45.) There is a prejudice against the idea that the Greeks painted their statues; that they did so however is an indisputable fact, though it was not a universal practice. The statue-painters, οἱ ἀνδριάντας γράφοντες, as Plato calls them, are definitely spoken of by Plutarch (*De Glor. Athen.* 6,) as Ἀγαλμάτων ἐγκαυσταί—the encaustic painters of statues—and the art itself as ἀγαλμάτων ἔγκαυσις. Statues seem to have been sometimes entirely painted, which appears from the following words of Plato (*De Republ.* iv. 420. c.). He observes, in speaking of statue painters—'It is not by applying a rich or beautiful colour to any particular part, but by giving every part its local colour, that the whole is made beautiful.' That it was not however the common practice to paint the marble entirely is evident from the conversation between Lycinus and Aristratus, in the dialogue of the *Portraits*, or *Panthea*, in Lucian; from which it is plain the Venus of Cnidus, by Praxiteles, and other celebrated statues, were not painted, though parts may have been coloured, and the whole body covered with an encaustic varnish. (Lucian, *Imag.* 5-8.)

We may infer therefore in this case that the *circumlitio* of Nicias, applied to the marble statues of Praxiteles, was the ἀγαλμάτων ἔγκαυσις of Plutarch, and that Nicias was himself an ἀγαλμάτων ἐγκαυστής, or painter of statues, in his youth. In his *circumlitio* the naked form was probably merely varnished, the colouring being applied only to the eyes, eye-brows and lips, to the hair, the draperies, and the various ornaments of dress; and there can be little doubt that marble statues, especially of females, must have had a very beautiful appearance when carefully coloured in this way.

(See *Dictionary of Greek and Roman Antiquities*, article Painting, by the author of this article; Pliny, *Hist. Nat.*, xxxv., 10. 36-40; Pausanias, i. 29, iii. 19, vii. 22; Plutarch, *Mor.* 'Epicurus,' c. II.; Junius, *Catalogus Artificum*.)

NICOLE, PIERRE, one of the distinguished recluses of Port Royal, was born at Chartres on the 19th of October, 1625. At the age of fourteen, when he is said to have had an ample command over Greek and Latin, he was sent to study at Paris, where he was persuaded to join the community of the Port Royal. There he occupied himself in instructing the pupils confided to the institution. He formed an intimate acquaintance and a species of alliance with Anthony Arnauld, with whose fiery zeal and restless energy his placid disposition and clear systematic mind afforded a strong contrast. [ARNAULD, P. C.] The angry disputes regarding the five points of the Jansenists prompted him to remain for several years a simple clerk, but in 1676 he was induced to seek holy orders. He was refused the necessary consent however of the Bishop of Chartres, who disliked his opinions; and he was evidently rather rejoiced than saddened by an excuse for remaining in a position where he was not too near the van in the battle of controversy. In his own province, however, of a clerical or polemical logician, he was bold and uncompromising, and it was not from the defence of his principles but their too conspicuous championship that he shrunk. He was obliged in 1679 to retire from France, but returning soon afterwards, he entered with some keenness into two of the celebrated disputes of his age—that of the studies suited to monastic institutions, where he joined Mabillon in defending a devotion to science and learning in place of pure asceticism; and the discussion regarding quietism, in which he opposed the devotees of that mental epidemic. He was a man of simple habits and candid mind, and some ludicrous incidents have been told as arising out of his absent habits. He died on the 11th November, 1695. His works are many and voluminous. He was the principal author of 'La Logique, ou l'Art de Penser' (1668), known as the Port Royal Logic. Of the first three volumes of 'La Perpétuité de la Foi de l'Eglise Catholique touchant l'Eucharistie,' which is generally associated with the name of Arnauld, he is known to have been the principal writer. Hume admired the logical clearness with which Nicole in this work showed the impossibility of one mind sufficiently examining all subjects connected with religion to form a creed for itself on the principle of private judgment; and stated that the difficulty so ingeniously set forth suggested to him the sceptical argument in his Dialogues on Natural Religion. He wrote also 'Traité de l'Unité de l'Eglise;' 'Les Prétendus-Réformés convaincus de Schisme;' 'Les Lettres imaginaires et visionnaires,' &c. He was eminent as a translator and composer in Latin, and in 1659 published 'Epigrammatum Delectus.'

(Niceron, *Mémoires*, t. xxix. 285-333; *Nouveau Dictionnaire Historique*.)

NICOLL, ROBERT, a poet distinguished by the precocity of his talents, was born at Tullybeltane, in Perthshire, on the 7th January, 1814. His parents were in too humble circumstances to afford him any education beyond the rudiments of reading and writing; and at a very early age he was set to the occupation of herding cattle. At the age of seventeen he was apprenticed to a grocer in Perth, and at the conclusion of his service endeavoured to earn a livelihood by keeping a circulating library in Dundee. During this interval he had been acquiring the elements of knowledge. He was a devourer of books, and at the age of twenty had acquired both knowledge and cultivation without being educated. In 1835 he published a small volume of 'Poems,' which became very popular, were extensively noticed by the newspaper press, and passed through three editions. They are less remarkable for energy or originality than as the fruit of a fine-toned and sensitive mind. In prose his writing was of a different character. In 1836 he undertook the editorship of the 'Leeds Times,' a paper of strongly liberal sentiments; and by the spirit and energy of his political articles, and their adaptation to the feelings of the surrounding community, he soon more than tripled the circulation of the paper. His early struggles had probably undermined his constitution, and he soon sank under the excitement of his editorial labours. When on his death-bed he was removed to the neighbourhood of Edinburgh, where, amidst tho attentions of kind friends, he died on the 9th of December, 1837, in his twenty-third year.

(*Memoir*, by Mrs. Johnstone, prefixed to a third edition of his Poems; *Westminster Review*, No. 76.)

NICO'MACHUS (Νικόμαχος) of Thebes, son and pupil of Aristodemus, was a celebrated Greek painter, who lived between 360 and 300 B.C. He is classed by Cicero with Apelles and Protogenes, and his paintings are compared by Plutarch with the lines of Homer: he was the most celebrated of all the Greek painters for rapidity of execution. In illustration of the rapidity of his execution, Pliny mentions the decorations of the monument which Aristratus, tyrant of Sicyon, had erected in honour of the poet Telestes, which were executed in a few days by Nicomachus, with remarkable beauty, and to the entire satisfaction of Aristratus, who shortly before was exceedingly angry with him, for, as he supposed, neglecting his contract, which was to have the tomb finished by a certain day. Nicomachus had deferred the commencement of the tomb so long, that Aristratus concluded he did not intend to meet his engagement: the painter, however, was a better judge of the required time in his own case.

The notices of Nicomachus are few, and what there are contain but little information about him. Pliny mentions by him—a Rape of Proserpine in the Temple of Minerva on the Capitol, hanging above the niche or shrine of Juventus or youth; a Victory in a quadriga, in the Capitol, which was dedicated by Plancus; also Apollo and Diana; a Cybele, the mother of the gods, sitting upon a Lion; Bacchantes, with Satyrs creeping up to them; and a Scylla, which was in the Temple of Peace. Pliny notices also an unfinished picture of the Tyndaridæ by Nicomachus; he instances it as an example of the unfinished works of painters being in greater repute than their finished works, when left unfinished through death, or perhaps other circumstances impeding their completion: he mentions four pictures—the Tyndaridæ of Nicomachus, the Iris of Aristides, the Medea of Timomachus, and a Venus of Apelles. Nicomachus is the first who represented Ulysses with the pileus or cap of liberty. He is one of the painters who from an error of Pliny's is said to have used only four colours. (See Dictionary of Greek and Roman Antiquities, article *Colores*.) Cicero, in speaking of the cruder performances of the early artists, notices that in the works of Echion, Nicomachus, Protogenes, and Apelles, all things are perfect. He is, however, enumerated by Vitruvius among those artists who though of the greatest ability met with little substantial success in life. Stobaeus relates of Nicomachus that, hearing some one say that he saw no beauty in the Helen of Zeuxis, he observed—'Take my eyes, and you will see a goddess.' He had several scholars: Aristides, the celebrated painter, his brother; Aristocles, his son; Philoxenus of Eretria; Nicophanes; and a certain Coryhas. Philoxenus imitated Nicomachus in celerity. Nicophanes was notorious for licentious pictures.

(Pliny, *Hist. Nat.* xxxv., 10, 36; 11, 40; Cicero, *Brutus*, 18; Plutarch, *Timol.* 36; Vitruvius, iii. *in proœm.*; Stobaeus, *Serm.* 61.; Junius, *Catalogus Artificum*.)

NIGELLA (from niger, black, because of the colour of the seeds), a genus of plants belonging to the natural order Ranunculaceæ. It has 5 coloured petal-like spreading sepals. The petals small, from 5 to 10, bilabiate, with a hollow nectariferous claw. The capsules more or less connected together, terminated by the elongated styles opening in the inside, many-seeded. The leaves are capillary, multifid, often surrounding the flowers like an involucre, and finely cut like fennel. The flowers are solitary on the tops of the stems or branches. The species are erect annual smoothish herbs.

N. sativa has ovate obtuse anthers, capsules muricated, united up to the very point into an ovate fruit, terminated by five erect styles; the stem erect and rather hairy; flowers naked. The seeds are angular, aromatic, subacid, and were formerly used instead of pepper; and have also been employed as carminatives. It is the Μελάνθιον of Hippocrates, 'Steril.' 675, and of Dioscorides, 3, 93; the Githex of Pliny, 20, 17.

N. arvensis has pointed anthers; from 5 to 7 styles circinately revolute, outwardly smooth; capsules connected below the middle into an obconical fruit, which is narrowest at the base. It has a smooth stem, with diverging branches. It is native of middle and southern Europe in corn-fields, also in the north of Africa. The seeds are sometimes used instead of those of N. sativa, but they are not so aromatic, neither have they so pleasant a smell. Both species are employed in the adulteration of pepper. All the species of Nigella are plants of easy culture, only requiring to be sown in the open border. They are curious and ornamental.

(Don, *Gardener's Dictionary*; Lindley, *Flora Medica*; Fraas, *Synopsis Plantarum*; *Floræ Classicæ*.)

NIGRITIA is a term, which was formerly applied by geographers to that part of Africa which at present is known by the name of Soodán of which Arabic expression it is only a translation, meaning the country of the blacks. [SOODAN, P. C., vol. xxii.]

NILE. Since the article NILE was printed in the P. C. the course of the western branch of the river, the Bahr-el-Abiad, has been traced to 4° 42′ N. lat., which is nearly nine degrees south of Aleis, to which place it had been explored by Linant. In 1840, 1841, and 1842, the pasha of Egypt sent three expeditions for the purpose of exploring the course of the river to its source, and the two last expeditions were accompanied by several scientific Europeans.

South of Khartun (15° 17′ N. lat.) and as far south as Aleis the Bahr-el-Abiad is in general from one to two miles wide, and runs in a bottom, which is generally four miles wide, but sometimes even six miles. The bottom is covered with grass and the higher grounds at the back are partly covered with trees. There occur a few low hills in this part of the country. The western banks of the river are occupied by the Hussaniyeh, a nomadic tribe of Arabian origin, the most southern of this description. This tribe is frequently at war with the black tribes who live farther south, especially the Shillucks.

South of Aleis begins the country of the Shillucks, which extends to about 10° N. lat. The river is here three miles wide and contains a great number of low islands. They are frequently several miles long and a quarter of a mile wide, and nearly all of them overgrown with high trees and bushes. On the western side is a mountain group, called Arasholl, which is crowned with seven peaks; between this high ground and the banks of the river are extensive forests. In these forests are numerous villages, which when seen from the river appear to be regularly arranged in three rows parallel to tho river. They are inhabited by the Shillucks, a piratical nation of blacks, who frequently descend with their boats in great numbers to the countries lower down the river, and formerly extended their predatory incursions as far as Khartun, but at present they are kept in awe by the pasha of Egypt. Near the southern limits of their territories the country is interspersed with numerous isolated conical hills, among which one called Defa Fungh (10° 20′ N. lat.) appears to be an extinct volcano, consisting partly of tufa and red-brown porous lava.

Near 9° 11′ the Bahr-el-Abiad is joined from the east by a large tributary, the Sobat, which is supposed to rise in the mountains of Abyssinia, and brings down a volume of water nearly equal to that of the principal river. The lower course of this tributary was explored, and it was found that it runs between banks, which are much higher than those of the Bahr-el-Abiad itself, and well wooded. From the mouth of this river to Khartun the Bahr-el-Abiad flows from south to north, but higher up it runs from west to east for about a hundred miles, through a country inhabited by another black nation, the Dinkas, who are divided into seven tribes and speak a language different from that of the Shillucks. In this part (between 8° and 9° N. lat.) the river appears to traverse an immense swamp interspersed with many smaller and larger lakes, one of which is stated to cover an area of 420 square miles. The current of the river through these low grounds is imperceptible, and its water divided into so many branches, that it is difficult to find out the main channel. It is supposed that the great quantity of water which collects in those parts is brought down by a river running from north-west to south-east, perhaps that river which by the Arabian geographers is called Kailack. It is also possible that the course of this river has induced them to adopt the opinion that the Bahr-el-Abiad rises far to the west. The Dinkas inhabiting this swampy region are a nomadic tribe, who live principally on the produce of their herds of cattle, distinguished by large horns like those of antient Egypt. They are less strongly built than their northern neighbours, the Shillucks, and it appears that their health suffers from their residence in the swamps. In this region elephants, giraffes, and hippopotami are met with in great numbers.

Before the Bahr-el-Abiad enters this swampy region it runs from south to north, but farther upwards (south of 7° N. lat.) from south-east to north-west. The country traversed by it is a plain. The river is completely navigable, without cataracts and even without rapids. Its eastern banks are occupied by the Nuerres, and its western by the Kyks or Kekes. Both nations are cultivators of the ground, but have also numerous herds of cattle, sheep, and goats. The Nuerres are not negroes. The colour of their skin inclines to the red, and their hair is smooth and lank, not woolly. They have enclosures round their huts, and others for their cattle. The Kyks have also numerous herds of cattle, but live chiefly on fish, grain, and roots. Both nations received the expeditions with confidence and joy, and presented to them a great number of cattle. It appears that these tribes speak a language which is understood by the Dinkas.

Farther upwards other tribes are named, as tho Heliab, Bhor, and Chir. At last the expeditions arrived in the country of a black nation called the Barrys, where their progress was stopped by a ledge of gneiss, which traversed the river in all its width near 4° 42′ N. lat. and 30° 58′ E. long. In approaching 5° the bed of the river, which up to these parts appears to be formed by alluvial soil, begins to be rocky, and at the same time mountains become visible, which extend from east to west. The river by degrees acquires such a velocity as to run six knots an hour. According to the information obtained from the *matta*, or king of the Barrys, persons must walk for a month before they arrive at a country called Anyan, where the river is formed by the confluence of four rivulets, the largest of which comes down from the east.

The Barrys are described as a very interesting nation. They consist of five tribes, and speak a peculiar language. Their country is well cultivated and exhibits the richest crops, their fields being irrigated by numerous canals. They enjoy a considerable amount of ease, which appears to have a great influence on their character, and to render them peaceable and humane. They are in general more than six Paris feet in height, and are well built. They inhabit a great number of villages, consisting of huts built of reeds, and situated either on the banks of the river or at a distance from them; some are built on hills. They cultivate dhurra, sesamum, tobacco, and several kinds of melons. No horses, camels, or asses are found in their country, but their cattle are of great size and very numerous; they have also fowls in abundance. Among the wild animals, elephants, giraffes, and antelopes are very numerous. In the mountains lying towards the east iron-ore is abundant, and they make agricultural implements, lances, and arrow-points. They are also acquainted with the art of tanning and making some cotton fabrics, and with working copper and ivory, which they employ as ornaments. The king is said to live in a palace built on an island, to which his subjects can only arrive by swimming. He is surrounded by a guard composed of women. It was observed by the persons who composed the expedition, that the inhabitants were in possession of several articles brought from India, as calicoes, and several fabrics made at Surat, as also swords and other arms of iron. The natives stated that all these articles were brought to them from a commercial place which they called Berry, and which, as they said, was fifteen days' journey farther east, at the foot of a range of mountains.

Thus we learn by the accounts of these expeditions that the interior of Africa is much more populous than was supposed, and that several of the nations inhabiting it have attained a considerable degree of civilization.

(Werne, *Ueber die zweite Expedition welche auf Befehl des Paschas von Aegypten Mehemed Ali zur Erforschung der Quellen des Weissen Nils unternommen wurde. In den Monatsberichten der Gesellschaft für Erdkunde zu Berlin*, New Series, vol. ii., and Ritter, *Ein Blick in das Nil Quelland.*)

NIMA, a genus of plants belonging to the natural order Simarubaceæ. It has hermaphrodite flowers, a 5-parted permanent calyx, 5 oblong petals, 5 stamens with filaments dilated at the base; the 5 ovaries are connected together, pilose, and seated on the thick disk beneath the petals. The embryo is large, without albumen. The species are trees, with alternate imparipinnate leaves, having four pairs of serrated leaflets. The flowers are disposed in panicle corymbs.

N. quassioides is a native of Nepaul, in a valley near the town called Thankot. It has elliptical oblong leaflets, which are acuminated and serrated. The corymbs are trichotomous. It is as bitter as the quassia of South America.

(Don, *Gardener's Dictionary;* Lindley, *Flora Medica.*)

NINEVEH. Since the publication of the article NINEVEH in the 'Penny Cyclopædia,' discoveries of the highest importance have been made, if not on the precise site, yet in the immediate vicinity of that city, of which the following are some of the most interesting particulars.

For these discoveries we are indebted to M. Botta, consul of France at Mosul on the Tigris, opposite to the presumed site of Nineveh. M. Botta, leaving Paris in the spring of 1843, announced to his friends his intention of employing what leisure the duties of his office might allow him in making excavations at Nineveh. He began with some operations in the inclosure on the river, which have been long conceived to be the rampart of Nineveh, but which we must now suppose to have contained only tho palace of the Assyrian kings, as intimated by Mr. Rich. M. Botta found only some bricks and fragments of no value. Meantime the inhabitants of the environs, seeing the consul engaged in these researches, brought him bricks with inscriptions, and other remains of antiquities, which induced him to send his workmen to the village of Khosabad, Khorstabad, or Khortabad (for, says M. Botta, 'the name, which is certainly not Arabic, is pronounced in all these ways'*), distant about five hours (caravan reckoning) north-east of Mosul, on the left bank of the little river called the Khauser (Khosar). M. Botta's researches in this place not only proved more successful, but have led to discoveries of the highest importance, which, if the numerous cuneiform inscriptions can be deciphered, will doubtless throw great light on the antient history of Asia. Commencing his excavations in a small mound, his workmen soon came to a monument, remarkable for the number and stylo of the sculptures with which it is adorned, and which appears to have been a royal palace. M. Botta regularly communicated, during the progress of the work, with M. Julius Mohl, at Paris, to whom he wrote sixty letters, with drawings of the sculptures and copies of the inscriptions. M. Mohl published the most important letters, and the drawings and inscriptions, in the 'Journal Asiatique;' and they have since appeared in one volume, with fifty-five plates. M. Botta regretted that he was not a competent draughtsman, and wished the government to send him a good artist; and as soon as the French ministry were aware of tho great importance of the discoveries, they sent him M. Flandin, an able artist, who had lately returned from Persia, and granted sums of money to enable M. Botta to prosecute his researches. The following particulars are extracted from M. Botta's letters, and such parts have been selected as may be understood without the plans. He had great difficulties to encounter, and impediments wero thrown in his way by the ill-will of Mehemet, tho Pasha of Mosul. All are now happily surmounted, and the excavations are terminated (in 1845). M. Flandin has

* With respect to the name of this village, it is noted by an English traveller as *Hor-'sabad*, 'which,' says he, 'viewed as an Arabic and Persian compound, would designate—what it is—a city in a marsh. As to the more ancient name of the place I am quite at fault, but cannot at all admit that it constituted part of ancient Nineveh—the distance is too great.' M. Mohl says, 'Mr. Rawlinson, English consul-general at Bagdad, lately wrote to me that he has found in Yakould that this place was called by the Syrians *Sar'oun*. A letter from Constantinople, written June, 1844, says, however, 'Botta's most recent discovery is that the hill was connected with Nineveh. On the direct road from Nineveh to Chorsabad there is a series of similar hills covered with fragments of bricks and marble tablets with inscriptions, and it begins to seem probable that Chorsabad was a royal palace, situated at the end of the city. In this case the quadranglo which is still surrounded with a wall, and has generally been taken for the whole city of Nineveh, was probably only the great palace, while tho city extended to tho hill of Chorsabad, a distance of five caravan leagues.'

returned, with drawings of 130 bas-reliefs; and the greater part of the sculptures (weighing it is said above 300 tons) have been sent to Bagdad, to be embarked on board a vessel to be conveyed to France, where they are to form an Assyrian museum. M. Botta is we believe now at Paris, with copies of 200 inscriptions, and will publish an account of his great discoveries, with engravings of all the sculptures and inscriptions.

*From M. Botta's third letter, dated Mosul, June 2nd, 1843.**—'I return with increasing astonishment from my discoveries at Chorsabad. My operations have again brought to light a great number of bas-reliefs and inscriptions. . . . On the north wall of the apartment there are, first, some figures, of which only the feet remain; then a bas-relief, on which there are two archers standing and two kneeling, who wear coats of mail, and have an inscription over them. These archers are shooting at a fortress, which is taken by storm. The fortress consists of an embattled wall, strengthened by projecting towers; at the bottom there are undulating lines, probably representing a river or the water of the moat. Within this wall there is an eminence with a castle upon it, from which arise what I suppose, from their red colour, to be intended to represent flames. At the other extremity there are three warriors armed with pikes, holding their shields over their heads, and ascending a ladder; others have already reached the top; and in the intervals between the towers others are mounting scaling ladders. At the other end there are the remains of a similar scene, but this part is much damaged; we only see that one of the soldiers pursues an enemy with his sword; a man pierced with an arrow is seen falling from the top of the wall; and on several parts of the fortress others are lifting up their hands to heaven; at the bottom there is a row of wretches impaled. On the top of the hill there is a short inscription, probably containing the name of the fortress. The whole is very animated. The attitudes are perfect, and though the heads of the figures are scarcely an inch long, the expression of the features is excellent.

'After this bas-relief there are on the same wall five war-chariots following each other, turned to the fortress, and evidently meant to represent a battle. These chariots are all alike. The horses are in full gallop, and trample with their hoofs on a man lying on the ground. There are five persons in each. The principal figure wears a pointed tiara, and is discharging arrows; beside him is the driver, and behind them two warriors, armed with darts and wearing bucklers. Above there is a man who seems to be wounded, and thrown into the air with the head downmost. The singular position of this figure is perhaps meant to indicate the confusion of the battle, or the rapidity of the chariot, which violently throws to a distance whatever it encounters in its course. The scene is extremely animated; the horses in particular are very spirited. The harness of the horses is very rich, and has evidently been coloured. These five bas-reliefs are each sculptured on one of the large slabs which form the walls; and over them is a long inscription, which at first seems to be continuous, but it is certain that it is divided into parts, each bounded by the edge of the slab on which it is sculptured; in fact a perpendicular line at the edge of each slab separates the inscriptions, which differ in the number of lines.'

M. Botta describes several other figures, and proceeds:—'This description of these newly discovered sculptures is very incomplete; to describe them in detail would require a volume. I doubt whether more richly decorated walls are to be found even in Egypt. In the whole monument there is scarcely a square foot which is not covered with sculptures and inscriptions. The mode of building is everywhere the same. The walls are formed of enormous slabs of gypsum or alabaster ten or twelve feet square, and scarcely a foot thick. . . . The figures are in relief, and often lower than in Greek sculpture, but higher than the Egyptian. Though rather stiff they are well designed, the attitudes admirable, the muscles strongly marked, and the hands, feet, and ornaments very carefully executed. I have no doubt that the building has been destroyed by fire; on the ground were found a quantity of charcoal and some remains of burnt beams. The surface of the slabs is in many places calcined by fire and friable. . . . . As persons better informed than myself will probably be desirous to determine the age of the monument, I shall refrain from all discussion on the subject, and merely state some particulars which may aid them in their researches. Though the hair, the beards, and the costumes resemble the Sassanide modes, I have found no trace of any inscription in a different character from that of the bricks found at Nineveh itself: all the mythological emblems are Babylonian. I have not met with any trace of iron being employed in the monument, but many remains of articles of copper (query brass or bronze); nails, rings, and even part of a small wheel, a foot or a foot and a half in diameter. These facts indicate the antiquity of the monument; but on the other hand I have discovered that the stones with which it is built belong to a more ancient edifice. In fact, some of the slabs of gypsum have on the back cuneiform inscriptions evidently injured by time, in characters exactly resembling those on the present monument.'*

M. Botta in his fourth and fifth letter continues to give an account of the progress of his discoveries; among the most interesting are two colossal statues of bulls fifteen feet high, with human heads, and between them a passage seven feet and a half wide, forming, as he presumes, a portal of a striking character and of great magnificence. These bulls were winged; they are not properly statues, but in high relief. On clearing the passage it was found that the bodies of the bulls were continued on the walls in low relief. These figures are of large dimensions, 18 feet in length and high in proportion. They have five legs, so contrived that from whatever side you look at them, one leg being hid by another, four legs are always to be seen. On each of the walls of the passage to which this is the entrance, there is a figure with the head of a bird of prey; the hair is regularly braided, on the head is a sort of cap which comes down to the shoulder. The figure has a necklace, armlets, and bracelets, and wears a short tunic, with a fringe girdle. On the opposite side of the chamber, M. Botta afterwards found a similar portal. M. Botta resolved to send two of these bulls to Paris.

This discovery cannot fail to engage the attention of the learned; but unfortunately the greater part of these remains has already disappeared. The walls are not solid, but formed of slabs of gypsum or alabaster, with an intervening space which is filled up with earth. 'This earth,' says M. Botta, 'has caused the walls to bulge in many places, and broken the sculptures into a thousand fragments since I have cleared them. Having nothing to support them, they would fall did I not take the precaution to shore them up as I proceed; but as these supports will last only during the operations that I am carrying on, the monument will necessarily perish entirely if the enlightened munificence of the French government does not furnish me with means to save the most interesting portions.'

In a report to the Minister of the interior, M. Botta says, that on visiting the ruins of Khorsabad (after the excavation had been suspended for two months on account of the heat), 'I much regret that a great part of the sculptures is already destroyed. The inhabitants have stolen the props which I had placed to support them; the rains have caused many walls to fall. I am extremely sorry that M. Flandin has not yet arrived.'

'I am still in doubt,' says M. Botta to M. Mohl, 'respecting the destination of this monument; whether it was a palace or a tomb. The latter seems the more probable, because the interior must have been completely dark; for there is no appearance whatever of windows. At all events, the extreme richness of the decorations, and the number of battles represented, prove that it must have been built by a rich and powerful monarch.'

It is to be hoped that the 300 tons weight of the sculptures sent by M. Botta to France, the 200 inscriptions, and the drawings of M. Flandin, will enable the learned antiquarians of Europe to throw much light on the history of those remote ages.

The writer of a private letter from Constantinople says, 'M. Flandin's drawings, which we had the good fortune to see a few days ago, will greatly interest the public in general as well as antiquarians—the manners and customs, the religion, the art of war, the costumes and the instruments of the people

* M. Mohl has published only five of M. Botta's letters.

* A letter from Constantinople, of the beginning of 1844, says, "M. Botta has entirely given up his opinion that the slabs had belonged to another building. The reason is, that these plates which form the angle of all the apartments, have the two faces forming the corners hewn out of one piece, and have always at the back, an inscription which runs round the corner. To account for these inscriptions being so placed that they could never be seen while the building remained entire, we need only suppose that their contents are of a talismanic, religious, or mystical nature, and were purposely concealed, like the idols which M. Flandin found in deep recesses in the walls; which could not be got at as long as the walls remained entire."

who built Khorsabad, are here delineated in faithful copies of the bas reliefs. The principal figure in most of them is a sovereign, king, or hero; on his head he wears the tiara, his forehead is low and prominent, his eyebrows thick; his hair and beard falls straight on the shoulders and breast, terminating in large ringlets. The dress, which appears to have been extremely magnificent, consists of a richly embroidered tunic, and an upper garment, resembling the surplice of a Roman Catholic priest. This figure appears, sometimes engaged in combat, driving his enemies before him; sometimes seated at an entertainment; and sometimes in a solemn procession, guiding a chariot with four horses abreast. Among the many figures of combatants, there is frequently a shield-bearer, under whose protection another warrior draws his bow or poises his lance.—There are no female figures, except one, which is not very distinct.' M. Botta at first took several figures for females, but afterwards changed his opinion, and thought they might perhaps be meant for eunuchs.

(*Lettres de M. Botta, sur ses Découvertes à Khorsabad près de Ninive, publiées par* M. Julius Mohl, Paris, 1845.)

NIPADI'TES, a genus of fossil fruits, from Sheppey. (Bowerbank.)

NISI. [RULE (in Law), P. C.]

NISSO'LIA (in honour of William Nissole, a French botanist), a genus of plants belonging to the natural order Leguminosæ. It has a campanulate calyx, a papilionaceous corolla, and ten monadelphous stamens. The legume is stipitate, one- or few-seeded. The species are climbing shrubs, with imparipinnate leaves.

N. ferruginea has from 7 to 11 leaflets, which are alternate, oblong, mucronate, and clothed with rusty velvety down; beneath the flowers are panicled, monadelphous, and the legume straight and rather velvety. The flowers are violaceous. It is native of Guiana, and exudes from its stem a red transparent gum that has a powerful astringent flavour. It is also known by the name of *N. quiriata.*

None of the species of this genus are European, nor are they of use in art or science. A mixture of loam and peat is the best soil for them, and young cuttings will strike root in sand under a bell glass in heat.

(Don, *Gardener's Dictionary;* Burnett, *Outlines of Botany.*)

NITELLA, a genus of plants belonging to the natural order Characeæ. It is characterised by the whole plant being more or less pellucid; the cells are tubular, not invested with a secondary layer of smaller cells as in Chara; the reproductive organs consist of globules and nucules, mostly seated on the terminal whorl and axillary.

Four species of this genus have been described inhabiting Great Britain.

N. translucens has an elongated flaccid pellucid glossy stem, with the branches of the whorls spreading, elongated; the nucules and globules approximate, on the smaller ramuli scarcely bracteated. It grows in deep and stagnant ponds, but is by no means a common plant in Great Britain. It is the largest of the British species, and best adapted for the examination of the curious currents, which are obvious in the whole of the family to which it belongs. [SAP, P.C.]

N. flexilis has a stem one to two feet long, smooth, flaccid, somewhat glossy and pellucid. It is not unfrequent in lakes and still waters. The nucules are often solitary. The stem, like that of Chara, is often incrusted with carbonate of lime. Hassall thinks this constitutes the only distinction of Agardh's *N. opaca.*

N. nidifica, has single stems, smooth below, flaccid, somewhat glossy and pellucid: the nucules and globules separate. It is a native of the salt water ditches in the south and east of England.

N. gracilis has smooth, glossy, pellucid stems, with whorls of the branches compound, the segments acute, the bracts wanting. This is a small delicate and elegant species, but probably not distinct from N. flexilis. In fact, it may be questioned whether all these species are not varieties of one.

(Hassall, *Freshwater Algæ;* Smith, *English Botany.*)

NODAL POINTS AND LINES. The former are those points in the length of a string extended between two fixed objects, or in a column of air confined at one or at each extremity, which, when the string or column is put in a state of vibration, are found to remain at rest; and the latter are corresponding lines which exist on the surface of an elastic body, usually a plate, whose parts are in a state of vibration.

It is well known that if a string or a metallic cord be attached at its extremities to a board or plate, on causing it, when in a state of tension, to vibrate transversely, there may be distinguished, besides the principal sound, which is due to the length of the string, several others which have a greater degree of acuteness; these are called *harmonic sounds,* and they are conceived to result from some property of the extended string, by which, when in a state of vibration, it becomes a sort of moving axis, having on it points, at distances from one another equal to some aliquot part of the whole length of the string, at which points a contrariety in the directions of the vibrations of the particles keeps the latter in a state of rest. Such are called *nodal points;* and they may be conceived to form themselves in consequence of inequalities in the thickness or density of the string, or of different degrees of flexibility in its different parts. The string between every two such points is in the same condition as if it were attached at those points to fixed objects; its partial vibrations are consequently such as are due to the distance between the points, and hence arise the secondary or harmonic sounds.

A string of considerable length, on being made to vibrate, will be found to have several such nodal points, and the curves which the intervals assume in consequence of the vibrations, though alternately on opposite sides of the axis of the string, are equal and similar to one another. The situations of the nodal points may be made evident by placing, at intervals, across the string, pieces of paper notched or bent in the form of an inverted V; those which are at the places of the nodes remaining at rest, while the others experience considerable agitations, or are thrown entirely off.

If a string, in a state of tension, have its extremities attached to a board or a plate of metal, and be made in some part of its length, to pass over a bridge resting in the centre of the board or plate, the vibrations of the string, when a violin-bow is drawn across it, will be communicated to the plate; and if over the latter light dust be strewed, that dust will be agitated and made to arrange itself on lines at which the surface of the plate is in a state of rest: these are called *nodal lines,* and the figures which they form are called Acoustic figures. Again, if a glass rod be cemented at one end to the centre of a disk of the like material, and be excited by being rubbed, for example, with a wet cloth, so as to be put in a state of vibration longitudinally, those vibrations will be communicated to the disk, and light dust strewed over the latter when in a horizontal position will arrange itself in acoustic figures. Or, if a glass rod be connected at each extremity to a glass disk at right angles to its length, on exciting one of the disks by drawing a violin-bow across its edge, the vibrations of that disk will, by means of the rod, be communicated to the other; and if light dust be strewed over both it will arrange itself in figures: when the disks are equal and similar to one another, the figures are alike on both; otherwise they differ.

If a column of air in a cylindrical tube which is closed at either, or at each end be acted upon by the force of the breath, for example, applied at an aperture in any part of its length; it will spontaneously divide itself into portions in which the particles are subject to equal and similar vibrations [ACOUSTICS, P. C.; VIBRATION, P. C.]: these portions are separated from one another by sectional areas in which the particles are at rest; the condensations, or rarefactions, of the air being, in those areas, greater than in any other parts of the tube in consequence of the particles moving in contrary directions, and with equal velocities towards, or from, them. Such areas are called *nodal sections,* and several may exist at the same time in the tube. Their existence is rendered evident by boring small holes in different parts of the sides of the tube and covering them with pieces of thin paper slightly adherent to the surface: at the nodal sections the papers will be scarcely affected, while, in the intervals, they will be greatly agitated.

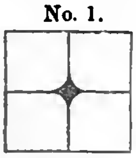
If, in the side of a tube containing a column of vibrating air, any aperture exist by which that air is enabled to communicate with the atmosphere, the air in that section becomes in equilibrio with the latter, and, in that section, there is consequently neither condensation nor rarefaction: this section corresponds to the middle point between two nodes in a vibrating string.

Vibrations corresponding to those which are produced in strings or rods and in columns of air may be conceived to take place in any solid bodies or in any elastic fluids whatever be the figure of their mass: in such a mass there may be several places at which the vibrations are performed in contrary directions so as to produce nodal lines; and these, when they occur on the surface of the mass, may become sensible by means of light dust strewed over it. Some of the vibrations are found to take place parallel to the surface, and others perpendicular to it: the former being called tangential, and the latter normal vibrations. In one case the particles of dust glide upon the surface in directions which tend alternately towards and from the nodal lines (the movements in the former direction being always more rapid than those in the other) till they come to a state of rest on those lines: in the other case the particles alternately rise from and fall back upon the surface at the places where the latter is in a state of vibration; and, dispersing from those places, they become quiescent in the lines of no vibration.

Galileo was the first who observed (*Dialoghi delle Scienze Nuove*) that the vibrations of elastic plates might be rendered visible by covering the plates with fine sand; and he remarked that the sand became accumulated at the parts where the vibrating plate was in a state of rest: but this subject was extensively investigated by Dr. Chladni of Wirtemberg, who first discovered the longitudinal vibrations of solid bodies; and, in 1787, published, in a work entitled *Entdeckungen über die Theorie des Klanges*, an account of numerous experiments which he had made on the nature of the vibrations produced in plates of glass of different forms.

The plates with which such experiments may be performed should be of good window glass; and, if square, from 4 to 8 inches on each side; if circular, their diameters may be within the same limits: in making an experiment the plate must be held horizontally between a finger and thumb, or it may be fixed within the lips of a clamp screw; and when it is required to prevent any particular part of the plate from vibrating, that part, if on the edge, may be pressed against a fixed object, or, if at any part of the surface, one of the fingers of the hand may be pressed gently upon that part. The plate being in a horizontal position, it must be covered with a layer of fine dust; and it may be put in a state of vibration by drawing a violin-bow across its edge: the dust will then arrange itself in figures which will vary with the form of the plate, the place at which the bow is applied, and that at which the plate is held. If, for example, a square plate be held at its centre, and the bow be applied near one of the angles, the dust will arrange itself in lines so as to divide the plate into four equal squares (No. 1). If the plate be held as before,

No. 1.



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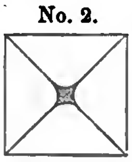

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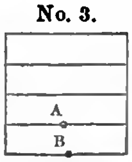

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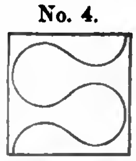
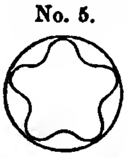


and the bow be applied at the middle of one of the sides, the vibrations will be such as to make the dust lie in the directions of the two diagonals (No. 2). Again, if the plate be held at A (No. 3) and the bow be applied at B, the dust will assume the positions of three lines parallel to one another: and if the plate be held at a point nearer the edge, the lines will become curves, as in No. 4.

If a circular plate, held at the centre, be pressed against a fixed object at any point on its circumference, and the bow be applied at 45 degrees from that point, the lines will take the positions of two diameters at right angles to one another, one of them passing through the point at which the circumference touches the object. A greater number of radiating lines than four will be produced if the bow be drawn more rapidly and with less pressure against the edge of the plate than in the former case. If the centre of the circular plate be free, various curve lines will be assumed by the dust, according to the position of the point which is held; and one of them is represented in No. 5. The figures represented in

No. 5.



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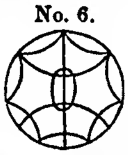
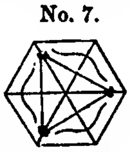
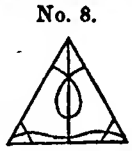


No. 7.



No. 8.



Nos. 6, 7, and 8, are selected from the great number which Chladni has obtained with glass plates of a circular, a polygonal, and a triangular form.

M. Felix Savat, has observed, that if a rectangular plate of glass about 27 inches long, $\frac{3}{4}$ inch broad, and $\frac{1}{16}$ inch thick, be held horizontally between a finger and thumb at the middle of its opposite edges, and it be put in a state of longitudinal vibration, either by rubbing its under side, near one of the ends, with a wet cloth, or by striking it gently at one end, the dust on the upper surface will arrange itself in lines perpendicular to the length of the rod. It is remarkable, that if the plate be turned with its upper face downwards, being held as before, and vibrations be produced in like manner, the places of the nodal lines will be opposite to the middles of the intervals between the lines observed in the other position of the plate—a circumstance which proves that the motions of the particles in one-half of the thickness of the lamina of glass are directly contrary to those in the other half. A like effect has been observed when cylindrical rods of glass have been made to vibrate longitudinally; the line of nodes then assuming a spiral form about the cylinder, and the curves consisting of portions which run alternately in contrary directions: the points of greatest and least inclination to the axis of the cylinder are at 90 degrees from each other with respect to a line drawn on the surface parallel to the axis, and the effect is such as would arise if the cylinder were divided longitudinally into four quadrantal portions, having opposite qualities. The places of the nodes on that part of the rod which was uppermost were found, the rod being held in a horizontal position, by annular pieces of paper loosely encircling it.

In 1822, M. Savart read to the Académie des Sciences at Paris, an account of some curious experiments in which acoustic figures were produced in consequence of vibrations communicated through the air to elastic membranes. (Brewster's Edinburgh Journal of Science, vol. ii. p. 296.) A sheet of thin paper was slightly stretched over a glass vessel four or five inches in diameter, and on it was strewed light dust. A thin circular plate of glass, in a state of vibration, was then brought within a few inches of the paper, when the vibrations were communicated to the latter, and, the paper being of uniform thickness and well stretched, the dust assumed figures which were perfectly regular. M. Savart, having rendered the glass plate immoveable at opposite points on its circumference by holding it there between the thumb and a finger of each hand, placed the tip of another finger at a point on the surface, at a distance from the centre equal to about one-fifth of the diameter, and caused the plate to vibrate by drawing a violin-bow across its circumference. In these circumstances, on presenting the plate to the stretched paper, the following appearances were observed. The nodal figures on square paper were analogous to those formed on a square plate of glass or metal, and on circular plates their general character was circular. The circular lines were sometimes cut by diametrical lines which formed nodal points, or stars, and the number of these increased with the acuteness of the sound produced by the bow. When the plate of glass was parallel to the paper, the nodal lines were similar on both, as when two plates were connected with each other, by a rod fixed perpendicularly between them. When the plane of the glass plate was held vertically, the nodal lines on the paper became parallel to one another; and the figures on the paper changed as the glass plate was made to decline from the vertical position.

NODIER, CHARLES, was born at Besançon, in France, on the 29th of April, 1780. Under the care of his father, a man of stern principles and of a cultivated mind, he evinced in early life a considerable disposition for the acquirement of knowledge. At the age of twelve he entered on a course of classical study, which was, however, soon interrupted by the events of the Revolution, the principles of which his father, at that time mayor of Besançon, warmly espoused. During the Reign of Terror young Nodier employed himself in writing poetry and composing tragedies on classical subjects. These early compositions he was accustomed to read to an aged friend, who judiciously advised him to devote himself to more serious pursuits. The beneficial consequence of his advice became manifest, when five years afterwards he published a work of considerable research and great critical acumen, entitled 'Le Dictionnaire des Onomatopées,' that is, a dictionary of words which derive their signification directly from the action which they represent (ὄνομα, 'a name,' and ποιέω, 'to make'), as the verb 'to hiss' in our language, and 'siffler' in French. At the suggestion of Fourcroy [FOURCROY, P. C.], it was used as a class-book throughout France, and a copy of it, by order of government, was placed in the library of every Lyceum or public school. The preface of this remarkable work on philology evinces great grammatical knowledge, and is not inferior in style to any of his later productions. During the same period of the Reign of Terror he formed an acquaintance which terminated in the most intimate friendship with Mons. de Chantrans, a Royalist officer, who was compelled to seek for safety in a retired country-life; through him Nodier acquired a taste for the study of natural history, to which he afterwards devoted a considerable portion of his time; it was especially to the minute examination of insects and flowers that he attached himself, and his taste for them is strongly marked in all his after-productions. He published in 1798 the result of his studies in a dissertation on the organs of hearing in insects, and in 1801 in a small work entitled 'Bibliothèque Entomologique.' In 1796 Nodier had gone to Paris, where, furnished with numerous recommendations, he had been introduced into the best literary societies of that time. Two years afterwards he retired to his native town; but soon becoming wearied of the monotony of a provincial life, he sought for novelty in the society of the political prisoners and suspected Royalists, who at that time abounded at Besançon. His imprudence, however, became the fortunate means of bringing his talents more prominently into notice. The company he was keeping brought him under the suspicions of the government, and his room was one night forced open and searched by the police agents, and his papers placed in the hands of the prefect, Jean Debry, one of the deputies of the French Republic, who was imprisoned at Rastadt by the Austrians. While searching among his papers for some traces of a political plot, Debry met with the manuscript of 'Le Dictionnaire des Onomatopées,' and was surprised to discover the deep research and learned disquisitions contained in a work of a young man whose habits were apparently so frivolous. With just discernment he perceived to what important uses might be applied the power of a mind so brilliant in imagination and so persevering in study. Under his influential auspices the work was published, with the success already mentioned.

At the Revolution which placed Napoleon on the throne, Nodier, who during the most turbulent periods of the Republic had expressed opinions favourable to the Royalists, became under Napoleon a stern Republican. Indeed, in the strict acceptation of the term, he had no political opinions. The disposition of his mind always prompted him to oppose the prevalent tendencies of the age. Thus, under the Republic, which discountenanced religion, Nodier professed openly the most religious sentiments; under the Consulate, he was at one time a Girondist, at another a Vendean; under the Empire, he was a discontented Liberal; under the Restoration, he sung the praises of the political party which had brought to the scaffold the brother of the reigning king. The following remark made to a young friend, who has lately published a most interesting relation of his life, is the best index of his disposition: 'My child,' he one day said to him, 'of whatever political struggles you may become witness, always abide by the side of the conquered; their cause is almost invariably the most just.'

His first poem, 'Napoleone,' is consecrated to the defence of liberty, and appeared in 1800, when military power was assuming the ascendant; the last lines are a tribute of praise to 'the martyred Sidney.' The author of a poem filled with unseasonable praise of democratical institutions, was sought for among the ranks of the suspected republicans; and several had already been arrested, when Nodier acknowledged the poem as his own. An imprisonment of some months was the result, at the expiration of which he was sent back to his native town, and placed under the inspection of the police. These measures of the government, as they were the means of secluding him from society, enabled him to devote more time to literature, and he especially attached himself to a critical study of his own language. It was during this period that appeared his 'Examen critique des Dictionnaires de la Langue Française;' a work replete with the most learned and instructive remarks. To this period also is to be assigned his 'Peintre de Saltzbourg,' which he composed while wandering over the country to avoid the watchful persecution of the government agents. After some years spent in this manner of life, he retired to Dôle, where he gave public lectures on French literature, which met with success unprecedented in a small country-town. It was there that he first became acquainted with Mademoiselle Desirée Charvés, a lady of great accomplishments and personal attractions, whom he afterwards married.

Nodier spent the first years of his married life at Quintigny, near the Jura; it was amongst the picturesque woods and meadows which adorn the neighbourhood of that town that most of the poems which have added so much to his celebrity were composed. The necessity of providing for the subsistence of his family obliged him to abandon the charms of a country life in order to settle in Paris. Previous to leaving Dôle he had solicited the vacant situation of public librarian of that town, to which was attached the small salary of 1000 fr., about 40*l.* a year, but the corporation, with a singular want of discernment, had refused it to him. In Paris he soon made himself known by his numerous publications, and became a regular contributor to the 'Journal des Débats.' A short interruption to his residence at Paris was caused by the acceptance of the office of librarian at Laybach in Illyria, with a salary of 1800 fr., half of which he generously bestowed upon an aged German who had been his predecessor. The restoration of the Bourbons produced little change in the fortunes of Nodier; he continued attached to the 'Journal des Débats,' which paper he afterwards left to undertake the direction of the 'Quotidienne.' This period of Nodier's life was rich in literary labour; each successive year he produced a work, which, taken by itself, was sufficient to confer celebrity on the author. In 1818 appeared his 'Jean Sbogar,' in which he displays an intimate knowledge of German literature; in 1819 'Thérèse Hubert,' a short romance remarkable for the unaffected beauty of its style and the simple development of its plot; in 1820 'Adèle,' another imitation of the German; in 1821 'Smarra,' derived from the writings of Apuleius, and 'Trilby' in 1822.

Nodier was shortly after this nominated to the important situation of librarian to the Arsenal at Paris. Nodier's rooms at the Arsenal soon became the resort of the most distinguished literary men of the capital, who were attracted thither by the amiable affability of the librarian, and by the charms of his brilliant and learned conversation. Among the most constant of his visitors were Victor Hugo, Lamartine, Alexandre Dumas, and Ste. Beuve. It is not the least surprising fact connected with the life of this remarkable writer, that amidst the incessant occupations of his situation, and the time which he devoted to the society of his friends, he should have produced so many works, all of which bear the stamp of original genius. It would be here impossible even to enumerate all his productions. He was a contributor to the 'Biographie Universelle' and other publications, and the originator of the 'Grand Dictionnaire Historique,' while almost daily publishing various works of a more popular character, such as his 'Souvenirs de la Jeunesse,' 'Inès de las Serras,' 'Les Fantaisies du Docteur Néophobus,' 'Dernier Banquet des Girondins,' and 'Franciscus Columna,' his last and perhaps most remarkable novel. In 1834 the French Academy did him the tardy justice of electing him a member of their body in the place of Mons. Laya.

At length, under the effects of constant application, Nodier's health gradually gave way. The evening before Christmas, 1843, was the last in which he was permitted to enjoy the society of his literary friends. Three days after he was taken with a serious illness, more lingering than painful, and expired on the morning of the 27th of January, 1844.

Nodier's character is described by those who enjoyed the privilege of his acquaintance as peculiarly amiable and unaffected. With more than an ordinary disposition to raillery and sarcasm, he ever tempered the sallies of his wit with kind consideration to those against whom they were directed. The father of a family, which he maintained by the most incessant literary labour, he had none of that irritability of temper too often the accompaniment of genius. When he was placed under the necessity of administering reproof, it was disarmed of offence by the simple modesty of his manner: to an acquaintance who had brought him a work for his perusal, in which he had made a bad imitation of his style and method, he remarked: 'My friend, what you have given me to read cannot be very good, for, at first sight, I mistook it for my own.'

His peculiar characteristic as a 'littérateur' is that he devoted the energies of his mind to no special subject, but to write on almost every subject, and that in a way which leads one to suppose that, had he attached himself to it, he might have attained the highest eminence. As a poet his merit consists in the purity of his style and diction, his hostility to the innovations which have been introduced in French literature, and his faithful adherence to their best classical models. In one respect he deserves especial praise, the substance and moral of his writings are as pure as his style.

There is a short but most interesting biography of Nodier by his friend Francis Wey, Paris, 1845; and also in the 'Portraits littéraires de Ste. Beuve;' to these two works we are chiefly indebted for the materials of this article.

NOLA'NA (so named by Linnaeus, from nola, a little bell, on account of the bell-shaped form of the corolla), a genus of plants belonging to the natural order Solanaceæ and the tribe Nolaneæ. It has a 5-cleft calyx, a campanulate 5-lobed 5-plicate corolla; 5 stamens adhering to the tube of the corolla, nearly equal. The anthers are 2-celled, dehiscing lengthwise. The seeds are roundish, with a membranous testa, and fleshy copious albumen. The species are herbs, natives of Peru and Chili, usually annual. Leaves alternate, quite entire. The flowers are solitary, pedunculate, and of a showy blue colour.

N. prostrata, prostrate Nolana, has a prostrate stem, ovate oblong leaves, a pyramidal calyx, with triangularly sagittate segments, furnished with spur-like processes at the base. It is a native of Peru, but grows freely in this country in the open air. In France poultry are fed upon it, and are so fond of it that Persoon proposed to call it *N. gallinacea*.

N. paradoxa has prostrate hairy stems, ovate obtuse pilose leaves, the segments of the calyx triangular, the corolla campanulately funnel-shaped, the drupes cumulated, 1-seeded. It is native of Chili, on the sea-shore about Concepcion. The flowers are blue.

The species of Nolana are only valuable as ornamental plants; they are showy when in blossom, and are much like some of the trailing species of Convolvulus. The seeds should be sown in a gentle hotbed in the spring, and the plants when of sufficient size or about the middle of May should be finally transplanted to the open ground, where they will flower and ripen seed; or the seeds may be sown at once in the open border in a warm sheltered situation.

(Don's *Gardener's Dictionary*; Burnett's *Outlines of Botany*).

NOLLET, JEAN ANTOINE, a distinguished French philosopher, was born at Pimpré, in the Noyonnais, in 1700. It being the intention of his father, who held a farm in that part of France, that he should embrace the ecclesiastical profession, he was sent to the college of Beauvais, in order that he might prosecute the study of theology; but his taste inclining him to cultivate the physical sciences the intention was abandoned, and he was never otherwise connected with the church than by holding deacon's orders with the title of Abbé. On leaving the college he went to Paris, where he attended a course of lectures on natural philosophy, the subjects of which he studied with great diligence, repeating in his humble dwelling the experiments which he had seen performed in public. He passed many of his leisure hours in the practice of enamelling; and he is said, at one time, to have superintended the education of a son of M. Taitbout, who held the post of recorder.

The Abbé Nollet applied himself particularly, in conjunction with M. Dufay, to the subject of electricity; and he soon became distinguished by the number as well as the ingenuity of his experiments with relation to that science, performing them in the laboratory of M. Réaumur, who generously permitted him to make use of his valuable apparatus. He was the first who observed that pointed bodies, when electrified, gave out streams of light, but did not exhibit in other respects such powerful indications of electricity as were shown by blunt bodies; and he found that the smoke of burnt linen and wood, and the vapour of water, were better conductors of electricity than the smoke of gum-lac, turpentine, or sulphur. He ascertained that an excited tube lost none of its electricity by being placed in the focus of a concave mirror when the sun's light was concentrated in that point; that glass and other non-conductors were more strongly excited in the air than in vacuo; and that oil of turpentine on a woollen cloth was capable of producing the electric fluid in abundance: he observed also the diffusion of the electric light in vacuo. He discovered that electricity augments the natural evaporation of fluids, and that the effect is the greatest when the fluids are contained in non-electric vessels.

In repeating the experiments of M. Boze on the effects of electricity in promoting the discharge of fluids through tubes, Nollet found that no acceleration took place when the bore of the tube exceeded $\frac{1}{12}$ inch in diameter: he ascertained however that if the bore was very small the electrified fluid divided into several streams and acquired considerable velocity, presenting a brilliant appearance when the experiment was performed in the dark. He electrified, during several days, the mould in a garden pot, in which seeds had been sown, continuing the operation three or four hours each day; when it appeared to him that the plants grew faster and produced shoots earlier than the plants obtained from the like seed in a pot containing the same kind of mould, but which was not electrified. Nollet electrified in the like manner cats, pigeons, sparrows, &c.; and he imagined that the animals were lighter than those of the same kind which were not so treated: from thence he concluded that electricity increases the insensible perspiration of animals. Accounts of these experiments will be found in the Philosophical Transactions for 1748; but it ought to be observed that experiments relating to the effects of electricity on plants and animals have, since, been frequently repeated without verifying the conclusions of the French philosopher; and it may be added, that the attempts which have recently been made to promote the growth of vegetables by an apparatus for conveying to the ground the electric fluid in the atmosphere, have signally failed.

In 1734 the Abbé Nollet, accompanied by his friend M. Dufay, made a visit to England, when he was elected a Fellow of the Royal Society of London: he went from hence to Holland for the purpose of conversing with the philosophers of that country; and, on his return to Paris, he delivered a course of lectures on physics, which was well attended. In 1739 he was elected a member of the Académie des Sciences: and, during the same year, he went to Turin, where he repeated his electrical experiments in presence of the Duke of Savoy. In 1742 he went by invitation to Bordeaux, where he delivered a course of lectures; and he subsequently delivered a course at Versailles in presence of the dauphin of France, the son of Louis XV.

Nollet made many experiments to ascertain, at various depths under water, the intensity of sounds excited in the air; and he perceived that the striking of a clock and the blowing of a hunter's horn were heard distinctly, but very faintly, at two feet below the surface. He was not fortunate however in his hypothesis concerning the nature of the electric fluid: he imagined that this fluid has two motions, viz. an afflux to the electric body and an efflux from it, and he supposed that, in consequence of the former, all light bodies are attracted or carried towards the electric; while, in consequence of the latter, they are repelled from it. Hence he considered that all bodies have two different kinds of pores, one kind for receiving and the other for emitting the electric fluid. This hypothesis has never been admitted by philosophers.

In 1747 Signor Pivati, of Venice, published a pamphlet in which it was stated, that a man who had suffered from a pain in his side had by him been cured on being electrified with a machine in the glass cylinder of which was contained some balsam of Peru; and that two persons of great age had been cured of the gout by the like means: the benefit was supposed to have arisen from the effluvium of the balsam, which was stated to be so great that the bed and even the whole apartment of one of the patients who had received it was strongly perfumed with it. Professor Winkler of Leipzig also stated, about the same time, that he had performed similar experiments with equal success, by means of sulphur or cinnamon enclosed in the globe of the machine. These extraordinary reports induced the Abbé Nollet to make a journey to Italy for the purpose of obtaining information respecting the nature of the experiments; and the result of his inquiry was that, though in some cases the patients might find relief from electricity, its effects had been greatly exaggerated. All attempts in England to obtain results corresponding to those which were said to have been produced on the continent entirely failed; and the reports of the pretended cures soon ceased to obtain credit.

In 1756 the king of France founded a chair of experimental philosophy at the college of Navarre, and he appointed the Abbé Nollet to superintend it: the zeal and ability with which the latter fulfilled the duties of his post gave full satisfaction to the king, who conferred on him the title of Master of Philosophy and Natural History to the Royal Family. Nollet was subsequently appointed Professor of Experimental Philosophy to the School for Artillery, which then existed at La Fère, and which was afterwards removed to Mézières.

He died April 24, 1770, in the Louvre, where the king had assigned to him a suite of apartments: the amiability of his character was equal to his talents; and it is said that he devoted nearly all the profits of his labours to the support of his parents while they lived. Besides being a Fellow of the Royal Society of London and a Member of the Académie des Sciences at Paris, he was a Member of the Institut of Bologna and of the Académie of Erfurt.

The Abbé Nollet published at Paris, in 1743 and the succeeding years, a work entitled 'Leçons de Physique Experimentale,' in 6 vols. 12mo.; this is considered as the most methodical work on that subject which had till then appeared, and it was the first in which the discoveries of Newton respecting the phenomena of light were stated in a popular form. His second work is entitled, 'Recherches sur les Causes particulières des Phénomènes électriques,' in 12mo., 1749; and the third, 'Essai sur l'Electricité des Corps,' 12mo., 1750. He also published, in 1753, his 'Recueil de Lettres sur l'électricité,' in 3 vols. 12mo.: and a work by him entitled 'L'Art des Expériences,' was published in 1770, also in 3 vols. 12mo.; this work contains the elementary principles and the practice of the mechanical arts.

(*Biographie Universelle; Philosophical Transactions* for 1748.)

NONATE'LLIA, a genus of plants belonging to the natural order Rubiaceæ, the tribe Guettardeæ, the subtribe Morindeæ. It has a calyx with an ovate tube, and a 5-toothed permanent limb; a tubular funnel-shaped corolla, with the tube as if it were gibbous, and a 5-lobed limb; the stamens five, almost inclosed; the stigmas (2?) obtuse; the fruit a globose drupe, furrowed, containing 5 coriaceous 1-seeded pyrenæ; the albumen horny. The species are shrubs or small trees with glabrous downy oval-oblong leaves, and the stipules combined together more or less or free. The flowers are white and arranged in a panicle-formed or corymbose thyrse.

N. officinalis, Asthma Bush, has ovate, acute, glabrous leaves, the stipules combined into a 4-toothed sheath, the panicles corymbose; the involucrum small, 3-leaved under each flower. It is a native of Guiana, in forests and sterile places. All the parts of this plant, when bruised or dried, give out a slight aromatic odour. The creoles in Guiana call this plant *Azier à l'asthme*, and it is said to have a powerful influence in subduing attacks of asthma.

There are several other species of Nonatellia, all natives of America, but none are used in the arts or as medicines.

(Lindley, *Flora Medica;* Burnett, *Outlines of Botany.*)

NONIONI'NA, a genus of foraminifera. It occurs fossil in the coralline crag. (Morris's Catalogue.)

NORD, DEPARTEMENT DU. In our notice of this department of France, [NORD, P. C. vol. xvi. p. 253, &c.] references were given to articles CASSEL and GRAVELINES, from which in their places, references had been given to the article NORD. We here supply a brief notice of those two towns.

Cassel is situated on an isolated eminence, the summit of which, Mont Cassel, close to the town, rises to the elevation of from 300 to 350 feet, in the midst of a level country; and commands a prospect of great extent, comprehending more than thirty towns, and extending to the ocean. Two streams, (one of them the little river Peene,) which flow into the Yser, rise near the town and furnish the inhabitants with a constant supply of water. The town, which was antiently fortified, is neat and clean, with a large '*place*,' irregularly laid out. The population of the commune by the census of 1831 was 4234; by that of 1836, 4495; about three-fifths in the town, the rest in the neighbourhood. Some lace, stockings, hats, and coarse earthenware are manufactured; there are oil-mills, and a considerable trade in cattle is carried on. Cassel has one yearly fair of seven days. The town has some historical interest. It is thought to have been one of the strongholds of the Morini, and was known in the Roman period by the name of Castellum Morinorum, whence the modern name Cassel. In the middle ages it was the scene of two severe conflicts. In A.D. 1071, Philippe I., King of France, was defeated by Robert Le Frison, who had usurped the county of Flanders from his nephew Arnulphe, whom Philippe supported, and who was killed in the battle. In A.D. 1328, Philippe VI. de Valois, King of France, defeated, with dreadful slaughter, the Flemish insurgents who had surprised him in his camp. In later times A.D. 1677, William, Prince of Orange, afterwards William III. of England, was defeated here by the French under the Duke of Orléans. Cassel is in the arrondissement of Hazebrouck, 148 miles from Paris by Amiens, Doulens, Lillers, Aire, and Hazebrouck.

Gravelines is near the coast between Calais and Dunkerque, in the arrondissement of Dunkerque, on the river Aa, twelve miles N.E. of Calais, and 170 N. of Paris by Beauvais, Abbeville, Boulogne, and Calais. It is a small town, but strongly fortified with a good citadel; but has very little trade. The Aa is navigable up to the town for small vessels, and some fishing is carried on, and small vessels are built. The town is laid out with tolerable regularity with wide streets. There are a church, a nunnery, a military hospital and barracks. The population of the commune was by the enumeration of 1831, 4193; by that of 1836, 4642. It is the chief place of the canton of Gravelines. The town has some historical interest from the defeat of the French in A.D. 1558 under the Maréchal De Termes, by the Spaniards under Count Egmont, assisted by some English ships that were off the coast.

(Malte Brun, *Géographie;* Vaysse de Villiers, *Itinéraire Descriptif de la France; Annuaire du Dép. du Nord;* Sismondi, *Hist. des Français; Dictionnaire Géographique Universel.*)

NORFOLK ISLAND PINE. [ARAUCARIA, P. C.]

NORMANDY, CUSTOMARY LAW OF. Previous to the first Revolution the several provinces into which France was divided [FRANCE, P. C.] were chiefly governed by a system of laws which, originally arising from the local usages and customs of the people, became in after time embodied in a code which, after it had received various modifications, obtained the sanction of the sovereign, and became the written and established law of the province. These codes were styled customs, 'coutumes,' and have been largely and learnedly commented upon by the various jurists of the period; their commentaries were often received as law; thus we have the customs of Burgundy, Brittany, &c., commented upon by Bouhier, D'Argentré, &c. The customary of Normandy, if not the most ancient, ranks certainly among the most ancient of the French provincial customaries. According to it laws, customs, and usages, were regulations of a very different order and authority: the laws were enacted by the sovereign power, reduced to writing, and registered by the exchequer, afterwards denominated the parliament of Rouen; its customs originated with the people, and in time were compiled and reduced to writing by the supreme authority. Hence the difference between 'loi,' 'us,' and 'coutume,' as understood in the ancient provinces of France. By 'loi' or law was understood the royal ordinances and Roman law; by 'coutumes' or customs those regulations which had been reduced to writing and received the sanction of the sovereign; by 'us' or usage, such regulations as had not been reduced to writing. Normandy, as an independent state, and after its annexation to the crown of France under Philip Augustus [NORMANDY, P. C.], may be said to have had three distinct codes; 'le grand coutumier' or ancient customary, 'la charte aux Normands,' or Norman charter, and the modern custom. The ancient and modern custom related more particularly to property, &c.; 'la charte aux Normands' to the political liberty of the subject. The Norman charter was granted by Louis X., and its principal object was to restrain the kings of France from imposing too heavy burdens on their Norman subjects: this charter was confirmed six times from its promulgation to the reformation of the customary by Henry III., which fact affords a fair presumption that it had been often violated. The customs of Normandy were first reduced into writing by a private hand in the reign of Louis IX., about the year 1229, which corresponds with 14 Henry III. of England. Being subjected to examination under Charles IX., many of its reforms were sanctioned by the high authority of the Chancelier L'Hôpital, and the modern reform dates from 1585 under Henry III. This custom was known thoughout France by the appellation of 'la sage coutume.' The number of provincial customs of France before the Revolution were reckoned at eighty, and its local usages at nearly three hundred. In Normandy there were no less than twenty-two different modes of devising patrimonial estates, which corresponded to the number of vicomtés or districts of which the province was composed.

The oath of a Norman duke so late as the thirteenth century differed very little from that of a king of France: he swore to protect the church and the property of the different orders of the community by the impartial administration of justice, and more particularly to govern according to the Norman charter.

'L'Ancien Coutumier' is divided into 125 chapters, nearly two-thirds of which are devoted to regulate the duties of the judicial officers, the proceedings in the different courts, and the respective rights and obligations of the kings of France, the dukes of Normandy, the feudal lords and people. The power of the kings of France was very inferior to that of the dukes of Normandy, and even to that of the counts and great territorial barons, who in those days monopolised the land, and with it all local influence. The transmission of property by wills and inheritance, which occupy so large a portion of modern law and of the reformed Norman law in the sixteenth cratury form a very small portion of the 'Ancien Coutumier.'

The modern or reformed 'Coutumier de Normandie' is divided into 24 chapters, which are subdivided into 622 articles. The modern 'Coutume' was reformed at Rouen on 1st July, 1585, by commissioners appointed by Henry III. of France with the concurrence of the provincial authorities known as 'les gens des trois états,' or three orders representing the nobility, clergy, and people.

Among the peculiar customs of Normandy was 'la clameur de Haro,' which custom still prevails in the Channel Islands, where the Norman ancient customary is the principal law. [ALDERNEY, P.C.; GUERNSEY, P. C. and P. C. S.; JERSEY, P. C.] The 'Clameur de Haro' may be denominated a call upon the supreme authority for justice, 'appellatio ad principem ad opem in lite ferendam.' The term is considered to be derived from Duke Rollo, or as the name is variously spelt, Raoul, Roul, and Rou, to whom Normandy was ceded by Charles the Simple of France, in 912. (Du Moulin's Hist. de Normandie, lib. i. c. 9, and lib. vii. cap. 20.) So that 'Haro' is a corruption of the cry Hal, or Ha Rou, by which this prince, who was remarkable for his justice, is said to have been invoked. It is thus practised in the Channel Islands: when an individual considers that another is making a trespass, or is infringing upon his right of property, in the presence of two witnesses he protests against the proceedings, and, crying out three times 'Haro,' in the queen's name summons the trespasser to desist. He then applies to the judicial authorities, declaring what he has done, and proceeds to the register, or record office, where note is taken of the particular circumstances of the case; he afterwards brings an action against the trespasser. If he neglects to do so, then the person against whom the 'Haro' was cried may bring his action against him who cried it, and oblige him, if he cannot justify his proceedings, to desist and submit to the judgment of the court. Upon the action of either of the parties the decision is generally referred to what is termed 'une vue de justice,' or an examination by the court of all the circumstances on the spot itself. Whichsoever of the parties is condemned, he is subjected to a small fine to the queen and pays all costs; in addition to which he was formerly punished by what was termed 'un regard de château,' that is, twenty-four hours' imprisonment; the imploring the aid of the prince without cause and the invasion of another's possession being accounted equally criminal. In ancient Normandy parties resorted to the 'Clameur de Haro' in cases of assault and battery, but that part of the custom has never prevailed in the Channel Islands.

The president or chief judicial officer in Guernsey is still styled bailiff,* the name by which he is designated in the ancient 'Coutumier de Normandie.' In Jersey he is styled bailly, by which name he is designated in the modern customary of the same island. In Alderney this officer is styled juge. In each island they are appointed by the crown to administer justice; and their authority continues to this day much the same as laid down in the ancient 'Coutumier,' wherein it is stated that the bailiff is intrusted by the prince or duke with power to administer justice to the people who owe him allegiance. It is his duty to maintain order, to decide according to law and usage all disputes arising between parties residing within his jurisdiction; and to put down all thieves, incendiaries, and other malefactors.

It was remarked at the commencement of this article that the different provincial customaries had been frequently commented upon. The first commentary on the Grand Coutumier of Normandy was written by Rouillé, a jurist of Alençon (Guillaume de Rouillé, *Commentaire sur la Coutume de Normandie*, fol., 1534, reprinted in 1539). It was followed by that of Terrien of Dieppe, which was published in 1574, after his death (Guillaume Terrien, *Commentaire sur les Coutumes anciennes de Normandie*, fol.). The former is more generally received as an authority in Jersey, and the latter in Guernsey. These commentaries, though they have not given to their authors the reputation of a Bouhier, the president of the parliament of Burgundy, or a D'Argentré of Brittany, were held in high authority by the parliament of Rouen. After the revision of the customary in 1585, several modern commentaries appeared, such as those of Bérault, Basnage, Godefroy, Flaust, Pesnelle, and Houard.

This last-named commentator has, at the end of the fourth volume of a work entitled 'Dictionnaire Analytique, &c., de la Coutume de Normandie,' Rouen, 1782, published, we believe, for the first time, from a manuscript lent him by the Marquis de Paulmy, a poetical version of the customary of Normandy. Several manuscripts of this poem then existed; in one of them there was the following prologue, which, if authentic, determines its date and the name of its author:—

'Mil deux cents quatre fois vingt (1280)
Après ce que Jésus Christ vint
En terre pour humain lignage
Pour rendre nous son héritage,
Et nous donner le Paradis
Qu' Adam nous tollit jadis,
Quand de mauvais venin fut yvre;
Mit Richard Dourbault ce livre
En rimes en mieux qu'il put
Pour commun et propre salut.'

There appear however at the end of the MS. of the Marquis de Paulmy, which did not contain the above prologue, the following lines:—

'Qui mon nom veult apperesvoir
Par aiguille et pour me voir,
Le saura, et le sournom sache
Cil y met C, A, U, P, H.'

This interesting relic of ancient poetry is of considerable length, and is divided into 147 chapters; the language and details afford internal evidence of its having been composed in the thirteenth century.

The following definition of 'coutumes' may be taken as a specimen of the style and correctness.

'Coustumes ce sont vieux usages
Approuvés par les Princes sages,
Du peuple gardé qui font rendre
A chacun ce qu'à soy doibt prendre;
Eulx apprennent possessions,
Des droits font introductions,
Et se mutacions respolvent,
Les droits aussi muer se doivent;
Si varient ou renouvellent
Les droits si lient et appellent,
Et des coustumes, sont les unes
Especiaulx, aultres communes.'
CHAP. XV.

The following are the best editions of writers on the subject of the Customary of Normandy:—'Décisions sur chaque article de la Coutume de Normandie, et observations sur les usages locaux de la même Coutume par Pierre de Merville,' Paris, 1731, fol.; Bérault, Josias, an advocate of the parliament of Rouen, born 1563, died 1640, 'Commentaire sur la Coutume de Normandie,' Rouen, 1684, in fol.; Basnage, Henri, born 1615, died 1695, 'Commentaire sur la Coutume de Normandie,' Rouen, 1678-1681; Godefroy, Jacques, 'Coutume du Pays et Duché de Normandie avec les Commentaire de Bérault, Godefroy et d'Aviron,' Rouen, 1684, 2 vols. fol.; Flaust, Jean Baptiste, born 1711, died 1783, 'Explication de la Jurisprudence et de la Coutume de Normandie,' 2 vols. fol.; Pesnelle, 'Coutume de Normandie avec la observations de Roupnel,' Rouen, 1759, in 4to.; Houard, David, born 1725, died 1803, 'Traité sur les Coutumes Anglo-Normandes,' Rouen, 1776, 4 vols. 4to.

Hale, in his 'History of the Common Law of England' (chap. vi.), maintains that the 'Coutumier of Normandy' was written long after Glanville's tract, which was written in Henry the Second's time; and that the Norman collection was made after the time of Henry II. appears from its mentioning his coronation, and appointing it for the limitation of actions ancestral, which must at least have been thirty years after. 'Nay, the "Coutumier" appears to have been made after the act of settlement of Normandy in the crown of France, for therein is specified the institution of Philip king of France, for appointing the coronation of king Richard I. for the limitation of actions, which was after the said Philip's full possession of Normandy.' Hale's opinion is, that 'this similitude of the laws of England and Normandy was not by conformation of the laws of England to those of Normandy, but by conformation of the laws of Normandy to England.'

NORONHA, FERNANDO DE, is a small group of islands, belonging to Brazil, and situated in the Atlantic Ocean. The fort Concepçaõ on the principal island is situated 3° 50′ N. lat. and 32° 25′ W. long. The group consists of two islands of moderate size, Fernando de Noronha and Dos Ratos, and a few rocks. Fernando de Noronha is about ten miles long and about three across, in the widest part. The surface is mountainous, and there is a peak, which resembles a steeple or tower, which is two or three thousand feet high. The soil is stony, and there are only a few small spots susceptible of cultivation. As there is no harbour, and the surf runs high on its shores, landing is difficult and sometimes dangerous. It has good water, which however is difficult to be got on board the vessels, which visit this island for a supply, on account of the surf. To the north, and separated from it by

* i. e. Guardian.

a narrow channel, is the Island dos Ratos (of the rats), which is three miles long, less stony and more wooded. These islands are used by the Brazil government as a place of deportation, to which exiles and criminals are sent. Their numbers amounts to about eight hundred, and the garrison consists of two hundred black soldiers. They cultivate a small quantity of mandioc, a few fruits, and a little corn, and keep some cattle, sheep, and goats. Rats and wild cats, the descendants of those which have fled from the houses, are numerous. No boats are kept on the island, and no intercourse is held with shipping, without permission and the strictest inspection.

(Henderson's *History of the Brazil*; *Narrative of the Surveying Voyages of the Adventure and Beagle*.)

NORTH, SIR THOMAS, Knight. We regret that we have been unable to obtain any materials for a biographical notice of Sir Thomas North, the first translator of the Lives of Plutarch into English. North had previously published two other works:—1, 'The Diall of Princes; compiled by the Reverend Father in God, Don Anthony of Guevara, and Englyshed out of the Frenche; right necessary and pleasaunt to all gentlemen and others which are lovers of vertue,' London, 1557, folio; 1568, folio; 1582, 4to.; 'Reformed of faultes in the first edition, with an amplification also of a fourth book annexed to the same, entitled the Favoured Courtier; never heretofore in our vulgar tongue; right necessary and pleasaunt to all noble and vertuous persons.' 2, 'The Morall Philosophie of Doni, drawne out of the auncient writers; a work first compiled in the Indian Tongue, and afterwards reduced into divers other Languages; and now lastly Englyshed out of tho Italian,' London, 1570, 4to. Watt observes that 'the word Doni seems to be of like import with that of Magi,' a strange blunder of the learned bibliographer. Doni is the name of an old Italian writer, and the original work is called 'La Filosofia Morale del Doni, tratta dagli antichi Scrittori, ovvero, La Filosofia de' Sapienti Antichi, scritta da Sendebar, moralissimo Filosofo Indiano,' Venice, 1552, 4to.

North's translation of Plutarch was made, as he states in the title, from the French version of Amyot, which is generally very exact, and has considerable merit in point of expression. Indeed it is said that Amyot's translations did much towards fixing the French language. Amyot's dedication to Henry II. of France is dated 1559. North's dedication to Queen Elizabeth is dated January 6th, 1579; his address to the Reader is dated January 24th, 1579. North's version is often inaccurate, where that of Amyot's is correct, which is somewhat strange, for he tells us that he translated Amyot. The book, besides tho Lives of Plutarch, contains 'The Lives of Epaminondas, of Philip of Macedon, of Dionysius the Elder, and of Octavius Cæsar Augustus, collected out of good Authors; also the Lives of Nine excellent Chieftaines of Warre, taken out of Latine from Emylius Probus, by S. G. S., by whom also are added the Lives of Plutarch and of Seneca; gathered together, disposed, and enriched as the others. And now translated into English by Sir Thomas North, Knight.' This part of his book is also dedicated by North to Queen Elizabeth, to whom he seems to have been indebted for some kind of pension or means of subsistence, for he says, 'The princely bounty of your blessed hand (most gracious Soveraigne), comforting and supporting my poore old decaying life, of right challengeth the travel of my study, the labor of my body, and the prayers of my devotions, to be wholly imployed for your Highnesse, and altogether dedicated to your service.'

(Watt's *Bibliotheca Britannica*; *Biographie Universelle*, article 'Doni.')

NORTH, FRANCIS, BARON GUILDFORD, lord keeper of the great seal of England, the immediate elder brother of the following, was born, as Lord Campbell has discovered from the inscription on his tomb-stone, on the 22nd of October, 1637. He acquired the rudiments of education at a school at Isleworth, where he appears to have been taught some rigid Presbyterian principles, which left very little trace on his mind in subsequent life. In 1653 he was admitted fellow commoner of St. John's College, Cambridge. He afterwards became a member of the Middle Temple. He passed his time gravely and studiously, and appears early to have resolved not to leave any plan untried, whether by intellectual exertion or less commendable means, to obtain wealth, power, and distinction. His relaxation consisted of music meetings, hearing Hugh Peters preach, and occasional convivial suppers with fellow-students—very small items of dissipation, the nature of the times and the habits of the young lawyers of the Restoration considered. He was well connected, and received some aid and auspices from his relatives in his early struggles. His practice however was for some time insufficient to satisfy his expectations, and he was sunk in despondency when he was taken in hand by Sir Jeffrey Palmer, the attorney-general, who saw in the character of the young barrister something for which the crown lawyers of such times might find use. Sir Jeffrey's son dying about this time, much of the business destined for him fell to the lot of his father's favourite, young Francis North. He went on the Norfolk circuit, which brought him into the neighbourhood of his family interest; but he was careful to let no influence that seemed likely to aid him slip from his hands. 'He was exceeding careful,' says his brother, 'to keep fair with the cocks of the circuit, and particularly with Serjeant Earl, who had almost a monopoly. The serjeant was a very covetous man, and when none would starve with him in journeys, this young gentleman kept him company.' The memoir of the lord keeper by his brother, Roger North, is one of the most ample developments of private life and habits during the seventeenth century which our literature possesses. We are let into all the hopes and fears of the young aspirant—his paltry and dishonest tricks, his intense selfishness, his moral cowardice, his trimming politics, and his readiness to do any work that persons well intrenched in power might set before him. The book is all the more curious because its author treats these qualities as prudential virtues, and exhibits them as that patient perseverance in well doing which finally brought him who practised them to solid honour and wealth. Standing between a Shaftesbury and a Jeffreys, North's character had some features which may well have appeared commendable, and perhaps the honest indignation which his character has elicited from Lord Campbell seems rather disproportionate when the nature of the times is considered. The brother is particularly instructive in describing his attempts to obtain a rich wife, bestowing hearty commendation on the skill and intrepidity with which he foiled every effort to ally him to anything under the desired standard of wealth. Other qualifications appear not to have given him much concern. One of his negotiations is thus told:—'There came to him a recommendation of a lady, who was an only daughter of an old usurer of Gray's Inn, supposed to be a good fortune in present, for her father was rich; but, after his death, to be worth nobody could tell what. His lordship got a sight of the lady, and did not dislike her: thereupon he made the old man a visit, and a proposal of himself to marry his daughter. There appeared no symptoms of discouragement; but only the old gentleman asked him what estate his father intended to settle upon him for present maintenance, jointure, and provision for children. This was an inauspicious question, for it was plain that the family had not estate enough for a lordship, and none would be to spare for him. Therefore he said to his worship only "that when he would be pleased to declare what portion he intended to give his daughter, he would write to his father, and make him acquainted with his answer." And so they parted, and his lordship was glad of his escape, and resolved to give that affair a final discharge, and never to come near the terrible old fellow any more. His lordship had at that time a stout heart, and could not digest the being so slighted, as if, in his present state, a profitable profession and future hopes were of no account. If he had had a real estate to settle, he should not have stooped so low as to match with his daughter; and thenceforward despised his alliance.' He brought himself into notice at court by pleading against the privileges of parliament in the Writ of Error brought into the House of Lords upon the judgment of the King's Bench in the old case of the prosecution of the five members for holding the Speaker in the chair. On this occasion he was rewarded with a silk gown. On the 20th of May, 1671, he was made solicitor-general; and on the promotion of Sir Heneage Finch to the woolsack, he succeeded him as attorney-general on the 12th of November, 1673. On the 25th of January, 1675, he was made lord chief justice of the Common Pleas. This was at the period of the curious disputes for jurisdiction conducted between the Common Pleas and the King's Bench, founded on no higher motive than the fees paid by the suitors. The King's Bench had engrossed so much business by the fictitious use of the writ of 'latitat,' that 'the proper court sat idle, and had scarce enough to countenance their coming to Westminster Hall every day in the term.' North retaliated by a dexterous use of the 'capias,' and wo are told that 'after this process came into common use, it is scarce to be conceived how the court revived and flourished, being, instead of vacation in term, rather term in vacation; so large was the increase of trials by *nisi prius* out of the court, as also of motions and pleas in the court.' These struggles are well known to have had great influence in the practical extension of the jurisdiction of the three courts of Westminster Hall to all ordinary questions of civil right.

On the death of Lord Nottingham, the great seal was confided to North's keeping on the 20th of December, 1682. On this occasion, and in the presence of the king and some of the most accomplished courtiers of the age, he was not so much dazzled as to lose sight of his own ultimate interest. Knowing that, from the difficulty felt by the king in obtaining parliamentary supplies, it was intended that the new lord keeper should have no salary beyond the fees of his office, and conscious that he was the only person who had at that juncture a substantial claim on the appointment, he refused to touch the seals until, 'for his majesty's honour,' they were accompanied by a pension of 2000*l.* a year. As a judge, he was almost invariably in favour of the prerogative, and seldom if ever endangered his influence at court by his independence. A bolder and a still less scrupulous instrument of power was however gradually undermining him in his latter days in the person of Jeffreys, whose ascendancy and presumption seem to have completely broken the spirit of the lord keeper. His brother gives him credit for having attempted to mitigate the cruelties of 'Jeffreys's campaign;' but Lord Campbell, in a comparison of dates, finds that the lord keeper's death occurred at too early a period in the history of the massacre to admit of his having offered any effectual intervention. He died on the 5th of September, 1685. He was, in private life, a moral man even for an ordinary age, and a miracle in the reign of Charles II. On his professional merits, Lord Campbell emphatically says, 'He had as much law as he could contain, but he was incapable of taking an enlarged and commanding view of any subject.'

(North's *Lives of the Norths*; Campbell, *Lives of the Chancellors*, iii. 431-496.)

NORTH, SIR DUDLEY, the third son of Dudley, Lord North, Baron of Kelting, was born on 16th May 1641. In childhood he was lively and active, and having strayed from his custodiers, he was stolen away by a gipsey or beggar, and with difficulty recovered. He made little progress in literary education, and his brother and biographer tells us that he 'had a strange bent to traffic, and while he was at school, drove a subtle trade among the boys by buying and selling. In short, it was considered that he had learning enough for a merchant, but not phlegm enough for any sedentary profession, which judgment of him was made good by the event.' Being 'bound to a Turkey merchant upon the ordinary terms to be sent abroad,' he was sent as supercargo to Archangel and Smyrna. He left an animated and curious journal of his voyage to Archangel, and his subsequent progress by Italy to Smyrna, published by his biographer. It is not the production of a scholar, but it is full of amusing descriptions and sagacious remarks. After a residence for some time in Smyrna, where he suffered from disease, he removed to a factory at Constantinople. He acquired a knowledge of Turkish, of which he said "that for scolding and railing it was more apt than any other language." He left some curious information about Turkish manners, particularly as to the administration of justice, with which he had some practical experience. His experience and observations are generally printed in his memoir as he wrote them; but on some occasions, when his brother professes to render them in his own language, the biographer being a practising English barrister, makes a singular jumble of the Turkish administration by putting his allusions to it into the technical phraseology of the English law.

Very few dates are given in his biography, but it is stated that Dudley on his way home having touched at Smyrna, left that place on 25th March 1680. He wrote, as to his journey homeward, a 'Voyage from Smyrna, with an Account of Turkey, containing matters little known in Europe,' left unfinished. He spent his latter years in London. Soon after his return he was chosen sheriff, and knighted, and was afterwards elected alderman of Basinghall. By the interest of his brother, the lord keeper, probably as much as by his own merits, he was made a Commissioner of the Customs. Towards the end of the reign of Charles II. he was made a Commissioner of the Treasury, but on the accession of James II. he was sent back to his office in the Customs. He made himself somewhat unpopular in his office by suggesting a tax on sugar and tobacco. In the mean time he had been chosen member of Parliament for Banbury, and took considerable interest in politics, with, apparently, a far more independent spirit than his brother, the lord keeper. His biographer claims for him the merit of having offered resistance to the crown under the operation of 'closeting.' He lost his office at the Revolution, and was subjected to a pretty rigorous examination by both Houses of Parliament. He died on 31st December, 1691. (North's *Lives of the Norths.*)

NORTH, ROGER, the sixth son of Dudley, Lord North, was born about the year 1650. He studied in the Middle Temple, and became steward of the courts to Archbishop Sheldon. It is stated in Rees's Cyclopædia that he was Attorney-General to James II., but his name does not appear in the list of Attorney-Generals in Beatson's Political Index. He died in 1733. He left, in manuscript, some 'Memoirs of Music,' which met with approbation from Dr. Burney. In 1740, a quarto volume was published called 'Examen, or an Enquiry into the Credit and Veracity of a pretended complete History, showing the perverse and wicked design of it, and the many Falsities and Abuses of Truth contained in it, together with some Memoirs occasionally inserted, all tending to vindicate the Honour of the late King, Charles II., and his happy Reign, from the intended Aspersions of that foul Pen.' The work against which this volume is levelled is Kennet's 'Complete History.' Notwithstanding its purely partisan object, much insight may be had into the state of society and politics during the reign of Charles II., by a perusal of the Examen, and when measured by a higher tone of public feeling, the author, in his vindications, often, in pure simplicity, embodies the severest censures. In professing to point out the course he intended to pursue, he indicated that which he avoided. 'Is it fit,' he says, 'that, upon pretence of candour and impartiality, good and evil should stand upon equal pretence or level of choice? Therefore, when bad dealings occur, whereof the facts are apparently evil, let them be branded with infamy, and the contrary adorned with terms of fitting approbation. And this seems to be so far from a fault, that it is incident to the work of a good writer, and whoever, on pretence of impartiality, in that distinction is mealy-mouthed, may be accounted not only a sneaking neutral in the cause of good and evil, but a positive traitor to goodness itself. And herein let the fruit declare the tree, and the works the author. Upon these reasons the writer here is fortified, and declares himself no trimmer between right and wrong, virtue and vice, fidelity and treachery, or in any moral difference of good and evil; but will be positively and plainly declared, let it concern whom it will.' But a clause which immediately follows this bold declaration very distinctly accounts for the utter abandonment of this rule in practice. He is to follow it out, 'saving only the not speaking evil of dignities, that is, of men in regal exaltation and magistracy.'

The work by which Roger North is now best known was published after his death—1740, 1742—in two volumes quarto, with the title, 'The Lives of the Right Hon. Francis North, Baron Guilford, Lord Keeper of the Great Seal under King Charles II. and King James II.; the Hon. Sir Dudley North, Commissioner of the Customs, and afterwards of the Treasury, to King Charles II.; and the Hon. and Rev. Dr. John North, Master of Trinity College, Cambridge, and Clerk of the Closet to King Charles II.' The Life of the lord-keeper was republished in 8vo., and the whole work was re-edited in 1826. It will be seen, that besides the two of whom notices are given above, he commemorated a third brother, John, who lived the life of a retired student. The nature of the book has been already characterised, and it only remains to be stated that whatever opinions may be formed of the author's general notions of right and wrong, it is a memorial of very strong fraternal affection.

(*Article* by Burney, in Rees's *Cyclopædia*; Collins's *Peerage*; *Works referred to.*)

NORTHUMBERLAND INLET, is a large bay on the eastern coast of North America, running nearly parallel to Davis' Strait and entering the continent to a distance of more than 150 miles from the open sea. Its entrance lies between 64° and 65° N. lat. and is more than 60 miles wide. Hence it extends in a north-north-western direction with a width varying between 40 and 50 miles to the north of 66° N. lat., where it begins to grow narrower, and it terminates in an inlet not more than three or four miles wide, which extends from 66° 30′ to 67° N. lat. Though by its geographical situation this bay appears to be placed without the general course of the icy masses, which during the summer are met with along the coast of this part of America, the prevailing southerly and south-easterly winds, and the tides, which rise to twenty-five feet and more, bring during that season large masses of floating ice into the bay, which circumstance renders its navigation rather difficult. The country along the shores of the inlet is very rocky, and in the vicinity of the ocean mountainous. Near the western shores is Mount Hecla, whose summit rises to 2000 feet above the sea-level, according to an estimate. Farther inland the country appears to be less elevated. The shores of the bay, especially on the western side, are beset with numerous rocky islands and cliffs. It does not appear that this inlet is much visited by whales, nor are other fish abundant. But as it is pretty well peopled by Esquimaux, wild animals probably are numerous. The Esquimaux have also several stations, at which great numbers of salmon are caught. This inlet was first explored or discovered in 1841 by Captain Wareham.

(*London Geographical Journal*, vol. xii.)

NOSO'LOGY, (from νόσος and λόγος), is the term applied to the classification and arrangement of diseases. It was early found in the observation of the symptoms of disease, that many of them recurred again and again, and this led to the assigning to such groups of symptoms particular names. Thus we find that the term fever was early applied to designate a certain set of symptoms, and, as any of these symptoms preponderated, the fever obtained a specific name, as putrid fever, petechial fever, &c. But not only were symptoms had recourse to for the purpose of distinguishing peculiar forms of fever, but the causes and the locality were frequently employed; thus marsh, jail, hospital, and other fevers have been described. In this way the materials were early accumulated for the formation of a system of nosology. It was not, however, till comparatively modern times, that anything like a scientific system of arrangement was proposed. One of the earliest of these was that of Sauvages, who, taking the most prominent symptoms of diseases as his guide, divided them into ten great classes which he named Vitia, Febres, Phlegmasiæ, Spasmi, Anhelationes, Debilitates, Dolores, Vesaniæ, Fluxus, and Cachexiæ. Under these classes were arranged various orders: thus, under the first class Vitia, he arranged the orders, Maculæ, Efflorescentiæ, Phymata, Excrescentiæ, Cystides, Ectopiæ, Plagæ. The order Maculæ was divided into the diseases Leucoma, Vitiligo, Ephelis, Gutta rosea, Nævus, and Ecchymoma. This classification of diseases was followed by those of Linnæus, Vogel, Sager, and Macbride, but in their arrangements they all recognised the same principle of classification as Sauvages, and made their division of diseases to depend on the greater or less prominence of particular symptoms. All these systems, were, however, supplanted by that of Cullen, which he promulgated in the second edition of his 'Synopsis Nosologicæ Methodicæ.' The following plan will give an idea of its structure:—

CLASS I.—PYREXIÆ.

ORDER I.

FEBRES.

§ 1. *Intermittentes.*

1 Tertiana
2 Quartana
3 Quotidiana

§ 2. *Continuæ.*

4 Synocha
5 Typhus
6 Synochus

ORDER II.

PHLEGMASIÆ.

7 Phlogosis
8 Ophthalmia
9 Phrenitis
10 Cynanche
11 Pneumonia
12 Carditis
13 Peritonitis
14 Gastritis
15 Enteritis
16 Hepatitis
17 Splenitis
18 Nephritis
19 Cystitis
20 Hysteritis
21 Rheumatismus
22 Odontalgia
23 Podagra
24 Arthropousis

ORDER III.

EXANTHEMATA.

25 Variola
26 Varicella
27 Rubeola
28 Scarlatina
29 Pestis
30 Erysipelas
31 Miliaria
32 Urticaria
33 Pemphigus
34 Aphtha

ORDER IV.

HÆMORRHAGIÆ.

35 Epistaxis
36 Hæmoptysis
37 Hæmorrhois
38 Menorrhagia

ORDER V.

PROFLUVIA.

39 Catarrhus
40 Dysenteria

CLASS II.—NEUROSES.

ORDER I.

COMATA.

41 Apoplexia
42 Paralysis

ORDER II.

ADYNAMIÆ.

43 Syncope
44 Dyspepsia
45 Hypochondriasis
46 Chlorosis

ORDER III.

SPASMI.

47 Tetanus
48 Convulsio
49 Chorea
50 Raphania
51 Epilepsia
52 Palpitatio
53 Asthma
54 Dyspnœa
55 Pertussis
56 Pyrosis
57 Colica
58 Cholera
59 Diarrhœa
60 Diabetes
61 Hysteria
62 Hydrophobia

ORDER IV.

VESANIÆ.

63 Amentia
64 Melancholia
65 Mania
66 Oneirodynia

CLASS III.—CACHEXIÆ.

ORDER I.

MARCORES.

67 Tabes
68 Atrophia

ORDER II.

INTUMESCENTIÆ.

§ 1. *Adiposæ.*

69 Polysarcia

§ 2. *Flatuosæ.*

70 Pneumatosis
71 Tympanites
72 Physometra.

§ 3. *Aquosæ.*

73 Anasarca
74 Hydrocephalus
75 Hydrorachitis
76 Hydrothorax
77 Ascites
78 Hydrometra
79 Hydrocele

§ 4. *Solidæ.*

80 Physconia
81 Rachitis

ORDER III

IMPETIGINES

82 Scrofula
83 Syphilis
84 Scorbutus
85 Elephantiasis
86 Lepra
87 Frambœsia
88 Trichoma
89 Icterus.

CLASS IV.—LOCALES.

ORDER I.

DYSÆSTHESIÆ.

90 Caligo
91 Amaurosis
92 Dysopia
93 Pseudoblepsis
94 Dysecoea
95 Paracusis
96 Anosmia
97 Agheustia
98 Anæsthesia

ORDER II.

DYSOREXIÆ.

§ 1. *Appetitus erronei.*

99 Bulimia
100 Polydipsia
101 Pica
102 Satyriasis
103 Nymphomania
104 Nostalgia

§ 2. *Appetitus deficientes.*

105 Anorexia
106 Adipsia
107 Anaphrodisia

ORDER III.

DYSCINESIÆ.

108 Aphonia
109 Mutitas
110 Paraphonia
111 Psellismus
112 Strabismus
113 Dysphagia
114 Contractura

ORDER IV.

APOCENOSES.

115 Profusio
116 Ephidrosis
117 Epiphora
118 Ptyalismus
119 Enuresis
120 Gonorrhœa

ORDER V.

121 Obstipatio
122 Ischuria
123 Dysuria
124 Dyspermatismus
125 Amenorrhœa

ORDER VI.

TUMORES.

126 Aneurisma
127 Varix
128 Ecchymoma
129 Scirrhus
130 Cancer
131 Bubo
132 Sarcoma
133 Verruca
134 Clavus
135 Lupia
136 Ganglion
137 Hydatis
138 Hydarthrus
139 Exostosis

ORDER VII.

ECTOPIÆ.

140 Hernia
141 Prolapsus
142 Luxatio

ORDER VIII.

DIALYSES.

143 Vulnus
144 Ulcus
145 Herpes
146 Tinea
147 Psora
148 Fractura
149 Caries

It was the simplicity of this system which recommended it to general adoption, and which has caused it to exercise so great an influence over other systems of pathology. At the same time it will be seen that this and the previous systems are purely artificial, and frequently bring together diseases of a very dissimilar character. Such systems have also led to the impression that diseases have a character as definite as the objects of natural history, and that a species in the one car. be as easily defined as the species of another. But it becomes evident, after a little inquiry, that, with the exception of those diseases that depend on a specific contagion, no part of the idea of a species as applied to plants or animals can be made use of to designate particular diseases.

With tho progress of a sound knowledge of physiology and pathology, many attempts have been made to give a more natural arrangement of diseases than that of Cullen. Dr. Mason Good divided diseases into the following six classes:—

Class I.—*Cœliaca.* Diseases of the digestive functions. Class II.—*Pneumatica.* Diseases of the respiratory function. Class III.—*Hæmatica.* Diseases of the sanguineous function. Class IV.—*Neurotica.* Diseases of the nervous function. Class V.—*Genetica* Diseases of the sexual function. Class VI.—*Eccritica.* Diseases of the excernent function.

This system, however successful it may be regarded in its primary divisions, was too technical in its details to be very generally employed. One of the most simple of natural classifications founded on pathological distinctions is that of Pinel, who divides diseases into fevers, inflammations, hæmorrhages, nemoses, and organic affections. The great objection to a physiological system is the imperfection of our knowledge of the functions of many parts of the human body, whilst the symptoms of diseases, being very evident, lead to the assumption of causes of disease and pathological states which probably do not exist.

(Cullen, *Systema Nosologiæ Methodicæ;* Williams, *Principles of Medicine;* Mason Good, *Study of Medicine.*)

NOSTOC. [Zoocarpes, P. C.]

NOTHOSO'MUS, a genus of fossil fishes, from the lias of Dorsetshire. (Agassiz.)

NOTI'DANUS, a genus of fossil fishes from the chalk of Kent. (Agassiz.)

NOY, WILLIAM, a lawyer, whose professional career had a considerable influence on British History, was born about the year 1577. 'He was,' says Fuller, 'for many years, the stoutest champion of the subjects' liberty, until King Charles entertained him to be his attorney.' He was made Attorney-General on 31st October, 1631. He had for some years been member of Parliament, first for Helston, and subsequently for St. Ives. He was a profound lawyer and juridical antiquary; but, as Clarendon says, 'he could not give a clearer testimony that his knowledge in the law was greater than all other men's than by making that law which all other men believed not to be so.' It was to his researches in the older constitution, conducted in this perverse spirit, that the court owed the project of ship-money. Noy drew the writ for levying this illegal tax, but he did not live to see the momentous effects of his exertions, and died on 6th August, 1634. In private matters he seems to have been fond of startling novelties adverse to received opinions and feelings. Thus he bequeathed a fortune to his son, 'to be squandered as he shall think fit—I leave it him for that purpose, and I hope no better from him.' The young man responded to the anticipation, and, after a brief and wild career, was killed in a duel. There are several traditionary anecdotes of Noy's ingenuity as a lawyer. He was the author of several legal works, which seem generally to have been published posthumously. Among these are 'A Treatise of the Principal Grounds and Maximes of the Lawes of England,' 4to., 1641, which has passed through several editions; 'The compleat Lawyer; or a Treatise concerning Tenures and Estates in Land of Inheritance for Life, and other Hereditaments and Chattels, real and personal; together with Observations on the Author's Life,' 1674, 8vo.; 'A Treatise on tho Rights of the Crown; declaring how the King of England may support and increase his annual revenues,' 1715, 8vo. He collected 'Reports and Cases taken at the time of Queen Elizabeth, King James, and King Charles,' 1669, folio.

(Fuller's *Worthies of England*; *Life prefixed to Compleat Lawyer.*)

NU'CLEUS. [Seed, P. C.]

NULLITY OF MARRIAGE. [Marriage, P. C.]

NUMBERS, OLD APPELLATIONS OF. The student of books verging on the middle ages will occasionally meet with some designations of numbers, or rather of the ratios of numbers to numbers, which may need explanation in a work of reference. Corresponding terms are found in the Greek writers, particularly in those on music, and they seem to have obtained universal currency in the middle ages by means of the work of Boethius on Arithmetic, which was a general object of study up to the middle of the sixteenth century.

These words illustrate a fault which has been avoided in our day by the adoption of the opposite extreme. The antients often overloaded a subject with terms; the moderns cannot prepare them as fast as they want them. The higher analysis now abounds with objects of thought for which there are no names except complex algebraical symbols; the old arithmeticians strove to find names for all the varieties of numerical ratio.

In describing these words, we shall, where we can, use the English form of the Latin adjectives, to avoid overloading our article with Latin words: the adjectives accompany the word *numerus*, not *ratio*. The ratio of the greater integer number to the less was one of the following five, multiple, superparticular, superpartient, multiple superparticular, or multiple superpartient. The ratio of the less to the greater was either submultiple, subsuperparticular, subsuperpartient, multiple subsuperparticular, or multiple subsuperpartient.

The term multiple has been preserved, and its species, duple (double), triple, quadruple, quintuple, &c. Thus 10 to 2 is a multiple ratio, namely quintuple: that of 2 to 10 is submultiple, namely subquintuple.

Superparticular ratio (part, that is, aliquot part, over) is when the greater contains the less and a submultiple of the less: its varieties are sescuple or sesquialter, sesquitertius, sesquiquartus, &c. Thus the following ratios are superparticular: 15 to 10, which is sesquialter; 16 to 12, which is sesquitertius; 15 to 12, sesquiquartus; and so on. But the ratio of 12 to 15 is subsuperparticular, namely subsesquiquartus. One of these names is still preserved in our language, in the *sesquialter* stop of an organ. The ratio of 3 to 2 (a sesquialter ratio) is that of the length of a pipe to the length of a pipe which sounds the fifth above the note of the first. Accordingly when a stop was made to sound with the ordinary stop, but a fifth above it, the name sesquialter was given to the stop which gave the higher note.

Superpartient ratio, according to Boethius, is that in which the major term is twice the minor all but an aliquot part. Its varieties are superbipartient (ratio of 5 to 3), supertripartient (ratio of 7 to 4), superquadripartient (of 9 to 5), and so on. Thus the ratio of one and *four*-fifths to one is super-*quadri*-partient. According to Boethius, then, the intermediate ratios of one and two-fifths and one and three-fifths to one have no names. Some of his followers extend the name of superpartient to these, and some would invent the adjectives superbiquintus and supertriquintus to signify them; others used superbipartiens quintas and supertripartiens quintas. Multiple superparticular and multiple superpartient ratios have in the major term a multiple of the minor together with the fraction which gives the remaining adjectives. Thus, the ratio of $7\frac{1}{4}$ to 1 is multiple superparticular, being septuplus sesquiquartus; and $7\frac{3}{4}$ to 1 is multiple superpartient, being septuplus supertripartiens. The preposition *sub* serves as before, prefixed to *super*, to denote the inverse ratios. The reader may fancy for himself, if he can, the beauty of a treatise in which the ratio of 4 to 11 is expressed by *duplus subsupertripartiens.* Not that the writers of these works were ignorant of more simple phrases; and we remember one place in which the example of Aristotle is brought forward to show that it would not be wrong to use them.

Of means, or *medieties*, Boethius discusses ten, to which Jordanus added an eleventh. The first three bear the names which have descended to us, arithmetic, geometric, and harmonic; and all are as follow. Let a, b, c, be three numbers, of which a is the greatest and c the least.

1	a—b : b—c : : a : a	7	a—c : b—c : : a : c
2	a—b : b—c : : a : b	8	a—c : a—b : : a : c
3	a—b : b—c : : a : c	9	a—c : b—c : : b : c
4	b—c : a—b : : a : c	10	a—c : a—b : : b : c
5	b—c : a—b : : b : c	11	a—c : a—b : : a : b
6	b—c : a—b : : a : b		

The works of Boethius and his followers consist in dissertations on what would now be called the most obvious properties of the ratios of numbers, enriched with comments of every species, from numerical to theological. It is not right that they should be utterly lost sight of, for they form a dark background on which the merits of Sacrobosco, Bradwardine, Regiomontanus, and afterwards Tonstall and Recorde, are very distinctly seen.

NUMBERS, THEORY OF. We are here to supply an omission in the article on this subject, or rather in filling up the references which were made from it.

Euclid's geometry, assuming only the use of his three celebrated postulates, enables him, a linear unit being given, to construct the length represented by any algebraical expression which involves only additions, subtractions, multiplications, divisions, extraction of the square roots, or combinations of all these. But a cube or fifth root is beyond the power of the system. Again, from the theory of equations it is soon made obvious that the solution of the equation $x^n-1=0$, and the division of a circle into n equal parts, are one and the same problem. One solution of the preceding is $x=\cos\theta+\sqrt{-1}.\sin\theta$, where θ is the nth part of four right angles. [ROOT, P. C.] Euclid, in his fourth book, shows how to cut a circle into three, four, five, and fifteen equal parts; and analysis shows that the sines and cosines of the angles so involved can be obtained by formulæ which involve no roots except the square. But except into halves, thirds, fifths, or fifteenths, or parts obtainable from these by one or more bisections, Euclid was not able to cut a circle into equal parts.

So the matter rested for about 2000 years, until Gauss, in his 'Disquisitiones Arithemeticæ' (1801), not only pointed out how to extend Euclid's conclusions, but also in a manner how to account for them. The statement of his results, even without demonstration, is instructive to the learner, and we shall give it accordingly: referring for the demonstration to the works of Gauss or Legendre [NUMBERS, THEORY OF, P.C.], or to Murphy's 'Theory of Equations.'

The expression $a+\sqrt{b}$, a and b being rational, is the solution of a quadratic equation with rational efficients. But if a and b themselves have the form $c+\sqrt{d}$, in which c and d have themselves the same form, and so on; then $a+\sqrt{b}$ is the solution of a quadratic equation in which the coefficients are themselves the solutions of quadratic equations, whose coefficients are again the solutions of quadratic equations, and so on. Consequently, any equation, the root of which is capable of construction by Euclid's postulates, must be reducible to a system of quadratics; and the converse. Now if n be a prime number, $n-1$ is an even number, and therefore has factors. Let its prime factors be 2, a, b, c, &c., and let them severally enter p, q, r, s, &c. times: so that

$$n-1=2^p a^q b^r c^s \ldots.$$

Gauss succeeded in showing that when n is a prime number, the solution of the equation $x^n-1=0$, can be made to depend upon the solution of p equations of the second degree, q of the ath degree, r of the bth degree, and so on. Consequently, whenever 2 is the only prime factor of $n-1$, or when $n-1=2^p$, n being prime, or when 2^p+1 is a prime number, the solution of x^n-1 is reducible that of p quadratic equations, and the division of the circle into n equal parts can be accomplished by Euclid's geometry. And further, it is easily demonstrated that 2^p+1 can never be a prime number, except when p itself is a power of 2 (2^0 included) though 2^p+1 is not then always prime. Nor has it been shown that other divisions are impossible: Gauss's theorem merely points out cases in which the thing can be done, without pronouncing the exclusion of others. Gauss, indeed, does assert that be can demonstrate all other cases to be impossible to be constructed by geometry, that is, reducible to quadratic equations: and the thing is highly probable. If we now construct the series $2^1+1, 2^2+1, 2^4+1, 2^8+1$, &c., among which all our chances lie, we have 3, 5, 17, 257, 65537, 4294967297, &c. The first five are prime numbers: Euclid has disposed of the two first divisions; Gauss has added that a circle can be geometrically divided into 17, 257, and 65537 equal parts. But 4294967297 is not a prime number, being divisible by 641. Euclid's mode of obtaining the division into 15 parts can also be extended.

From $\frac{1}{3}$ and $\frac{1}{5}$ we get $\frac{2}{15}$ by their difference, as in Euclid; and thence $\frac{1}{15}$. From $\frac{1}{15}$ and $\frac{1}{17}$ we give $\frac{2}{255}$, and thence $\frac{1}{255}$. From $\frac{1}{255}$ and $\frac{1}{257}$ we get $\frac{2}{65535}$, and thence $\frac{1}{65535}$. From $\frac{1}{65535}$ and $\frac{1}{65537}$ we get similarly $\frac{2}{4294967295}$. Consequently the circle is divisible geometrically into the following numbers of equal parts.

3	4	5
15	16	17
255	256	257
65535	65536	65537
4294967295	4294967296	——

NUMERAL CHARACTERS. In the article under this name, P.C., we have stated that the mode of accounting for the Roman numerals there given is an antient suggestion. We were not then prepared to lay our hands on the works which contain it. The account of it was revived in our day by Leslie, in an article in the Edinburgh Review, and afterwards in his Philosophy of Arithmetic. But it may be found almost entire in the 'Cursus Mathematicus' (1690, vol. i. p. 28) of Dechales, who gives it as the opinion of several of his time. And the earliest hints (by no means complete, and mixed with some absurdities) which we have found are in the 'De Numeris Libri Duo' of John Noviomagus, Paris, 1539, 8vo.

NUNCUPATIVE WILL. [WILL AND TESTAMENT, P. C.]

NUPHAR. [WATER-LILY, P. C.]

NUTRIA. [COYPOU, P. C.]

NUTTAINIA, a genus of Trilobites, from the Silurian strata of Tyrone. (Portlock.) It occurs also in England and Wales.

NYCTERI'BIA, a genus of parasitic insects of the order *Diptera*. They are closely allied to the horse-flies (*Hippoboscidae*). They have neither wings nor balancers. Their intermediate legs are connected at the base by a pair of comb-like organs supposed to represent wings. They live on the bodies of bats.

NYMPHÆA. [WATER-LILY, P. C.]

INDEX TO THE LETTER N.

VOLUME II.

O.

OATMEAL. [AVENA, P. C. S.]

OBLIQUE ARCH. [SKEW BRIDGE, P. C.]

O'BSEQUENS, JULIUS, the author of a small work in Latin which is entitled 'De Prodigiis.' Nothing is known about the author. Scaliger concludes that Obsequens lived before Hieronymus, because Hieronymus in a particular passage appears to have copied a fact from Obsequens. This passage of Hieronymus was written in the time of Valens, who died A.D. 379. The work of Obsequens is a record of wonderful things that happened during the period from the foundation of Rome to the time of Augustus. The first part of the work is lost, but it has been supplied by Lycosthenes, whose supplement commences with the time of Romulus and extends to the year of the City 563, when the extant work of Obsequens begins. There are various gaps after 563, which Lycosthenes has also supplied. The method of the author is to enumerate the wonderful occurrences under any given year, and then to state what happened thereon. The following is an example (No. XCI.):—'It rained milk on the Græcostasis. At Croton a flock of sheep with a dog and three shepherds were killed by lightning. At Satura a calf with two heads was born. There was an uproar in the city owing to Gracchus proposing his laws.' Obsequens chiefly followed Livy, for he uses pretty nearly Livy's words, as appears from a comparison of Obsequens with those parts of Livy which are extant. His work also terminates with an event relating to Drusus, the son of Livia, and the history of Livy terminates with the death of Drusus.

Lycosthenes in his preface argues that the attention which the Romans paid to wonderful occurrences and signs proved their religious feeling, while their blindness is shown by their worship of false deities; and he adds that if they had been acquainted with the true religion, they would have surpassed in religious zeal their posterity, who are Christians rather in name than in fact, and disregard the signs of the times foretold by Jesus Christ (Luke xxi.) as to happen when the end of the world was approaching. Among the signs then recently witnessed the author mentions three or four eclipses happening in a year, stars with hair (comets), burning meteors, and earthquakes and convulsions of the earth in Italy, all which made no impression on the people of that day, to such a height of impiety and wickedness were men come. The consequences of all this were pernicious errors, horrible blindness, and persevering blasphemy; and the divine vengeance showed itself in civil wars, strange diseases, and famine. The author thought that an edition of Obsequens at such a time would be suitable, and would show men that dreadful signs always portended evil to men, and that by this example they might take warning. The author supplied what is wanting in the MSS. of Obsequens from Livy, Dionysius of Halicarnassus, Orosius, and Eutropius, and other most esteemed authors, so that nothing should be omitted. If his labours should find favour with his readers, he promises to complete his chronicle which he had written of wonderful events from the creation of the world to his own time. The author's preface is dated Basle, 1552.

The edition of Obsequens by F. Oudendorp, Leiden, 1720, contains the notes of Scheffer and the Supplements and Preface of Lycosthenes.

ODEVAERE, JOSEPHUS DIONISIUS, the most celebrated historical painter of the Flemish school of recent times, was born at Bruges, October 2, 1778. He was brought up in the college of the Augustines of that city, and was destined by his parents for mercantile pursuits, though he had always displayed a decided ability for the graphic art. In 1794, in consequence of the French invasion of Belgium, Odevaere was removed by his parents, and accompanied them into Holland, where he remained fourteen months. They returned to Bruges, and as Odevaere had a confirmed dislike to a mercantile pursuit, he was placed in the Academy of Bruges, in which he obtained the first prize for drawing in 1796. He went, towards the close of the following year, to Paris, and studied in the school of his fellow-townsman Suvee until he was appointed director of the French Academy at Rome, when Odevaere entered the school of David. In 1804 he obtained the grand prize of the French Academy of Painting, for a picture of the death of Phocion, and had the honour of being presented to the emperor. He returned in the same year to Bruges, and in 1805 he went as a pensioner for five years of the French government to Rome, but he remained there altogether eight years. According to the regulation of the French government, he sent, after his residence of five years in Rome, an historical picture to the French Academy; the subject was the Coronation of Charlemagne, and it was generally admired. In 1812 he received a commission in Rome to paint two large frescoes for the palace of Monte Cavallo, but political events which followed prevented the execution of these works. He left Rome at the close of 1812, and returned to Paris, and obtained the gold medal for a picture in the exhibition there. He returned finally to Bruges, where he executed several public and private commissions. In 1814 he established himself in Brussels, where he painted his pictures of the Peace of Utrecht, and the Battle of Waterloo at the moment the Prince of Orange was wounded, for the King of the Netherlands, who had created Odevaere his court painter in the spring of 1815. The Battle of Waterloo was exhibited in 1817 and 1818 in many of the provinces of the Netherlands, together with a portrait of the Prince of Orange, which is engraved by Lignon, and a picture of Bramante introducing Raphael to Julius II. Odevaere was the commissioner appointed on the part of the Netherlands to reclaim the pictures which had been taken by the French to Paris from the collections of Holland and Belgium. Upon the completion of this commission, the King created him a Chevalier of the Lion of the Netherlands, and several Flemish cities presented him with medals struck expressly in commemoration of the restoration of their respective works.

The Battle of Waterloo was followed, in 1820, by the Battle of Nieuwpoort, and a Narcissus, engraved by Vlamynck. In 1821 he exhibited at Brussels his Triumph of Cimabue: and subsequently David in his studio; the Establishment of the Power of the House of Orange; the Inauguration of the King at Brussels in 1815; besides others from classical history, and many scripture-pieces for various churches in the Netherlands, in some of which are excellent altar-pieces by Odevaere. He died at Brussels, in February, 1830, not having completed his fifty-second year. Van Eynden and Vander Willigen, in the third volume of their 'National History of Painting since the Middle of the Eighteenth Century,' published in 1820, have given December 2, 1775, as the date of Odevaere's birth, which is corrected in the fourth volume of appendix, published in 1840, to the date given above. His portrait is published in the work of Eeckhout and Burggraaff, 'Portraits des Artistes modernes,' &c., Brussels, 1822; and several of his works are engraved in the 'Annales du Salon de Gand'—as the Coronation of Charlemagne; the Confession of Phaedra to Theseus; Narcissus; and the Battle of Nieuwpoort. Some of the pictures of Odevaere are of very large dimensions. He was a member of the Academy of St. Luke at Rome, and of several other institutes of the fine arts.

(R. Van Eynden en A. Van Der Willigen, *Geschiedenis der Vaderlandsche Schilderkunst, sedert de helft der* xviii. *Eeuw*, Amsterdam, 1842.)

ODO'METER (from ὁδός, a road, and μέτρον, a measure) is an instrument used for measuring the distances passed over in travelling, and is very nearly the same as that which is called a Pedometer: the latter is carried in the pocket of a person on foot or on horseback, and the former is attached to a carriage. [PEDOMETER, P.C.]

OECUMENICAL COUNCILS. [COUNCIL OF THE CHURCH, P. C. S.]

ŒDE'MERA, a genus of beetles belonging to the third family of heteromerous Coleoptera, the Stenelytra.

ŒNOTHE'RA, a genus of plants belonging to the natural order Onagrariæ or Onagraceæ. It has a 4-cleft calyx, 4 petals, a filiform style, with a clavate or cruciform stigma, linear capsules of 4 cells, with 4 valves, and numerous seeds.

Œ. biennis, Evening Primrose, has ovate lanceolate flat-toothed leaves, a rough hairy stem, petals longer than the stamens and about half as long as the tube of the calyx. The flowers are large, numerous, and of a bright yellow colour. It abounds on the Lancashire coast, and covers several acres of ground near Woodbridge, Suffolk. The roots are eatable, and were formerly taken after dinner to flavour wine as olives now are; therefore the generic name was changed from Onagra, the ass-food, to Œnothera, the wine-trap. This plant was once cultivated for the sake of its tubers, which might in some measure have stood instead of the potato had they not been superseded by the introduction of the latter. This is the only British species of the genus. There are 85 species enumerated by Don, growing chiefly in North America. They are handsome border flowers, and deserve to be cultivated, but are not valuable on account of any properties they possess. They will grow in any common garden soil. The perennial kinds are easily propagated by seed, by dividing the plants at the root, and some of them by cuttings. The seeds of the annual and biennial kinds only require to be sown where the plants are intended to remain.

(Don, *Gardener's Dictionary;* Babington, *Manual of British Botany;* Burnett, *Outlines of Botany.*)

OFFERINGS, OBLATIONS, and OBVENTIONS are not only those small customary sums paid at Easter, but also the customary payments for marriages, christenings, churchings, and burials. By 2 & 3 Ed. VI. c. 13, 'all persons which by the laws and customs ought to make or pay their offerings, shall yearly well and truly content and pay the same to the parson, vicar, proprietor, or their deputies or farmers, of the parishes where they shall dwell or abide; and that at such four offering-days as at any time heretofore within the space of four years last past hath been used and accustomed for the payment of the same; and, in default thereof, to pay for the said offerings at Easter then next following.' The four offering days above spoken of were Christmas, Easter, Whitsuntide, and the feast of the dedication of the parish church. It is directed by the rubric, at the end of the Communion Service, that 'yearly at Easter, every parishioner shall reckon with the parson, vicar, or curate, or his or their deputy or deputies, and pay to them or him all ecclesiastical duties accustomably due then at that time to be paid.' Easter offerings are due of common right, as well as by custom. (Bunb. 173, 198.) Thus, in Carthew *v.* Edwards, Trin. 1749, it was decreed by the Court of Exchequer that the Easter offerings were due to the plaintiff of common right, after the rate of 2*d.* a-head for every person in the defendant's family of sixteen years of age and upwards. But by custom the sum may be more. In London 4*d.* a-head is usually claimed. By the Small Tithe Act, 7 & 8 Wm. III. c. 6, offerings, oblations, and obventions may be recovered before justices of the peace.

Surplice-fees are payable for every marriage, whether by banns or licence; and for every funeral, churching, or christening, according to the custom of the parish. Mortuaries are claimed on the death of each person in a parish, according to value of property left, but not to a greater amount than 10*s.*

(Burn, *Ecclesiastical Law.*)

OGGIO'NE or UGGIO'NE, MARCO DA, a Milanese painter and distinguished scholar of Leonardo da Vinci at Milan about 1490; he was born therefore about 1470, at, as his name imports, Oggione, in the Milanese. He painted in oil and in fresco, and is on the whole one of the best of the Milanese painters. His frescoes of the church della Pace at Milan, which are much praised by Lanzi, are now in the Brera at Milan; they were removed from the wall by Barezzi. Oggione is however now chiefly known for his copy of the 'Last Supper' of Leonardo da Vinci, now in the Academy of Arts in London. This copy is painted in oil, and was executed about 1510 for the Refectory of the Certosa di Pavia; and as it was copied when the original was in a perfect state, the now almost total decay of the latter renders it very valuable. The opinions regarding its merits are various. Giuseppe Bossi does not wholly approve of it; but as the original has been virtually decayed since 1726, when it was first restored, all subsequent judgments of the merits of the copy with respect to the original must be received with due reservation, as they are certainly the result of individual fancies of what the original might have been, rather than of what it by actual comparison was found to be. Marco da Oggione's copy must be a better criterion of what the original was, than the remains of the original itself, or the speculations of all the critics combined; they have no right to assume a deviation from the original, when they cannot possibly demonstrate it. Oggione made two large copies, both, it is said, from a small copy made by himself for the purpose, that in oil, in the Royal Academy, and one in fresco for the Refectory of the convent of Castellazzo, which was copied by the Cav. Giuseppe Bossi, though Bossi's picture was taken chiefly from a copy in the Ambrosian Library made by Andrea Bianchi called Vespino in 1612, when the original was already much decayed. There is an older copy at Ponte Capriasca, made in 1565, and attributed to Pietro Luini. Bossi's copy was made in 1807 for Eugene Beauharnais, viceroy of Italy, to be worked in mosaic; the cartoon is now at Munich, and the mosaic is at Vienna. But this work, made partly from one copy partly from another, from studying other works of Da Vinci, and from the artist's own feeling of Da Vinci's style, is essentially a restoration or translation, and not a copy: it may have no resemblance to the original beyond size and composition; and to the true lover of art can have little value, compared with the old unassuming copy of Oggione. The mere fact that Oggione's copy was painted for people who must have been well acquainted with the original, and by a distinguished pupil of Leonardo's from the original when in its perfect state, ought to be sufficient guarantee for its fidelity, notwithstanding its imperfections, making of course due allowances for the different capacities of the two men. Marco da Oggione died in 1530.

(Lanzi, *Storia Pittorica,* &c.; Göthe, *Propylaeen.*)

OHMACHT, LANDELIN, an eminent German sculptor, was born at Dunningen near Rottweil in Würtemberg, in 1760. He was the pupil of J. P. Melchior. His first public works were some sculptures for the Kreuzkirche at Rottweil, which still decorate the choir. Among his other earlier works is a good bust of Lavater. In 1790 he went to Rome, where he remained two years, and after his return to Germany he was employed on several important monumental works, the first of which was the monument to the Burgomaster Rhode, in the cathedral of Lübeck; but his principal works are at Strassburg, where he settled in 1801. His first work there was the monument of General Desaix, who was killed at Marengo, erected on the Rheininsel near Strassburg: there are four monuments also by him in the church of St. Thomas, of which that to Professor Oberlin (1810) is one of his principal works; that to the historian Koch (1815) is likewise much admired. He executed also a beautiful monument in the new church to Dr. Blessig; another to General Kleber, in the cathedral; and a colossal figure to Adolph von Nassau, in the cathedral of Speyer. There are also several classical figures by Ohmacht—a Venus; Psyche; Flora; Hebe; the Judgment of Paris (at Nymphenburg), and others. Among his busts are several of Klopstock, with whom he was intimate. He died at Strassburg, in 1834: his portrait is in the Vogel collection of portraits in the possession of the king of Saxony. The celebrated sculptor David, upon seeing the works of Ohmacht at Strassburg, is reported to have said that one could not sufficiently admire them, and that Ohmacht was the Correggio of sculptors.

(Nagler, *Allgemeines Künstler-Lexicon.*)

OIL-PAINTING. [Eyck, John Van, P. C., p. 133; Painting, P. C., p. 142.]

OIL-COLOURS. [Painting, House, P. C., p. 145; Syringe, P. C., p. 479.]

OILS, MANUFACTURE OF. An account of the properties of the more important oils, and of the materials from which they are procured, is given in the articles Oils, P. C., p. 415, and Oils, Vegetable, P. C., p. 417; and further information may be found under the names of some of the principal oils, as Croton Oil, Linseed Oil, and Olive Oil, or in articles which treat on the materials from which oils are made, such as Elæis, Madiá, Linseed, Olea Europæa, Ricinus Communis, and Guacharo Bird. Under Fisheries, also [P. C., pp. 288, 289], is given much information on the produce of whale oil. We may here add a few words on the processes of the manufacture of such oils as are of the greatest commercial importance.

The manufacture of animal oils requires very little notice beyond what is given in the articles Oils and Fisheries above referred to. The *blubber,* or fat from which the oil is procured, is usually cut into small pieces and packed in casks soon after it is taken from the whale; it is then brought home in a half-putrid state, and is emptied into a large wooden vessel or receiver, capable of holding several tons. From this receiver the decomposing fat is conducted, after settling for a few hours, into a copper boiler, in which the separation of the fluid from the solid portions of the blubber is completed by the application of heat. From the boiler the oil flows through a kind of filter of brushwood, which detains the grosser impurities, into coolers, from which, when quite cold, it may be drawn off into casks. Various chemical processes are employed for purifying whale oil and diminishing its unpleasant smell. The quantity of oil obtained is about four-fifths that of the blubber used. In the South-Sea fishery it is found advisable to boil the blubber on board the whaling vessels, and to bring home the oil alone in casks. In this process, as commonly performed, the oil is very imperfectly extracted from the blubber, and the *scraps*, or solid portions which remain, are used as fuel under the *try-pots*, or boilers; by which arrangement the oil that remains in them is not only destroyed, but also becomes, from its great inflammability, a source of serious danger. To obviate these evils some ships are provided with powerful screw-presses for squeezing out whatever oil may remain after the process of boiling the blubber, and thus materially increasing the produce. Hebert, in the 'Engineer's and Mechanic's Encyclopædia,' vol. ii. pp. 206, 207, gives an engraving and description of such a press, in which the blubber-scraps are put into a hollow cylinder, while yet warm, and compressed by a piston brought down upon them with a great force. The oil escapes through holes in the bottom of the cylinder, between which and the blubber is laid a mattress of wicker-work, to prevent the blubber from choking up the holes. This press is the invention of Mr. John Blythe, of Limehouse.

Olive oil, as explained under OLEA EUROPÆA, in P. C., differs from most vegetable expressed oils in being extracted from the soft fleshy pericarp, whereas such oils are usually procured from the seeds only. The manufacture is very simple, and is usually conducted with very rude machinery; but writers differ in their accounts of the process, in some important particulars; some stating that the fruit should be gathered a little before it is ripe, and spread on the floor of a room for several days to dry and ferment slightly, while in the volume on 'Vegetable Substances used as Materials of Manufactures,' in the 'Library of Entertaining Knowledge,' it is stated on the authority of an English gentleman who had resided at Gallipoli, where much excellent olive oil is made, that the Gallipolitans never gather the olives, but allow them to drop in their maturity from the tree to the ground. In the 'Dictionnaire de l'Industrie,' published at Paris in 1795 (vol. iii., p. 73), in an account of the manufacture of olive-oil in Provence, however, it is stated that fallen olives should not be mixed with those which are gathered, for fear of imparting an earthy odour to the oil, and a caution is given against allowing the heap of gathered olives to heat or ferment, coupled with the remark that the sooner the olives are taken to the mill the better will be the oil. According to this authority, also, all leaves should be carefully removed, as their presence would give a bitter taste to the oil. But Dr. Ure, in the 'Dictionary of Arts,' &c., p. 898, writing of the same district, states that it is usual in the neighbourhood of Aix, in Provence, 'to preserve the olives for fifteen days in barns or cellars, till they have undergone a species of fermentation, in order to facilitate the extraction of their oil.' 'If,' he adds, 'this practice were really prejudicial to the produce, as some theorists have said, would not the high reputation and price of the oil of Aix have long ago suffered, and have induced them to change their system of working?' 'In fact,' he proceeds, 'all depends on the degree of fermentation excited: they must not be allowed to mould in damp places, to lie in heaps, to soften so as to stick to each other, and discharge a reddish liquor, or to become so hot as to raise a thermometer plunged into the mass up to 96° F. . . . A slight fermentation, however, is useful towards separating the oil from the mucilage.' The first and finest oil is obtained by crushing the olives in a kind of mill, termed by Dr. Ure an edge-mill, in which the crushing-stones are so mounted as not to break the stones of the fruit, but simply to crush the pulp. The mass thus bruised is put into *cabas*, or bags made of bulrush-matting, or of coarse canvas, which are piled or laid upon one another to the number of eighteen, and exposed to gradual compression in a screw-press; and the oil which flows from the cabas, which is the pure virgin oil, is conducted by channels into casks or stone cisterns partly filled with water, on the surface of which it floats so that it may be readily collected by skimming. When the oil ceases to flow, the mass of pulp is taken out of the bags, mixed with boiling water, and treated as before, but with an increase of pressure. The second quality of oil thus procured is quite fit for table use when fresh, but is apt to become rancid by keeping. After skimming off the oil which accumulates on the surface, the subjacent water still retains a good deal of oil, by the intervention of the mucilage; but after long repose in a large cistern the oil and water separate, and the water may be drawn off from below. This oil, however, is of very inferior quality, and can only be used for factory purposes. A still coarser kind of oil is finally procured by crushing the marc, or solid residue, in a mill, so as to break the stones, boiling it with water, and re-pressing it. All the oil, Dr. Ure observes, must be *fined* by keeping in clean tuns, in an apartment heated to at least 60° F., for twenty days, after which it is run off into strong casks, cooled in a cellar, and then sent into the market.

Dr. Ure, in the article and page above referred to, gives the following useful directions for refining olive-oil for the use of watchmakers:—'Into a bottle or phial containing the oil, a slip of sheet-lead is immersed, and the bottle is placed at a window, where it may receive the rays of the sun. The oil by degrees gets covered with a curdy mass, which after some time settles to the bottom, while itself becomes limpid and colourless. As soon as the lead ceases to separate any more of that white substance, the oil is decanted off into another phial for use.'

Passing over the processes of manufacture of many kinds of oil of less importance, we proceed to take linseed-oil, or the oil extracted from the seeds of the flax-plant, as an illustration of the manufacture of oil from seeds. 'Linseed, rape-seed, poppy-seeds, and other oleiferous seeds were,' Dr. Ure observes, 'formerly treated for the extraction of their oil, by pounding in hard wooden mortars with pestles shod with iron, set in motion by cams driven by a shaft turned with horse or water-power; then the triturated seed was put into woollen bags, which were wrapped up in hair-cloths, and squeezed between upright wedges in press-boxes, by the impulsion of vertical rams driven also by a cam mechanism.' In the best mills on the old construction, he adds, the cakes of crushed seeds obtained by this first wedge-pressure were ground anew upon the bed of an edge-mill, and subjected to a second pressure, with the aid of heat. 'These mortars and presses,' he states, 'constitute what are called Dutch mills: they are still in very general use both in this country and on the Continent, and are by many persons supposed to be preferable to the hydraulic presses.' A good account of the modern English process of making linseed-oil, as practised at the Walker oil-mill, near Newcastle-upon-Tyne, is given in Dodd's 'British Manufactures; Chemical,' (forming No. xxv. of 'Knight's Weekly Volume,') and in No. 802 of the 'Penny Magazine,' where also are some interesting details respecting the mode of cultivating and preparing hemp-seed and rape-seed for the oil-manufacture. When flax is cultivated for its seed, the plants, after being pulled up, are either laid on the ground in handfuls, with the seed end towards the south, or else several plants are tied together at the top, and placed upright with their roots spread out. When they have been thus dried by exposure to the air, the seeds are separated from them by means of a *ripple*, or comb with long wire teeth, through which the plants are drawn, and by which the capsules containing the seed are separated from the flax. [FLAX, P. C., pp. 303, 304.] The seeds and pods are then spread thinly upon a cloth to dry in the sun, when the ripest will separate from the pods of themselves, while such as are less ripe will need to be lightly trodden or thrashed. The whole is then carefully sifted, winnowed, and cleaned from dirt and chaff.

As the hardness and smoothness of the seed gives it a tendency to slide away unbroken under the rolling action of the millstones by which they are ground, it is well, before taking it to the grinding-mill, to bruise or crush it by causing it to fall from a hopper between two iron crushing-rollers, placed side by side, and capable of being pressed against each other with any determinate degree of force; but the use of such rollers is by no means universal, the seeds being, in many cases, submitted to the grinding-mill without any such preparation. This mill, which is sometimes called an *edge-mill*, consists of a pair of stones, technically called *running-stones*, or *runners*, usually made of granite, resembling grindstones in shape, and from five to seven feet or upwards in diameter, so mounted as to roll round in a circular path of small diameter upon a solid horizontal bed of stone or iron laid beneath them. Those stones, which roll round the bed from thirty to thirty-six times in a minute, are sometimes hooped with iron, though many prefer the rough surface of the granite, which may be re-dressed with a hammer as often as is needful. They grind the seed partly by their weight, which often amounts to three tons each, and partly by the peculiar rubbing motion which arises from the circumstance that the outer edge of the stone has to perform a larger circuit than the inner, although the two must of course revolve round the axle at one and the same speed. The action is therefore similar to that of a cone when forced to roll onward in a straight path. The two running-stones are mounted on the same horizontal axis, but at rather different distances from the central vertical shaft or axis round which they roll, so that they do not follow one another in precisely the same path on the bed of this mill. The bed is surrounded by a rim which prevents the seeds from being scattered, and the revolving framework in which the running-stones are mounted carries also two rakes or sweeps, which collect and lay the seeds in a ridge along the circular path of the runners. By this means the seeds are reduced, by the partial expression of the oil, to a pasty mass, from which a limited quantity of very fine *cold-drawn* oil may be obtained by the simple action of the press.

Owing to the extreme hardness and smoothness of the seeds of flax and hemp, and to the circumstance that the fragments of their shells, however broken, form minute concavities which will retain the oil unless a greater pressure be applied than could be given by an ordinary screw-press, the presses employed for extracting oil from such seeds differ materially from those used in crushing olives and other comparatively soft oleaginous substances. Hence it is that the wedge-press and Bramah's hydraulic press have been introduced for the purpose, and that of these two powerful machines some manufacturers prefer the former, believing that the same degree of pressure is more efficient when imparted by means of sudden impulses or blows upon the end of a wedge, than when it is applied gradually and steadily as in the hydraulic press. In the wedge-press, of which there are many varieties, the crushed seeds are put into bags of hair-cloth or some similar material, and these bags are then placed between plates of iron united together like the covers of a book, or between boards or blocks of wood, within a very strong and massive framework. The small end of a wedge is then introduced in such a way between the plates or boards that, when it is driven down by the blows of a ram or pestle, it may compress the bags with enormous force. Barlow, in his 'Treatise on Manufactures and Machinery,' in the 'Encyclopædia Metropolitana,' in which work (sections 504—513) is much important information on the subject of this article, states that the driving of the wedges is continued until they 'are so tight that the pestle rebounds from them three times, when they are judged to be sufficiently driven.' The use of the hydraulic press instead of this apparatus needs no minute explanation. In Barlow's work, just referred to, is an account of such a press which acts horizontally, the bags being, as in the wedge-press, placed vertically, and separated from one another by cast-iron plates; but in Dodd's account, above noticed, of the Walker oil-mill, the bags are represented as piled upon one another in cast-iron cases, and placed in a vertical press. Dodd speaks of the bags in which the seeds are contained as of flannel, and Barlow as of woollen, 'unfolded (enfolded?) by horse-hair mattresses, enclosed in leather wrappers.' The last-mentioned writer states that the first oil-mill in which the hydraulic press was thus applied was constructed at Bremen, in 1821, and that its proprietor is satisfied of the superiority of the plan to any other then in use. Among other advantages it is stated that the hydraulic or hydrostatic press requires less space than a stamping-mill which could do the same work, and that the hairs and bags are found to last longer with it than with the old machine. Since the above date the Bramah press has been successfully applied in the manufacture of cocoa-nut oil, and several presses have been exported to Ceylon and other places for that purpose. Mr. John Hall, of Dartford, patented in 1823 an ingenious oil-press in which the power of a steam-engine or other prime mover might be applied through the medium of cams or eccentric rollers: but Barlow states that the plan has not been generally adopted.

We have hitherto spoken only of the extraction of the finest oil, without heat. The application of heat before pressing is however necessary for obtaining the principal supply of oil. The precise order of the several operations, as well as the nature of the machinery employed, differs in different manufactories, but in the process detailed by Barlow the oil-cakes, or solid contents of the bags, which remain after the first cold pressing, are taken out of the bags, broken to pieces, and put into mortars to be pounded by pestles worked by machinery. 'There,' he observes, 'the paste is again broken down, and the parenchyma of the seed reduced to a fine meal; thus free egress is allowed to the oil from every vesicle in which it is contained, but it is now rendered much more clammy by the forcible mixture of the mucilage, and even of the fine parts of the meal.' When sufficiently heated it is removed to a *chauffer*, or circular copper-pan, in which, while it is kept continually stirred by machinery, it is heated to about the temperature of melting bees-wax, either by a charcoal fire, or, according to a more recent practice, by steam. It is then, while hot, put into the bags and subjected to a second pressing; and in some cases the like operations are repeated a third time, by which a further quantity of oil, but of inferior quality, is produced. Sometimes the produce of oil is increased by mixing a little water with the paste; but this practice is considered to impair the quality of the oil. The oil-cake which remains after the last process is used as food for cattle, and for various other agricultural purposes; but of course they vary greatly in richness according to the degree in which they have been divested of oil. Barlow states, indeed, that 'there are small mills in Holland which have no other employment than extracting oil from the cakes which they purchase from the French and Brabanters, after passing the process of their mills: a clear indication of the superiority of the Dutch practice.' In some of the Dutch mills, we learn on the same authority, the produce is increased by the application of moderate heat during the grinding process, by enclosing a little furnace in the bed upon which the running-stones roll; but it is observed that 'the utmost care is necessary to prevent the heat from becoming too considerable, as it causes the oil to dissolve too much of the fermentable substance of the seed, and exposes it to the risk of soon growing very rancid. When the seed is very dry the process of grinding may be facilitated by the addition of a little water. The oil produced by the above process needs little further attention. If left in a cistern, as it is by the Dutch manufacturers, the parenchymatous part, which inevitably passes away with the oil in some degree in the operation of pressing, will gradually subside, and the oil may be drawn off at various levels, of different degrees of purity; the bottom being at length removed to a deep and narrow cistern, where it should be left a considerable time for the dregs to subside.

Linseed oil is used principally as a vehicle for mixing oil-colours for painting, but it is also valuable in several branches of manufacturing industry, and, in a refined or purified state, in some medicinal preparations. Being a fat or unctuous oil, it is slow in drying, and as this is a great inconvenience for some purposes in painting, it is sometimes converted into *drying oil* by boiling it with sugar of lead, white vitriol, red lead, or other substances which possess similar properties. The common kinds of drying oil are generally known by the name of *boiled oil*.

Very full details of the improved modern machinery used in the manufacture of oil from seeds are given by Barlow, in the work above quoted, in Dr. Ure's *Dictionary of Arts*, and in the *Supplement* to that work; and some ingenious presses of simpler character are described in Hebert's *Engineer's and Mechanic's Encyclopædia;* and in both of these works additional details may be found respecting the manufacture of oils of a less generally important character. The process of making castor oil is detailed under RICINUS COMMUNIS, P. C., p. 5, 6.

O'KEEFFE, JOHN, was born at Dublin, on the 24th of June, 1747. Being designed for a painter, he was placed, when only six years old, under the charge of Mr. West at the Royal Irish Academy; and his literary education, in Greek, Latin, and French, was received from Father Austin, a learned Jesuit, he and his family being Roman Catholics. Two years of his youth, beginning when he was about fifteen, were spent in London with an uncle. From early boyhood he had dabbled in versification: at the age of sixteen he had composed a comedy: and when he was no more than eighteen another comedy of his was brought out by Mossop, at the Smock-alley Theatre in Dublin. His dramatic turn now took entire possession of him. He obtained an engagement from Mossop as an actor, and continued for some years to be a member of the company; acting both in Dublin and in other towns of Ireland. At the same time he exercised himself in dramatic writing, often producing small pieces for his own benefits and on other occasions. In 1774 he married a daughter of Mr. Heaphey, proprietor of the Theatre Royal in Dublin, by whom he had three children. Domestic disagreements arose: after seven years of union Mr. O'Keeffe and his wife separated; and the separation lasted for the remainder of their lives.

In 1778 Mr. Colman brought out successfully, at the Haymarket, the farce of 'Tony Lumpkin in Town,' the first piece by which O'Keeffe became known in England. In 1781, on his separation from his wife, he removed to London; and he never again visited his native country. From that time he was a play-writer by profession. The greater number of his pieces were composed for Colman's company at the Haymarket; but he wrote frequently also for Covent Garden under the management of Harris. His dramatic career may be said to have closed in 1798, after which date no new play of his was brought upon the stage. The fruit of his labours was a collection of dramatic pieces, amounting, on his own list, to no fewer than sixty-eight, of which fifty-six were acted, and many of these with great success. Some of them still keep possession of the stage. Such are his comedy of Wild Oats, and his operatic farces of The Agreeable Surprise and The Highland Reel.

O'Keeffe's works do not belong to a high class. Their diction is coarse, and in incident and character they are merely farcical; but the best of them have a flow of spirits, a kindliness of feeling, and a richness of whim and eccentricity, which account adequately for the popularity they so long enjoyed. They were composed in circumstances calling for much indulgence. They were the constant efforts of a very poor man to preserve himself and his children from beggary. And, further, from his twenty-eighth year, when a neglected cold brought on inflammation of his eyes, he suffered under a gradual decay of sight, which speedily made reading and writing alike impossible. He was never entirely blind; but for many years he could do little more than distinguish light from darkness.

In 1798 twenty-one of his pieces were published together, in four volumes octavo. The subscription for the edition scarcely paid the expenses. In June, 1800, Mr. Harris gave him a benefit at Covent Garden, at which he himself appeared on the stage and delivered an address: and the receipts enabled him to spend 300*l.* in purchasing a small annuity. In 1803 he received a life-annuity of twenty pounds from Covent Garden, nominally as the purchase-money of his dramas still unprinted: but this annuity ceased to be paid in 1826. In 1808 he began to receive a pension from the crown, to which another pension of a hundred guineas was added in 1826. From these combined sources he was, during the latest years of his life, in receipt of an income little exceeding two hundred a-year; and, in an honourable spirit of independence, he refused a donation sent him by the Literary Fund Society. In 1826 he published 'Recollections of the Life of John O'Keeffe, written by himself:' two volumes 8vo. In 1828 he removed from the neighbourhood of London to Southampton, and there resided thenceforth, attended by a daughter, who was his only surviving child, his eldest son, a clergyman of the Church of England, having died of the yellow fever at Jamaica, in 1804. O'Keeffe himself was a Roman Catholic to the last. He died at Southampton, on the 4th of February, 1833. In 1834 appeared a small volume of his versified pieces, entitled 'O'Keeffe's Legacy to his Daughter,' and prefaced by notices of his character and domestic circumstances.

OLBERS, HENRICH WILHELM MATHIAS, an able physician and a distinguished astronomer of Germany, was born October 11, 1758, at Arbergen, near Bremen. Of his private life few particulars have yet been made public; and almost all that can be stated respecting the history of this celebrated individual consists only of a few brief notices relating to his discoveries in the heavens. He studied medicine at the University of Göttingen, and, during all his life, his time appears to have been divided between the exercise of his profession and his astronomical researches: it is said that, in 1830, he celebrated, by a public festival, the fiftieth anniversary of his medical labours; and his observatory is described as the most complete of those which, at the time of its construction, existed in Germany. It consisted of three rooms in the upper part of the house, which was situated in the heart of Bremen: three great windows in the south front gave a view of the heavens almost to the horizon on that side, and one in a closet enabled the observer to look towards the north: openings in the ceiling and roof permitted observations to be made near the zenith. Olbers possessed a five feet achromatic telescope, with a position micrometer by Dollond, and a reflecting telescope of equal length by Schröter: he had, also, an astronomical clock by Carsten, a quadrant by Bird, and a reflecting sextant by Troughton, but he had neither a transit instrument nor a mural circle; and, apparently, he determined his time by extra meridional altitudes. Attached to the observatory was an astronomical library containing, among other valuable works, an extensive collection of documents relating to cometography: this library was, after the death of Olbers, purchased by the Emperor of Russia, and deposited in the observatory of Pulkowa.

Dr. Olbers wrote but little on the subject either of medicine or astronomy; but, in 1780, he printed a thesis entitled *De Oculi Mutationibus Internis*, in which he showed that the eye accommodates itself to the different distances of objects from it by means of a variable action of the muscles, in consequence of which changes are produced in the convexity and the focal length of the cornea; and in 1832, he published in the *Annuaire du Bureau des Longitudes* a mémoire entitled 'De l'influence de la lune sur les saisons et sur le corps humain.'

In 1779 he became known to astronomers by a series of observations which he made on the comet of that year, and by his determination of the elements of its orbit: the computations were founded on a method which had been given by Euler; but, at a subsequent period, Olbers discovered a method of calculating the orbits of comets from three observations, which, with respect both to facility and accuracy, he considered as having great advantages over the methods before in use. An account of this method, with a preface by the Baron de Zach, was published at Weimar in 1797. It is entitled *Abhandlung über die leichteste und bequemste methode die Bahn eines Cometen aus einigen Beobachtungen zu berechnen*, and it affords sufficient evidence that the talents of the author as a mathematician were considerable. An outline of the method, with its application to an example is given in Delambre's *Astronomie* (tom. iii. Nos. 184, 223, &c.) Olbers computed also the orbits of the comets which appeared in 1781 and 1795; those of two comets which appeared in each of the years 1798 and 1799, of one in 1802 and of the great comet of 1811.

The interval between the orbits of Mars and Jupiter, which appears disproportionably great when compared with the intervals between any two of the other planets belonging to our system, had suggested to the original and inquisitive mind of Kepler the idea that a planet, too small to be seen from the earth, existed in that region: the idea appears to have been little regarded till M. Bode, of Berlin, obtained his empirical formula, for the distances of the planets from the sun, which except with respect to the interval between Mars and Jupiter, was found to hold good for all the known planets, including the Georgian; when that which was before considered as the vision of an enthusiast was found to be deserving of serious consideration. With a view, therefore, of ensuring, as far as possible, a complete examination of the heavens in the parts where the supposed planet might be expected to be found, M. Schröter was induced to form an association of twenty-four astronomers, who, having divided the heavens into as many zones, were each to confine his observations to one of them. That distinguished individual was chosen President, the Baron Zach secretary; and among the members was Dr. Olbers: the labours of the association were not, however, immediately rewarded; and M. Piazzi, of Palermo, who was not one of the number, had the good fortune to discover January 1, 1801, a planet, to which he gave the name of Ceres, and which was found to be between the orbits of Mars and Jupiter, at a distance from the sun nearly equal to that which, in conformity to the law discovered by Bode, it ought to have.

This planet soon afterwards became invisible, from its vicinity to the sun; but Dr. Olbers and M. Gauss, having calculated its orbit approximatively from such observations as had been obtained, sought for it at the time when it was expected again to appear, and the former was the first to re-discover it. The idea of Kepler and the formula of Bode seemed now to be fully confirmed; but the harmony conceived to exist in the planetary distances was almost immediately, in appearance, deranged; for on the 28th of March, 1802, Dr. Olbers, being engaged in examining the northern part of the constellation Virgo, discovered a star which was not in any of the catalogues: this was ascertained to be a new planet, and it received the name of Pallas. Its orbit was soon calculated, and it was found to describe a very excentric ellipse about the sun at a mean distance from it which is nearly equal to that of Ceres: the time of its periodical revolution is also nearly the same as that of the last-mentioned planet, but it has a much greater inclination to the plane of the ecliptic. Dr. Olbers was led, from the fact that these two planets are nearly in the same part of space when they arrive at the places where the planes of the orbits intersect one another, to imagine that they might be dispersed fragments of a large planet which revolved, at one time, about the sun at nearly the same distance from that luminary; but which, in consequence of an internal convulsion or from some other cause, had been broken up. Pursuing this idea, he considered that there might be other fragments, or small planets, in the same region; and the idea was strengthened when, in September, 1804, a third planet of a like kind was discovered by M. Harding of Bremen. This planet, which was named Juno, has the nodes of its orbit nearly coincident with those of Pallas; the excentricities of the two planets are also nearly equal to one another, and both planets revolve about the sun at nearly the same distance. Dr. Olbers now determined to make the discovery of new planets a particular object of research; and, from 1804 to 1807, he persevered in examining with the most minute attention, at the times of their opposition to the sun, the parts of the heavens which were near the nodes of the three other planets. On the 29th of March, in the latter year, his sagacity and diligence were rewarded by the discovery of a fourth planet: on the 3rd of April he sent intelligence of the event to his friend M. Bode, and he transmitted the series of his observations to M. Gauss. The latter astronomer immediately computed the figure of the orbit, and, Olbers having requested him to give a name to the planet, he designated it Vesta. This is the smallest of the four new planets, or asteroids, as they have been designated, and the time of its revolution about the sun is the shortest.

It may be proper to mention, in this place, that additional confirmation of the opinion of Olbers has been afforded by the discovery of a fifth planet: this was made on the 8th of December, 1845, by M. Hencke of Drissen, and it has received the name of Astræa; it is a small planet, and revolves about the sun, between the orbits of Juno and Vesta, in about four years.

In 1815 (March 6th) Dr. Olbers discovered, near the constellation Perseus, a comet which presented the appearance of an attenuated nebulosity without any visible nucleus; and he continued to observe it till the end of August, when it ceased to be visible: its orbit was calculated by Bessell and Gauss, and it was found to accomplish its revolution about the sun in 73 years. In 1826, he published a dissertation on the probability that a comet may come in collision with the Earth:—a subject which then engaged the attention of astronomers on account of the near approach of the comet Biela when in one part of its orbit. In 1841 he made a proposal for a re-formation of the constellations and a revision of the nomenclature of the stars; recommending, as models, the figures in Flamsteed's Atlas, but better drawn than they are in that work, and also that the representations of persons and machines which have no relation to astronomy should be cancelled.

Dr. Olbers was elected a fellow of the Royal Society of London in 1804, and a Foreign Associate of the Académie des Sciences at Paris in 1829: he was also a corresponding member of several other learned societies, a knight of the order of Danebrog and of the Red-Eagle of Prussia. He died at Bremen on the 2nd of March, 1840; and, as a proof of the esteem in which he was held during his life, his fellow-citizens of Bremen placed his bust in the public library of the city.

(*Biographie Universelle, Supplement*. Monthly Notices of the Royal Astronomical Society.)

OLDMIXON, JOHN, one of the heroes of the Dunciad, was born in 1673. The place and kind of his education are unknown. His authorship appears to have begun with the drama, in which he was thoroughly unsuccessful; and his principal productions were historical, political, and critical. He superintended, carelessly and unfaithfully, the first edition of the collection of English historians which bears the name of Bishop Kennett. He himself wrote also 'A Critical History of England,' 'The History of England during the reigns of the House of Stuart,' and 'The History of England during the reigns of William and Mary, Anne, and George I.' These dull and unlearned works are chiefly remarkable for their strong spirit of Whig partisanship. In criticism Oldmixon was distinguished for his unscrupulous abuse of Pope and other eminent men of his day. He found abundant opportunity for venting his bile, not only in contributions to periodical prints, but in his 'Prose Essay on Criticism,' and his 'Arts of Logic and Rhetoric' (a clumsy adaptation from Bouhours). His party-services were rewarded by an appointment to the place of Collector of the Customs at the port of Bridgewater. He died in London, in 1742.

OMBRO'METER. [Rain Gauge, P. C.]

OMNIBUS. [Metropolitan Stage Carriage, P.C.S.]

OMNIUM, a term used in the Stock Exchange, to express the value, taken as an average, of the different stocks in which a loan is usually funded. Thus, a loan having been contracted for on a certain day, an average is made of the stocks in which such loan is contracted, at the price which they bore on that day, and the fund thus formed as an average of the whole is called Omnium. (M'Culloch's *Dict. of Commerce*.)

ONA'GRA. [Œnothera, P. C. S.]

ONA'TAS (Ὀνατᾶς) of Aegina, the son of Micon, was alike distinguished as a painter and a sculptor: he was contemporary with Polygnotus, and lived accordingly in the early part and about the middle of the fifth century before the Christian æra. His name does not occur in Pliny, and, with the exception of an epigram upon a statue of Apollo by him, in the Greek Anthology, he is noticed only by Pausanias, who however mentions several of his works and speaks of him in terms of great praise. Pausanias speaks of a group of Homeric heroes near the great temple at Olympia, which were dedicated by the Achaeans in common; Thiersch attributes them all to Onatas, but his name was inscribed on one only. Pausanias says that the Achaean people in common dedicated those statues which represent the Greeks who drew lots for the challenge of Hector; they stood armed with spears and shields near the great temple; opposite to them was Nestor with the lots in a helmet. There were eight besides Nestor; the statue of Ulysses, which made the ninth, had been removed by Nero to Rome. Of the remaining eight, only one, that of Agamemnon, had his name inscribed upon it, and it was written from right to left. On the shield of another was represented a cock, and this, says Pausanias, was Idomeneus, the grandson of Minos. In the interior of the shield was the following inscription, which appears to apply to the statue of Idomeneus alone:—

Πολλὰ μὲν ἄλλα σοφοῦ ποιήματα καὶ τόδ' Ὀνατᾶ
Ἔργον, ἐν Αἰγίνῃ τὸν τέκε παῖδα Μίκων.

'As well as many others, this is the work of the skilful Onatas; Micon was his father, his birth-place Ægina.'

The Thasians also dedicated a bronze statue of Hercules by Onatas at Olympia, with a club in his right and a bow in his left hand; it measured ten cubits, and the name of Onatas with his birth-place and parentage was inscribed upon it. Pausanias observes with respect to Onatas that he was not surpassed by any artist that had appeared in the school, or from the workshops, of Attica, since Daedalus; that is, from Daedalus to Onatas's own time, which was shortly before Phidias.

Pausanias mentions further, by Onatas, at Olympia, a Mercury carrying a ram under his arm; he had on a helmet and a cloak besides a tunic or under robe; he was assisted by Calliteles, whom Pausanias supposes to have been the son or pupil of Onatas.

Onatas cast also in bronze a statue of Ceres the Black, or Demeter Melaina, for the Phigalians, in the place of an old wooden image which was destroyed by fire. Onatas cast the new statue from a picture or wooden image of the former one, assisted by a vision in a dream: it had a horse's head. He made also a statue of Apollo, at Pergamus, magnificent for its size and its workmanship.

Onatas made also the bronze chariot of Hiero, dedicated by his son Deinomenes at Olympia in honour of his father's victories in the games: the horses and riders were by Calamis. He made also, together with Calynthus, an artist otherwise unknown, the monument dedicated by the Tarentines at Delphi: they sent a tenth of the spoils taken from the Peucetii, a neighbouring barbarous people. The offerings consisted of several figures of warriors on foot and on horseback: Opis, king of the Iapyges, who assisted the Peucetii, was represented dying; near him stood the hero Taras, and Phalanthus, by whom was a dolphin; Phalanthus was saved from shipwreck in the Crissaean sea and brought on shore by a dolphin.

Onatas is mentioned only once as a painter: he decorated with Polygnotus the walls of the vestibule of the temple of Minerva Areia at Platsea. Onatas painted the first expedition of the Argives against Thebes. He probably also painted at Plataea the picture of Euryganea lamenting the death of her sons Eteocles and Polynices killed by each other's hands; which, according to Sylburgius, is by a MS. error, attributed to Onasias, otherwise not mentioned. Böttiger supposes Micon the father of Onatas to be the celebrated Athenian painter of that name.

(Pausanias, v. 25, 27, viii. 42, vi. 12, x. 13, ix. 4, 5; Junius, *Catalogus Artificum*; Thiersch, *Epochen der Bildenden Kunst unter den Griechen*; Böttiger, *Ideen zur Archäologie der Mahlerei*.)

ONGOLE, or ANGOLE, a town of Hindustan, in the Presidency of Madras, and Northern Carnatic. [CARNATIC, P. C.] Ongole is the chief town of the district of Ongole, and is situated in 15° 31′ N. lat., 80° 1′ E. long., 173 miles N. by W. from Madras. The sovereignty of the district and town of Ongole was acquired by the East India Company in 1801, by treaty with the Nabob of Arcot, to whom it previously belonged. The town was then strongly fortified, but the fortifications have been suffered to fall into decay or have been destroyed.

(Hamilton's *East India Gazetteer.*)

ONOBRY'CHIS (from ὄνος, an ass, and βρύχω, to gnash the teeth), a genus of plants belonging to the natural order Leguminosæ. It has a calyx with five nearly equal subulate teeth; the keel obliquely truncate, longer than the wings; the pod one-celled, compressed, indehiscent, one-seeded, upper suture straight, lower curved, toothed, winged or crested. The species of this genus are natives of Europe or Asia, with unequally pinnate leaves, and axillary elongated peduncles having spikes of flowers red or white at their tops. The most common, as well as only British species is *Onobrychis sativa*, common Sainfoin. [SAINFOIN, P. C.; HEDYSARUM, P. C. S.] About forty other species have been described, but none of them possess useful properties. Many are showy plants when in bloom, and are adapted for flower borders or rockwork. They may be propagated by seeds.

(Don's *Gardener's Dictionary*; Babington's *Manual of British Botany.*)

O'NONIS (from ὄνος, an ass, and ὄνημι, to delight, some of the species being said to be grateful to asses), a genus of plants belonging to the natural order Leguminosæ. It has a five-cleft campanulate calyx, narrow segments, the lower ones longer. The keel is beaked, the style filiform and ascending, the stigma terminal and subcapitate.

O. arvensis, trailing Rest-harrow, has a procumbent uniformly hairy stem, axillary stalked solitary flowers, broadly oblong leaflets, ovate pods shorter than the calyx. It is usually without spines. The stems root at their base, and the seeds are tubercular and scabrous.

O. antiquorum has an erect or ascending stem, bigariously hairy; axillary solitary stalked flowers, oblong leaflets, and ovate, erect pods longer than the calyx. It is doubted by many botanists as to this being the true *O. antiquorum*. Koch and Reichenbach both describe quite a different plant, with smooth seeds.

O. reclinata has a viscid pubescent stem, axillary flowers with one flowered pedicles shorter than the leaf flower, a pod without bracts, the corolla about equal to the calyx, obovate cuneate leaflets serrated at the lip, ovate stipules, and cylindrical reflexed pods. It is found in sandy places in Galloway and the Channel Isles, and in the south of France by the sea coast.

There are 107 species of this genus described, but none of them are used in medicine or the arts. They are chiefly natives of Europe; about twelve species are found in Africa, and a few on the coast of Asia. They are generally handsome when in flower. The hardy shrubby kinds are increased by seeds and layers, the hardy perennial kinds by dividing the roots in the spring, or by seeds. These are well fitted for flower borders. The seeds of the hardy annual kinds only require to be sown in the open border in April. The greenhouse and frame species thrive well in a mixture of loam, peat, and sand; these are usually increased by seeds which ripen in abundance.

(Don's *Gardener's Dictionary*; Babington's *Manual of British Botany.*)

ONOPORDUM, a genus of plants belonging to the natural order Compositæ. It has a honeycombed receptacle, a four-ribbed fruit, and an imbricated involucre, with simple spinous pointed scales.

O. Acanthium, Cotton-Thistle, has an erect many-headed stem, elliptic oblong leaves, woolly on both sides; serrate, spinous, and decurrent; the outer involucral scales lanceolate, subulate, recurved, and spreading. The stem is from four to five feet high; woolly, with broad spinous wings; the involucre nearly globose, large, and somewhat cottony; the scales fringed with spinous teeth; the florets are purple. This plant is found on waste ground in Great Britain and Spain. Another name for the same species is Wild Artichoke, or *Alcachofa* of the Spaniards, on account of the fleshy receptacle being once cultivated as an esculent vegetable. The expressed juice of this plant is said by Eller to be a serviceable application to cancer of the breast, and to cleanse foul ulcers; and a decoction of the root, which is astringent, has been used to restrain discharges from the mucous membranes. The seeds are oleiferous; and M. Durand reports, as the result of experiments, that 22lbs. of onopordum heads will yield 12lbs. of seeds, from which 3lbs. of oil fit for burning may be extracted by heat.

(Babington's *Manual of British Botany*; Burnett's *Outlines of Botany.*)

ONOSMA (from ὄνος, an ass, and ὀσμή, smell: grateful to the ass), a genus of plants belonging to the natural order Boragineæ. It has a five-parted calyx, a tubularly campanulate corolla, and a naked throat. The anthers are sagittate, and connected together by the bases of the lobes. The nuts are ovate, strong, and fixed to the bottom of the calyx, unperforated at the base. The species are small scabrous canescent plants, with crowded lanceolate or linear leaves, and terminal racemes of large yellow secund and usually drooping flowers.

O. Emodi has lanceolate triple nerved leaves, less hairy beneath, terminal solitary racemes, linear bracts, not half so long as the flowers; the calyx is five cornered with ovate segments, a ventricose five-keeled corolla contracted towards the mouth, and the anthers longer than the filaments. It is native of Nepaul, in Gosaingsthan, where it is called by the natives *Moharanga*. The root is branched, of a dark purple colour, and is used in dyeing.

O. echinatum is a hispid plant, covered with white pungent hairs. It has terminal racemes and pedicellate flowers. The corolla is yellow, a little longer than the calyx, tubularly campanulate with reflexed teeth.

O. tinctorium is native of Tauria, in the vicinity of the Bosphorus. The root is simple, blackish, and covered with a red pigment, which stains paper a violet colour.

All the species of this genus, which exceed thirty in number, are extremely handsome when in blossom, but are not valuable on account of any peculiar properties. Most of them are natives of rocks and sandy places in Europe and Asia, and answer well to grow in rock work or wall tops. They are short-lived, and apt tu rot. They do well, however, in pots among other alpine plants.

(Don's *Gardener's Dictionary.*)

OOSTERHOUT, situated in 51° 30′ N. lat. and 4° 52 E. long., is a market-town in the province of North Brabant, in the kingdom of the Netherlands. The population is about 8000 inhabitants. There are numerous potteries, brick-kilns, and three annual fairs for cloth, linen, and shoes.

(Stein, *Lexicon*; Hassel, *Handbuch*; Cannabich, *Lehrbuch.*)

OPACITY is a condition of bodies by which they are incapable of transmitting light through them. It seems to depend upon the nature or disposition of the particles of bodies, but its precise cause is, at present, far from being understood. According to Newton, opacity may arise from the unequal densities of the particles of certain substances, in consequence of which the rays of light on entering those substances suffer such refractions and reflexions as compel them there to remain, and cause them to be finally absorbed; while, in bodies of a homogeneous nature, as glass, diamond, &c., the light experiences so much less of these irregular actions that, except when the thickness of the medium is very great, it is enabled to pass quite through them.

The entire absorption of all the light which enters a substance, merely by the multiplied refractions or reflexions which it undergoes within the mass, is difficult to conceive; and the advocates of the undulatory theory ascribe opacity to the unfitness of the pores, or intervals between the particles of a body, for permitting the vibrations of the particles of æther, and consequently for continuing in the interior the existence of the waves which are incident on its surface. The same persons consider transparency to consist in such a dispositiun of the particles of a body that the incident waves of æther can be propagated with a certain degree of freedom through the mass: some impediment to the propagation of the waves may exist in the most transparent substances; and hence when such substances have more than a certain thickness, the waves cease to be transmitted through them. [TRANSPARENCY, P. C.; ABSORPTION OF LIGHT, P. C. S.]

OPERATION. In this article we intend to point out the principal steps of the application of the calculus of operations [OPERATION, P. C.] to the solution of differential equations and equations of differences. The article just cited must be carefully read before the present one, and also the general principles laid down in ALGEBRA, P. C. S.

However much the calculus of operations may throw light upon the character and principles of algebra, it would at one time have been thougnt unlikely that it should much facilitate actual processes. It does this, nevertheless, and nowhere more than in the subject we are now going to describe. Solutions which by the usual method [VARIATION OF PARAMETERS, P. C. S.] would never have been considered fit examples for an elementary work, on account of their complexity, may be represented with ease, and obtained in full with very little trouble.

When rules of algebra are true of the meanings of any symbols, all consequences of the use of these rules, all relations which are legitimate deductions from them, also represent truths. Not that these truths are always intelligible without subsequent interpretation: nor do we mean to say that, in the present state of the science, the interpretations are always attainable. And further, it may happen that theorems can be pointed ont, derived from processes in which *some* only, and not *all*, of the fundamental rules of algebra are true. This does not prevent our right to deduce conclusions from such theorems, as long as we use no fundamental rules except those which are true of the expressions in question. For instance, we have seen that the operations of our calculus are not convertible with the operation of multiplying by a function of the variable. Thus if E stand for the direction to change x into $x+1$, Δ for that of forming the difference thence arising, and D for the direction to take the differential coefficient with respect to x, we have no right to say $E\phi x(\psi x)=\phi x E(\psi x)$, or $\Delta\phi x(\psi x)=\phi x\Delta(\psi x)$, or $D\phi x(\psi x)=\phi x D(\psi x)$; in which ψx is the function operated upon. But, when we thus use another function, ϕx, besides the one operated on, ψx, this convertibility of operations is the only rule of algebra which fails; it is therefore the only one the use of which we must avoid.

The operations E, Δ, and D, are closely connected with $E+a$, $\Delta+a$, $D+a$, of which they are particular cases; a being a constant, positive, negative, or nothing. We have

$$(E-a)\,.\,\phi x=a^{x+1}\Delta(a^{-x}\phi x)$$
$$(\Delta-a)\phi x=(a+1)^{x+1}\Delta\big((a+1)^{-x}\phi x\big)$$
$$(D-a)\phi x=\epsilon^{ax}D(\epsilon^{-ax}\phi x).$$

The first sides of these equations being representatives of $\phi(x+1)-a\phi x$, $\Delta\phi x-a\phi x$, and $\phi' x-a\phi x$. If these operations be repeated, we have

$$(E-a)^m\phi x=a^{x+m}\Delta^m(a^{-x}\phi x)$$
$$(\Delta-a)^m\phi x=(a+1)^{x+m}\Delta^m\big((a+1)^{-x}\phi x\big)$$
$$(D-a)^m\phi x=\epsilon^{ax}D^m(\epsilon^{-ax}\phi x).$$

These results will also be found to be true when m is negative, by which means we are enabled to interpret $(D-a)^{-1}$, $(\Delta-a)^{-1}$, and $(E-a)^{-1}$ and their repetitions.

These same forms may be extended, as follows:—Let E_x and E_y severally denote the operations of changing x into $x+1$ and y into $y+1$; and let D_x, D_y, Δ_x, Δ_y, be similarly interpreted with respect to the differentiations and differences. We have then

$$E_x-a)^m\,(E_y-b)^n=a^{x+m}\,b^{y+n}\,\Delta_x^m\,\Delta_y^n\,a^{-x}\,b^{-y}$$
$$(\Delta_x-a)^m\,(\Delta_y-b)^n=(a+1)^{x+m}\,(b+1)^{y+n}\,\Delta_x^m\,\Delta_y^n$$
$$(a+1)^{-x}\,(b+1)^{-y}$$
$$(D_x-a)^m\,(D_y-b)^n=\epsilon^{ax+by}\,D_x^m\,D_y^n\,\epsilon^{-ax-by};$$

in which the function first operated upon is left out to save room. Here m and n may be either positive or negative integers. And even a or b may be symbols of operation, but not with respect to x or y. Thus

$$(D_x-a\,D_y)^m=\epsilon^{axD_y}\,D_x^m\,\epsilon^{-axD_y},$$

in which the second side is to be thus interpreted. Changing y into $y-ax$, differentiate m times with respect to x, and then change y into $y+ax$.

We shall now give the heads of some methods of solution, observing that this article is intended only for those who can already master the same solutions by other methods.

Take the common linear equation—

$$a\frac{d^my}{dx^m}+b\frac{d^{m-1}y}{dx^{m-1}}+\ldots=X,$$

in which a and b are constants, and X a function of x. The operation performed upon y is $aD^m+bD^{m-1}+\ldots$: if this be called G, then y is the result of performing the inverse operation G^{-1} upon X. By the method explained in FRACTIONS, DECOMPOSITION OF, P. C. S., transform $(aD^m+bD^{m-1}+\ldots)^{-1}$ into $A(D-\alpha)^{-1}+B(D-\beta)^{-1}+$, &c., where α, β, &c. are the roots of the algebraical equation $ax^m+bx^{m-1}+\ldots=0$ Then y is

$$A(D-\alpha)^{-1}\,X+B(D-\beta)^{-1}\,X+\ldots$$
$$\text{or } A\epsilon^{\alpha x}\!\int\!\epsilon^{-\alpha x}\,X dx+B\epsilon^{\beta x}\!\int\!\epsilon^{-\beta x}\,X dx+\ldots.$$

substituting for D^{-1} its usual mode of expression. The arbitrary parts of the solutions will be obtained by the constants of integration in the usual manner. But the arbitrary part will always be obtained, in all inverse operations, by considering the function operated upon as $X+0$, and operating separately npon X and 0. Thus $(D-a)^{-3}$ X may be completely expressed by

$$\epsilon^{ax}(\textstyle\int dx)^3\,\epsilon^{-ax}\,X+\epsilon^{ax}(\int dx)^3\,\epsilon^{-ax}\,0,$$

the second term of which is $\epsilon^{ax}(P+Qx+Rx^2)$, P, Q, and R being any constants.

Suppose that there are equal roots in the above equation, say three roots equal to a. The resolution of the fraction gives terms of the form

$$K(D-a)^{-3}+L(D-a)^{-2}+M(D-a)^{-1},$$

which contribute to the general value of y,

$$\epsilon^{ax}\{K(\textstyle\int dx)^3+L(\int dx)^2+M\int dx\}\epsilon^{-ax}\,X,$$

and the arbitrary part $\epsilon^{ax}(P+Qx+Rx^2)$.

The lincar equation of differences corresponding to the above is

$$au_{x+n}+bu_{x+n-1}+\ldots=X,$$

where u_x is a function of x to be determined. The operation performed on u_x on the first side is $aE^n+bE^{n-1}+\ldots$

Every single root a, contributes to the solution a term of the form

$$A(E-a)^{-1}.X \text{ or } a^{x-1}\,\Delta^{-1}(a^{-x}\,X),$$

in which $\Delta^{-1}\,a^{-x}$ X may be any function of which the difference is a^{-x} X. If x be an integer, what is called $\Sigma(a^{-x}\,X)$ will do. Any set of equal roots contributes terms of the form

$$A(E-a)^{-k}\,X \text{ or } Aa^{x-k}\,\Delta^{-n}(a^{-x}\,X).$$

Any linear equation being given, in which either of the operations E_x, Δ_x, or D_x is combined with either E_y, D_y, or D_y, the form of the solution may be found. Take for example

$$\frac{d}{dx}u_{x,y}-au_{x,y+1}=X,$$

the operation performed upon $u_{x,y}$ on the first side is D_x-aE_y, and accordingly we have

$$u_{x,y}=\epsilon^{axE_y}\!\int\!\epsilon^{-axE_y}X dx,$$

which is one form of the solution, and must be interpreted by expanding

$$\epsilon^{\pm axE_y}\text{ into } 1\pm axE_y+\frac{1}{2}a^2x^2E_y^2\pm\ldots.$$

Another form can be obtained from

$$(E_y-\frac{1}{a}D_x)u_{x,y}=-\frac{1}{a}X.$$

We can only touch very briefly upon these points, and rather to show the existence of the system than to enter into it. Further details will be found in the *Library of Useful Knowledge*, in the 'Treatise on the Differential Calculus,' pp. 751-758.

The theorems answering to that of integration by parts, when $D-a$ and $E-a$ are used, are as follows. To save room let $D-a$ and $E-a$ be denoted by Θ and Λ. Then

$$\Theta^{-1}(PQ)=P\Theta^{-1}Q-\Theta^{-1}\{P'\Theta^{-1}Q\}$$
$$\Lambda^{-1}(PQ)=P\Lambda^{-1}Q-\Lambda^{-1}\{\Delta P.\Lambda^{-1}EQ\}$$

P and Q being functions of x, to which D and E refer, and P$'$ meaning $dP:dx$. If $a=0$, the first becomes

$$\int PQdx=P\!\int\! Qdx-\int\{P'.\textstyle\int Qdx.dx\},$$

which is the formula for integration by parts. And if Q be of the form Θ^nR, or Λ^nR, and P be a rational and integral function of a lower degree than the nth, the preceding operations carried on will show that $\Theta^{-1}(P\Theta^nR)$ and $\Delta^{-1}(P\Delta^nR)$ can be performed without leaving any trace of inverse operation in the result. Of the first of these it is a particular case that

$$\int P\frac{d^nR}{dx^n}dx$$

can be found whenever P is a rational and integral function of a lower degree than the nth. Thus, P being of the second degree

$$\Theta^{-1}(P\Theta^4R)=P\Theta^3R-P'\Theta^2R+P''\Theta R$$

$$\Delta^{-1}(P\Delta^3R)=P\Delta^2R-\Delta P.\Delta ER+\Delta^2P.E^2R.$$

By help of these theorems the intermediate equations of any linear equation can be readily discovered. Suppose, for instance, we have

$$(D-1)^5(D-2)^3y=X,$$

an equation of the eighth degree. There are eight equations of the seventh degree. Two of them are discovered at once by performing the operations $(D-1)^{-1}$ and $(D-2)^{-1}$ on both sides, giving

$$(D-1)^4(D-2)^3y=\epsilon^x\int\epsilon^{-x}Xdx,$$

$$(D-1)^5(D-2)^2y=\epsilon^{2x}\int\epsilon^{-2x}Xdx.$$

To find the other six, multiply separately by x, x^2, x^3, x^4, the simplest functions of their several degrees, and perform $(D-1)^{-1}$ upon all four results, and $(D-2)^{-1}$ upon the first two. This, by the preceding theorems, can be done. Thus, multiplying by x we have

$$(D-1)^5\{x(D-2)^2y-(D-2)y\}=\epsilon^{2x}\int\epsilon^{-2x}xXdx,$$

$$(D-2)^3\{x(D-1)^4-(D-1)^3y\}=\epsilon^x\int\epsilon^{-x}xXdx,$$

which are two more of the required equations. To find the equations of the sixth degree, those of the seventh degree must be selected which admit of a repetition of the operation without leaving the inverse form $(D-2)^{-1}y$ or $(D-1)^{-1}y$: and the operation must be repeated; and so on.

(See the *Cambridge Mathematical Journal*, vol. iv., pages 60, 96. This work abounds in uses of the calculus of operations; it was here in fact that the late D. F. Gregory first introduced this branch of it. See also the *Examples of the Differential Calculus*, by the same author. Mr. Boole, in a recent volume of the *Philosophical Transactions*, has given great and ingenious extensions to the subject.

OPHI'DIUM (from ὄφις, a snake), a genus of malacopterygious fishes of the Eel tribe. The species have smooth heads; long slender bodies, margined by the united dorsal, anal, and caudal fins. The jaws, palate, and pharynx are all furnished with teeth. The branchial aperture is large. The species vary in form and colour, and in the presence, absence, and number of filamentous appendages or beards attached to the under jaw. Two species inhabit the British seas, but are both very rare. In the Mediterranean, the bearded ophidium is common, and is used for food.

OPHIOCE'PHALUS (from ὄφις, a snake, and κεφαλή, head), a genus of fishes belonging to the division of *Acanthopterygii*, characterised by having labyrinthiform pharyngeals, and capable of living for a long time out of the water. The species inhabit India and China. [ANABAS, P. C. S.]

OPHIOGLOSSUM (from ὄφις, a snake, and γλῶσσα, the tongue), a genus of plants belonging to the natural order Filices and the tribe Ophioglosseæ. The thecæ are connate, disposed in a simple distichous spike attached to an undivided frond.

O. vulgatum, Adder's Tongue, is the only British species. It has an ovate obtuse frond, and is from 4 to 12 inches in height. The spike is club-shaped, usually rather longer than the frond, sometimes very long. This plant is generally distributed over England, and in many places is exceedingly common, covering large plots of ground, and is highly injurious to the crop of grass. It is less frequent in Wales, Scotland, and Ireland. It is a common plant on the continent of Europe, and is said to occur in Africa and North America. Like most singular-looking plants, it has been used in medicine. Ray recommended an ointment composed of oil and adder's-tongue. Gerarde says that the 'Adder's Tongue is dry in the third degree. The leaves of Adder's Tongue stamped in a stone mortar and boiled in oile olive vnto the consumption of the juice and until the herbes be dry and parched, and then strained, will yeeld a most excellent greene oyle or rather a balsame for greene wounds comparable to oile of St.-John's-wort, if it do not far surpass it by many degrees, whose beauty is such that very many artists have thought the same to be mixed with verdigris.' Lightfoot says that the common people in Scotland make an ointment of the green leaves, and use it as a vulnerary. It is also used in the same way in many parts of England.

(Newman, *British Ferns*; Babington, *Manual of British Botany*.)

OPHIO'XYLON (from ὄφις, a serpent, and ξύλον, wood, because it has a twisted root and stems), a genus of plants belonging to the natural order Apocynaceae. It has a 5-cleft permanent calyx, a funnel-shaped corolla with a long tube, thickest in the middle, and a 5-cleft oblique limb. The anthers are subsessile, inserted into the middle of the tube. The ovary is double, each lobe with one ovule, a filiform enclosed style and a capitate stigma. The drupes are baccate, black, about the size of a pea, twin, or solitary by abortion, each containing a one-seeded wrinkled nut.

O. serpentinum, Serpentine Snake-Wood, is native of the East-Indies. In rich soil it becomes a climbing plant, but in poor soil it is a small erect shrub. The leaves are in threes or fives; they are short-stalked, oblong, pointed, wavy, and smooth. The peduncles are long, smooth, round, sometimes nearly erect, sometimes drooping. The pedicels and calyxes are of a bright red colour, and the corollas white. In India the root of this plant is employed by the Telinga physicians as a remedy in many diseases. It is given inwardly as a febrifuge and after the bite of poisonous animals. The juice is also expressed and dropped into the eye for the same purpose, and it is likewise given to promote delivery in tedious cases of labour. This plant is of easy culture and beautiful appearance. A mixture of loam, peat and sand is the best soil, and cuttings will readily strike root under a glass in heat.

(Don, *Gardener's Dictionary*; Lindley, *Flora Medica*; Burnett, *Outlines of Botany*.)

OPHRYS, a genus of plants belonging to the natural order Orchideae. It has a patent perianth, a variously-lobed lip without a spur. The glands of the stalks of the pollen masses each in a distinct pouch.

O. apifera, Bee Orchis, has a tumid 5-lobed lip, the two lower lobes prominent and with a hairy base, the two intermediate reflexed, truncate, terminal, acute, elongated and reflexed; the anthers with a hooked point, the petals oblong, bluntish, downy. It is about a foot high, and has large, few, and rather distant flowers. The sepals are whitish tinged with purple. The lip is velvety, brown, variegated with yellow. It is one of the handsomest species of orchidaceous plants, native of Great Britain, and grows on chalky calcareous soils.

O. arachnites, late Spider Orchis, is distinguished by a terminal, inflexed, flat, rather heart-shaped appendage, and deltoid downy petals. The sepals are pink, the lip dark purple variegated with yellow and velvety, the appendage green, never reflexed. It is found on chalk downs near Folkstone and Sittingbourne in Kent.

O. aranifera, Spider Orchis, has 3 obscure lobes, the middle lobe large, emarginate, without an appendage, the petals linear and glabrous. This species is smaller than the preceding, and with fewer flowers. The petals and sepals are green and quite glabrous. The lip is of a dark brown colour, hairy, and covered with pale or yellowish lines. It is found in chalky places in Kent and Sussex.

O. muscifera, Fly Orchis, has an oblong trifid lip with a large pale spot in the centre, the middle lobe is elongated, bifid, the anthers short and obtuse, and the petals filiform. It is a slender plant and grows about a foot high. The petals are very narrow, and of a purple colour, the sepals green, and the lip of a purplish brown colour, the spot in the centre of a bluish tinge. It is found in damp calcareous thickets and pastures in Great Britain.

(Babington, *Manual of British Botany*.)

OPORINIA, a genus of plants belonging to the natural order Compositae. It has a subimbricated involucre, the exterior scales much smaller in several rows, a punctured receptacle, attenuated uniform fruit; the pappus of all the fruit in one row, feathery, dilated at the base.

O. autumnalis has radical leaves, linear, lanceolate, toothed, or pinnatifid, nearly glabrous; stalk branched, scaly, and thickened upwards, the involucre glabrous or hairy. This is the *Apargia autumnalis* of Smith, and the *Leontodon autumnalis* of Koch. It is a native of Great Britain in meadows and pastures and on lofty mountains.

(Babington, *Manual of British Botany*.)

OPOPANAX, a genus of plants belonging to the natural order Umbelliferæ; it has an obsolete calyx, roundish entire petals rolled inwards, with a rather acute lobe; compressed fruit with a dilated convex border, bipinnate leaves with unequally cordate segments, crenated and obtuse. The umbels are compound; the involucre both universal and partial, and the flowers yellow.

O. Chironum is a native of the south of Europe and Asia Minor, on dry hills, margins of fields, and thickets. It is a plant six or seven feet high, of a dull yellowish colour, and resembling a parsnip. The stem is strongly furrowed; the leaves from one to two feet long, or more, flat, bipinnate, with ovate cordate leaflets, which are usually oblique at the base, often confluent, and surrounded by a cartilaginous crenated border. The calyx is inconspicuous, the styles rather short and stout. Although this plant is a native of the south of Europe, the resinous gum which exudes from the stalk or root when wounded is brought from the Levant and East Indies in roundish drops of a reddish yellow colour, with specks of white. It is supposed to be an emmenagogue, but it is seldom used; it is similar in its effects to assafoetida. This is a plant of easy culture, and may be propagated either by seeds or dividing at the root.

(Don's *Gardener's Dictionary*; Lindley's *Flora Medica*.)

OPTO'METER (from the Greek words ὄπτομαι, to see, and μέτρον, a measure) is an instrument devised for the purpose of ascertaining with precision the refractive powers of lenses, and the distances at which minute objects may be distinctly seen. The idea originated with Scheiner; but such an instrument was constructed by Dr. Porterfield for the purposes just mentioned, and was afterwards improved by Dr. Thomas Young.

Dr. Porterfield's contrivance consisted of a convex glass lens affixed by its frame to a slip of wood about two feet long: a pencil of light, diverging from a radiant point in the axis of the lens, was suffered to fall on a plate of metal in which were two small perforations; and the rays which passed through these, after being refracted in the lens, were received on a screen, where they formed in general two bright spots, but in certain positions of the lens and screen the spots united so as to form but one image. The distance of the single image from the lens, being measured by a scale of inches, constitutes the focal length of the lens for rays diverging from the radiant point. Dr. Porterfield used the instrument to determine the distance at which distinct vision of a small object takes place in the eye; the latter being substituted for the screen, to receive the rays coming from the object through the two perforations.

The instrument constructed by Dr. Young consisted of a slip of ivory, unpolished, or of wood covered with white paper, about eight inches long and half an inch broad, on which, in the direction of its length, was drawn a narrow and well-defined black line. At one extremity of the slip was fixed a plate of ivory, or a piece of card, nearly perpendicular to its length, and this was perforated either with a single aperture or with two apertures at distances from one another varying from $\frac{1}{40}$th to $\frac{1}{8}$th of an inch, but not exceeding the diameter of the pupil of the eye.

On applying the eye to a single aperture, and looking in the direction of the line drawn on the instrument, the line appears to have a certain breadth, and to be ill defined, at the nearest extremity: the breadth gradually diminishes at points successively more remote till it becomes a minimum, when the line becomes distinct; beyond that point the line gradually increases in breadth, becoming again ill defined. On applying the eye to a double aperture, the line appears to be double, the parts seeming to cross one another at a very acute angle, and the intersection is at the place where a single line would have had the minimum breadth: beyond this intersection the two lines appear to diverge from one another, and to become indistinct. The point of intersection is that at which a minute object being placed, its image would be distinctly seen by the eye at the aperture, and its distance from the eye may be immediately found by means of a scale of inches on the instrument, a sliding index being, at the time of making the observation, moved to the point of intersection.

This distance affords, evidently, a measure of the refractive power of the observer's eye; since rays of light diverging from a small object at that distance are, by the lenses of the organ, made to converge accurately to a point on the retina, so as to form there a single and well defined image. If the object were brought either nearer to or removed farther from the eye, the rays, after passing through the two apertures, would form two images, both of which would appear to be less perfectly defined than the single image.

It being assumed that a person whose sight is perfect sees a small object distinctly at the distance of 8 inches from the eye, Dr. Young obtained by computation a series of numbers which he placed on the scale of the optometer, at such distances from the plate containing the apertures, that a spectator having a *presbyopic* eye (or one which, like those of most persons who are advanced in life, has distinct vision of small objects only when they are at greater distances than 8 inches) on looking through the slits and observing the place where the two images of the line cross each other, might ascertain at once, by the number at the place, the focal length of a convex lens which would enable him to see distinctly at 8 inches. He also computed a series of numbers which he placed on the scale in such situations that a person having a *myopic* eye, or one which has distinct vision of objects at less than that distance from it, on observing the place at which the lines appeared to intersect one another, might ascertain the virtual focus of a concave lens which would enable him to see distinctly at 8 inches. The optometer thus became a means of enabling persons to make choice of the proper lenses for spectacles which would correct the imperfections of their natural vision.

But the scale of Dr. Young's optometer being, for convenience, only 8 inches long, and the inferior limit of distinct vision in a presbyopic eye being beyond that distance, Dr. Young applied to his instrument a convex lens 4 inches focus, by which the point of distinct vision for such an eye was reduced within 8 inches from it: the numbers on his scale were therefore computed for the instrument when furnished with such a lens.

Dr. Young used the optometer for the purpose of determining the refractive powers of the eye, not only in its usual state, but also when, in cases of cataract, the crystalline lens had been displaced or extracted, and when the effect of the cornea had been rendered null by immersing the anterior part of the eye in water, which was contained in a cell of a proper form, and having a plane glass in front. By such means he endeavoured to ascertain in what manner the eye accommodates itself to distinct vision for objects at different distances from it; and his conclusion is that the faculty depends entirely (*Lectures on Natural Philosophy*, vol. ii. pp. 575-603) upon changes of figure which take place in the crystalline lens.

ORCA'GNA, or **L'ARCA'GNUOLO**, is the name by which Andrea di Cione, a celebrated old Florentine artist, is generally known; he is by Rumohr first called L'Archagnuolo, which appears to be his proper name. Vasari calls him Orgagna. He was painter, sculptor, and architect; was born at Florence in 1329, according to Vasari, or according to other accounts about 1315 or 1320, and was probably first instructed in art by his father Cione, who was a celebrated goldsmith; from him he passed into the school of Andrea Pisano.

He painted several works, together with his brother Bernardo, in the churches of Florence, and also in the Campo Santo at Pisa, where the Triumph of Death and the Last Judgment were by Andrea, and the Hell by Bernardo; the Last Judgment and the Hell are engraved by Lasinio on a single plate in his 'Pitture del Campo Santo di Pisa:' Orcagna repeated them in Santa Croce at Florence: he had painted previously in the Strozzi chapel in Santa Maria Novella, a picture of Hell from Dante's 'Inferno,' in which he introduced the portraits of several of his enemies. As an architect, he built the elegant Loggia de' Lanzi in the Piazza Granduca at Florence, which is still in perfect condition — it and its sculptures are engraved by Lasinio in Misserini's 'Piazza del Granduca di Firenze, con i suoi Monumenti,' Florence, 1830. He built also the church of the monastery of Or' San Michele, and designed the celebrated tabernacle of the virgin of that monastery. It is a high Gothic pyramidal altar to the Virgin, free on all sides, is built of white marble, and is richly ornamented with figures and other sculptures. The following words are inscribed on the base: 'Andreas Cionis pictor Florentinus oratorii archimagister extitit hujus, MCCCLIX.' It is engraved in Richa's 'Notizie delle Chiese di Firenze,' after a drawing by Andrea himself. Orcagna generally signed himself painter upon his sculptures, and sculptor upon his pictures; on his pictures he wrote 'Fece Andrea di Cione, Scultore;' on his sculptures, 'Fece Andrea di Cione, Pittore.' He was also a poet. Vasari mentions some sonnets which he addressed to Burchiello; and in the works of Burchiello, published in London in 1757, there is a sonnet addressed to Orcagna. He died at Florence according to Vasari in 1389, but according to Manni in 1375.

He was a man of great taste in architecture, and has the credit of having been the first in those ages to adopt the semicircular arch in preference to the pointed; but to this merit, if one, he is not entitled, though his elegant 'Loggia de' Lanzi' may have contributed greatly towards the subsequent popularity of that form of the arch in Italy: Arnolfo di Lapo, however, and other earlier architects, used the semicircular arch. Those, says Lanzi, who are fond of minute detail in minute things, may consult Baldinucci, Bottari, and Manni, concerning Andrea di Clone; Rumohr, however, was the first to show his real name, of which Orcagna is a contraction, Lo Archagnuolo Lo 'rchagnio l' orchagno. In painting, Orcagna did not go beyond Giotto; in sculpture he was a worthy follower of the Pisani. According to his epitaph, which is given by Vasari in the first edition only of his work, he was chiefly excellent as a sculptor, or rather statuary:—

Hic jacet Andreas, quo non praestantior alter
Aere fuit; patriae maxima fama tuae.

His portrait, published in Vasari's work, was taken from one of the figures of the apostles in the above mentioned tabernacle of the Virgin, which is understood to be his own.

(Vasari, *Vite de' Pittori*, &c., and the Notes to Schorn's German translation of Vasari; Rumohr, *Italienische Forschungen*.)

ORDER IN COUNCIL. This expression is chiefly known in connexion with the measures taken by the British government in 1807 and 1809, in retaliation of the Berlin and Milan decrees of Napoleon, by which Great Britain and her colonies were declared in a state of blockade. The measure of retaliation had the effect of treating as enemies, not only France and its dependencies, but all who, either voluntarily or by compulsion, gave obedience to the decrees. A full account of the matter will be found under the head BLOCKADE, P. C. There has been much dispute as to the legality of these orders. The law of nations has acknowledged the blockading of lines of coast against the commerce even of neutral or friendly powers, when the object is to punish the state so blockaded, and the belligerent power has a force on the spot sufficient to make the blockade actual and physical. But where a belligerent power goes beyond this, and declares some place at which it has no armed force under a state of blockade, it simply issues an edict against the freedom of commerce, authorizes its cruisers to seize vessels which are not impeding any warlike operations, and covertly declares hostilities against the states affected by the fictitious blockade. The law of nations has never countenanced such a licence, and it came to be a question whether these orders in council, being thus not of an executive but of a legislative character, were legal, the Privy Council not having any legislative authority in this country, except in so far as it may be authorized by act of parliament. In favour of the orders, it was maintained that they were merely part of the execution of the royal prerogative of declaring and conducting war, and that they were methods of legitimate retaliation, by which individuals undoubtedly suffered, as individuals always must where warlike operations are conducted on a large scale. Analogy was taken from the exercise of the crown's prerogative during war, in prohibiting the supplying of the enemy with commodities contraband of war—an interference with the freedom of commerce justified by the necessity of the case. But these arguments did not satisfy the country generally that the measure, if it was a right one, should not have been accomplished by Act of Parliament instead of Order in Council.

It is difficult to draw the line between what may and what may not be accomplished by Order in Council. There have been various occasions on which, in cases of emergency, orders in council have been issued contrary to law, and those who have been concerned in passing, promulgating, or enforcing them have trusted to legislative protection, and taken on themselves the personal responsibility of the proceeding. In the year 1766, when there was a deficient harvest and the prospect of famine, an order in council was issued prohibiting the exportation of corn from the British ports. In the immediately ensuing parliament the act 7 Geo. III. c. 7 was passed for indemnifying all persons who had advised the order or acted under it, and for giving compensation to all who had suffered by its enforcement. The act in reference to the order declared, 'which order could not be justified by law, but was so much for the service of the public, and so necessary for the safety and preservation of his majesty's subjects, that it ought to be justified by act of parliament.' All orders restricting trade—unless when they are within the justification of the national war policy—and all orders suspending the operation of any act of parliament, would require an act of indemnity. There are some matters affecting trade and the revenue, as to which orders in council are specially authorized by act of parliament. Thus in the Customs' Duties Act, when there is any scale of duties to be paid by the subjects of a state having a treaty of reciprocity with Britain, it is enacted that the treaty of reciprocity, and consequently the right to import at the lower duties, shall be declared by order in council. By the International Copyright Act, 1 & 2 Vict. c. 59, the countries which, by their conceding a term of copyright to works published in Britain are to enjoy a similar privilege here, may be declared by order in council.

OREGON QUESTION. The country known by the name of Oregon is bounded on the south by the parallel of 42° N. latitude, being the northern boundary of Mexico. On the north this territory is bounded by the parallel of latitude 54° 40′, or, more strictly, this is the northernmost point on the coast, for in this latitude the irregularly shaped boundary of the Russian possessions in America terminates. On the east of it are the Rocky Mountains, and on the west the Pacific Ocean. It occupies a space of about thirteen degrees of latitude and fifteen degrees of longitude. Besides the Rocky Mountains, there are two other ranges, one called the Far West or Cascade Range, and the other the Blue Mountains, dividing the country into three divisions, which are distinguished by peculiarities of soil and climate. The country between the Rocky and the Blue Mountains is almost uninhabitable by those who depend on agriculture. In the middle district rain never falls from April to November, and the soil is unpromising. The western district may be calculated, from latitude 42° to latitude 48° 30′, to be 6½ degrees in its extreme length, or less than 450 miles, and its average breadth about 100 miles, that is, 45,000 square miles is the superficial extent of this westernmost region of Oregon, or rather more than the extent of the state of Pennsylvania, to which it is much inferior in fertility. Indian corn does not succeed in any part of Oregon, from deficiency of rain. The valley of the river Willametty, a tributary of the Columbia, which is the most fertile district, is about 150 miles long and 60 broad. Wheat produces here about 20 to 30 bushels an acre. The winters are wet and stormy.

The territory north of the Columbia river and south of the parallel of N. latitude 49°, is that which is in dispute between the governments of Great Britain and the United States. It is bounded on the east and the south by the Columbia river, on the north-west by the Straits of Juan de Fuca, on the west by the Pacific Ocean, and is roughly estimated to be a little larger than the state of New York. Nine-tenths of the eastern half of this 'disputed territory' is described to be 'a worthless desert,'—the other half has a very large proportion of bad land. President Polk has claimed for the United States the territory between 49° N. latitude and 54° 40′, as well as south of 49° to latitude 42°. Between Frazer's river, or latitude 49° and 54° 40′, Captain Wilkes states, that nowhere on the coast could a settlement be formed that could supply its own wants.

The claims of Great Britain and of the United States are both founded on an alleged title derivable from discovery, settlement, and treaty. Some writers have added to these elements of title, what they call 'contiguity,' but this is of no importance in the dispute.

I. The discoveries along the coast have been as follows:—

Navigator's Name.	Flag.	Date.	Latitude reached.
Ulloa	Spanish	1539	30°.
Cabrillo	„	1542	37° 10′.
Ferrelo (Cabrillo's 'pilot')	„	1543	40° 20′ or 43°.
Drake	English	1579	48°.
Gali, or De Gualle . .	Spanish	1584	37½° or 57½°.

[The 57½ is an alteration of a translator; the origiual account is 37½, *in words*, not figures.]

Viscaino	Spanish	1596	42°.
D'Aguilar	„	1596	43°.
Perez	„	1774	55°.
Heceta	„	1775	49° 30′.

[Inferred the existence of the Columbia from the general appearance of the embouchure or bay, and named it San Roque.]

De La Bodega . . .	Spanish	1775	58°.

[These last three voyages were kept secret by the Spanish Government.]

Navigator's Name.	Flag.	Date.	Latitude reached.
Cook	English	1778	44° to beyond 60°.

[Exact discovery scarcely began till Cook.]

Commercial Expedition	Russian	1783	60°.

[Planned from information obtained from King, Cook's successor. It started from the North, and proceeded no lower than 60°.]

Various commercial enterprises, chiefly English, then took place, which ended in the seizure of English vessels by the Spanish Officers at Nootka Sound in 1789. In these enterprises were the well-known names of Dixon, Portlock, Duncan, Colnett, Barclay, Douglas, and Meares; the last of whom may fairly stand next to Cook and Vancouver as a discoverer, in the immediate region north of the Columbia.

Vancouver	English	1792	Surveyed the Coast.

[Inferred the existence of the Columbia from the *river-coloured* water.]

Gray . . .	American merchant	1792	Entered the Columbia.
Baker . . .	English merchant	1792	Entered the Columbia.

[Broughton found Baker there, who stated that he had also been there in the earlier part of the year.]

Broughton, Vancouver's Lieutenant, surveyed the Columbia for upwards of 100 miles above the æstuary, and *took possession*, with the consent of the Indians.

The following are romances.

Lorenzo Maldonado . .	Spanish	1588	
Juan de Fuca	„	1592	Professed to have discovered the North-west passage by sailing *through* the Continent of North America.
Fonte, or De Fuentes . .	Spanish	1640	77°.

This last is a palpable forgery—and was first published in 1708, in London, in 'The Monthly Miscellany, or Memoirs of the Curious.' Neither Fuentes nor Fuca was ever noticed by Spanish writers. Fuca invented his story with a view of getting employed by Elizabeth; Fuentes never existed.

Hakluyt, in his 'Collection of Voyages,' published in 1589, states that Drake merely reached the lat. 42°, but his account is interpolated in the volume which contains it, and he appears to have intended to suppress it. In the edition of 1600 Hakluyt places the northern point of Drake's voyage in latitude 43°.

The authorities for the higher latitude are: 1, 'The World Encompassed,' printed in 1628, under the superintendence of Francis Drake, a nephew of the admiral, which states that the coast 'was searched diligently even unto 48°.' 2ndly, Fletcher, who accompanied Drake, and whose MS. is in the British Museum. 3rdly, the celebrated navigator John Davis, in 'The World's Hydrographical Discovery,' printed in 1595, says, that Sir F. Drake 'coasted all the Western shores of America until he came in the septentrional latitude of forty-eight degrees, being on the back side of Newfoundland.' An authority which ought to decide the question of the limit of Drake's discoveries. 4thly, Admiral Sir W. Monson, who had served under Drake, and who says that Drake 'ventured upon an unknown sea in forty-eight degrees.'

In the account of the Spanish expedition under Galiano and Valdes, published by the order of the King of Spain, at Madrid, in 1802, is this passage—'The true glory which the English navigator (Drake) may claim for himself is, the having discovered the portion of coast comprehended between the parallels of 43° and 48°, to which consequently the name of New Albion ought to be limited, without interfering with the discoveries of preceding navigators.'

The discovery of the coast was, therefore, made by the British. But even if Drake had not discovered it, still, according to the principles laid down by jurists, the exploration of Cook would be treated as conferring a title by discovery, since the voyages of Perez, Heceta, and Bodega were not made known until 1802. (Wolff, 'Institutes du Droit des Gens,' § 213; Vattel, book I. l. xviii. § 207.) The discovery must be made public, otherwise the presumption is against it, or that it was a mere passing act, or that occupation not being intended, the territory was abandoned. Publicity is essential to enable foreign nations to recognise and respect the title founded on it.

Such was the condition of the title by mere discovery when the Spanish officer, Captain Martinez, in May, 1789, seized the British vessels the 'Iphigenia,' 'North-West America,' and in July the 'Argonaut,' Captain Colnett, and the 'Princess Royal.' A correspondence ensued between the governments of Great Britain and Spain, which occasioned a message from the king to both Houses of Parliament, delivered May 25, 1790, stating that 'no satisfaction was made or offered for the acts of seizure, and that a direct claim was asserted by the court of Spain to the exclusive rights of *sovereignty*, navigation, and commerce in the territories, coasts, and seas in that part of the world.' The claim of *sovereignty* made by Spain was objected to, and Mr. Pitt stated that 'it was indefinite in its extent, and had originated in no treaty nor formal establishment of a colony, nor rested on any one of those grounds on which claims of *sovereignty*, navigation, and commerce usually rested.'

This dispute was terminated by the Convention of the Escurial, dated October 28, 1790, the third article of which declared that 'the respective subjects of the contracting parties should not be molested in navigating or carrying on their fisheries in the Pacific Ocean or in the South Seas, or in landing on the coasts of those seas in places *not already occupied*, for the purpose of carrying on their commerce with the natives of the country, or of making *settlements* there.' Great Britain then renounced its title to exclusive possession, founded on mere discovery—and any similar claim on the part of Spain was abandoned. The Convention was condemned by the opposition in parliament, the chief speakers asserting that Great Britain ought to have excluded Spain, and not to have conceded to it the right to settle on the coast. When it was asked where settlements could be made, Mr. Pitt replied that he should esteem the government highly culpable if it neglected to ascertain by actual survey.

Captain Vancouver was sent by the British government to take possession of Nootka Sound, and to ascertain among other things how far to the north Spanish settlements had been established. He sailed from Deptford, January 6, 1791. Nootka Sound was delivered to him, but having a discussion on the extent of his instructions with the Spanish officer, Quadra, Lieut. Mudge was sent to England for further orders. Ultimately, in March, 1795, Nootka was delivered up to Lieut. Pierce of the marines.

It was while Vancouver was on this voyage that he received information that in May, 1792, Captain Gray, of the ship Columbia, from Boston, had entered the æstuary of the river now known by the name of this ship. Vancouver had on the 27th of April observed the 'river-coloured' water of the sea, but he did not attempt to enter the river in consequence of being directed by his instructions not to pursue any other inlet or river than should be navigable by vessels of a burden safely to navigate the Pacific. Shortly afterwards Lieut. Broughton in the Chatham, the consort of Vancouver's vessel, entered the æstuary, and found there the 'Jenny' of Bristol, Captain Baker, who had been there before in the early part of the year. Lieut. B. explored the æstuary, discovered where the river entered it, which Gray had not done, and ascended the river above 100 miles—'taking possession' in the name of his sovereign. Gray, it must be observed, was a mere private trader, without a commission from his government: the coast had been previously discovered, and his own government never noticed his proceedings until 1814. But if he had had a commission, the discovery of the entrance to the river was a geographical merit conferring no rights, for rivers follow the title to the coast, and their discovery does not affect or impair such a title.

After Nootka Sound was delivered up in 1795, the Spaniards never made any settlement north of Cape Mendocino. They abandoned the country, and left the British to perfect their title by discovery, through occupation and settlement.

The subsequent expeditions to Oregon were as follow:—

Name of Traveller.	Flag.	Date.	
Mackenzie . . .	English	1793.	Crossed the Rocky Mountains and discovered Frazer's River.
David Thompson.	English	1800.	Crossed the Rocky Mountains, discovered and named the McGillivray River.
Thompson. . . .	English	1806.	First Settlement West of the Rocky Mountains, in 54°, speedily followed by other settlements among the head-waters of the Columbia.
Lewis and Clarke	American	1805-6.	Explored the Southern branches of the Columbia, and descended the main stream.

Name of Traveller.	Flag.	Date.	
Missouri Fur Company.	American	1808.	Established a post on the Southern arm of the Columbia or Lewis river.
Astor's Company . .	American	1811.	Established Astoria, at the Southern mouth of the Columbia, which was subsequently sold to the English North-West Company.
Thompson, North-West Co.	English .	1811.	Descended the Northern branch of the Columbia and main stream to the mouth.

The expedition of Mackenzie was the first made by civilized men west of the Rocky Mountains.

The posts and settlements made by Thompson were the first established by civilized men west of the Rocky Mountains, and Thompson and his followers were the first white persons who navigated the northern branch of the Columbia or traversed any part of the country drained by this branch of the river.

Astor's Pacific Fur Company consisted of Mr. Astor himself, six British subjects, and three citizens of the United States. Before those who were British subjects started, they asked for and received an assurance from the British minister at Washington—'that in case of a war between the two nations, they would be respected as *British subjects and merchants*.' The expedition received no sanction or support from the government of the United States. In 1813, the persons resident on the Columbia, having full power to do so, sold their establishment to the North-West Company. Subsequently in the same year, Captain Black, R.N., in the Racoon, took possession of Astoria in the name of his Britannic Majesty.

After the war the American government claimed Astoria, under an article of the Treaty of Ghent, made in December 1814, as a post *captured* during the war. This was not the fact; but in 1818 possession was formally delivered up, the British government having previously stated that the post had not been captured, and that the territory had early been taken possession of in his majesty's name (as it had been by Broughton); but that the question of title should be discussed in the negotiation on limits and other matters, which was soon to be commenced.' (Greenhow, 307, 310, 312.)

On the delivery of this post the United States for the first time exercised any act of sovereignty in Oregon. It was put into possession, but not relieved from proving its title, for its possession was derived from Great Britain.

In October, 1818, a treaty between Great Britain and the United States declared that the country should be open to the subjects of both powers for ten years, without prejudice to the claims of either power or to the claims of any *other* power.

In February, 1819, the United States made the Florida Treaty with Spain, which declared part of the west boundary of the United States to be along the parallel of latitude 42° to the sea, both parties ceding to each other, and respectively renouncing, all claims on either side of this line. The Americans pretend that this treaty confers a title to the coast north of 42°, though Spain never completed or obtained a title by occupation.

In August, 1827, a treaty between Great Britain and the United States extended indefinitely the provisions of the treaty of 1818, until determined by notice of a year, and it was not to impair the claims of *either* party. This treaty is still in force, but the Congress of the United States in April 1846, authorised the notice to terminate it to be given.

1. The government of the United States contend, notwithstanding their treaty of 1818, that Spain alone was entitled to Oregon until 1819. In reply it is said that the British title was acknowledged by the Convention of the Escurial—that Spain never made a settlement in the territory, but totally abandoned it—that Spain had no title either by discovery or occupation—that all the rights or claims which it had were derivable from the treaty of 1790—and that official Spanish writers admit the British title by discovery to New Albion.

2. It is contended that Gray discovered the Columbia, and that this is of itself a sufficient title to Oregon. In reply it is said that rivers follow the title to the coast—if the coast was discovered, the rivers follow the title to it—that Gray was not acting under a public commission, and could not, as a private person, extend the territory of the United States—that his discovery was never noticed by his own government for upwards of twenty years—and that in the negotiation with Spain in 1819 it was not set forth.

3. The settlement of Astoria is called a national settlement. In reply it is said that the only sanction the adventurers received was from the British minister—that it was a mere private speculation by a party of men, the majority of whom were British subjects, who had asked for British protection—that the application to the United States government to sanction it was not complied with—and that a colony could not be planted beyond the limits of the United States without the authority of an Act of Congress.

The British title depends on original discoveries made by Drake, Cook, and Vancouver, whose acts were sanctioned and approved of by their sovereigns, and notified to the world—on the acknowledgment of the title made by Spain in 1790—on the restoration of Nootka in 1795, as evidence of the acknowledgment of territorial rights—on the possession taken by British officers, which by our law, when done with the sanction of the sovereign, is alone sufficient to make a country part of the dominions of the crown—on the numerous settlements and posts which our government has allowed the North-West Company and the Hudson's Bay Company to establish—on the recognition of the claims of the British government made by the United States in 1814, in 1818, and in 1827—on the sovereignty which those acts of recognition proclaimed, and which was recognised by the United States before its treaty with Spain in 1819, as well as subsequently in the treaty of 1827.

Great Britain does not assert claims beyond the terms of the treaty of 1790. The United States some time since claimed the whole territory, without ever having obtained any legal authority over any part of it, and they now allege the extent of this bare claim as evidence of having a better title.

In the course of the early negotiations the United States government offered the boundary of 49° to the sea and the navigation of the Columbia river. Great Britain required that the line should run along 49° to the Columbia river, then along the Columbian river to the sea, agreeing not to erect any fort at the mouth of the river. Subsequently it offered part of the territory between the river and the coast. In the last negotiation carried on by Mr. Pakenham and Mr. Buchanan, the United States offered a boundary along the parallel 49°, withdrawing the former proposal respecting the Columbia river; and the correspondence closed with an assertion of an exclusive right to the entire west coast from 42° to 54° 40′, thus denying every claim made by Great Britain and hitherto recognised by the government of the United States. There are signs that this violent policy and disregard of the admissions made in former negotiations will not be supported by the people of America, and it is to be hoped that they will not be indifferent to what is just and honourable in the affair. The British government has twice offered to refer the question to arbitration, and the last offer was very remarkable for proposing that the arbiters should be civilians, in order to avoid the apprehension which republicans might have of a monarchical tribunal. The offers have been refused, and the last refusal was accompanied with most objectionable reasons.

(Greenhow, *History of Oregon and California*, Boston, 1844; Falconer, *On the Oregon Question*, 2nd ed., 1845; Wallace, *On the Oregon Question*, London, 1845; *The Oregon Question examined in respect to Facts and the Law of Nations*, by Dr. Travers Twiss, D.C.L., London, 1846; *Tracts on the Oregon Question, by an American*, New York, 1846. *Spectator*, No. 921.)

OREODAPHNE, Mountain Laurel (from ὄρειος, mountainous, and δάφνη, a laurel), a genus of plants belonging to the natural order Lauraceæ. It is hermaphrodite, diœcious, or polygamous, with a 6-parted nearly equal calyx, the limb eventually disappearing. It has 9 stamens, oblong anthers, with narrow filaments, 4-celled, the 3 inner looking outwards. The fruit is succulent, more or less immersed in a deep thick cup formed out of the altered tube of the calyx. The flowers are panicled or racemose, axillary, and occasionally umbellulate.

O. opifera is native of the woods of Para and the Rio Negro. It has oblong cuspidate leaves, tapering into the petiole, silky on the under side. The panicles are compact, divaricating, and silky. The fruit is oval in shape, and yields upon distillation a volatile oil, of a yellow colour and peculiar smell. It is used in Brazil as a remedy in pains and contractions of the limbs.

O. cupularis is a very large tree, with a strong-scented wood; it has ovate elliptical leaves, acute at both ends, sometimes blunt at the apex, ending in a channelled stalk, obsoletely netted, smooth; the axils of the costal veins without pores. The flowers are in clustered few-flowered rough hoary racemes below the axillary and terminal bud. The calyx of the fruit is nearly globose. This species is the cinnamon of the Isle of France, where it grows, and also in Bourbon and Madagascar.

(Lindley, *Flora Medica.*)

ORGANIC CHEMISTRY. [TISSUES, ANIMAL, P.C.S.]

ORGANON. The article ORGANON in the P. C. contains a general view of the nature and object of logical science; and the article SYLLOGISM contains all that is necessary on that part of the subject. But something is still wanted to complete what has been already given.

The 'Elementa Logices Aristotelicae,' by Professor Trendelenburg, Berlin, 1842, 2nd edition, consists of passages selected from the works of Aristotle, which passages may be considered as containing the elements of the science. These passages are so arranged as to present a kind of outline of the whole logical system of Aristotle. They are intended for the use of the higher classes in gymnasia, and as a preparation for philosophical studies.

The following article is simply a translation of these extracts, which are retained in the order given to them by Trendelenburg; and the references to the original places in Aristotle have also been retained. The original terms of Aristotle are also given in brackets the first time that each is mentioned.

In the preface to another useful work (*Erläuterungen zu den Elementen der Aristotelischen Logik*, Berlin, 1842, by the same author), he has more fully explained his views in making these extracts from Aristotle, and the following remarks are his: At the time of the Reformation Luther saw clearly the advantage of logical instruction in the higher schools, and he viewed it correctly as the completion of the grammatical instruction. The circle of studies in modern times has been wonderfully enlarged, and it has been found necessary to extend the school instruction to meet the wants of the present age. But the great variety of subjects with which our present systems of education occupy us, only render it the more necessary to discipline the mind in such a manner that it shall see a unity in all that is presented to it, and not be bewildered by the variety of objects whose connection escapes us, when they are contemplated separately. Such a discipline is furnished by a good course of elementary instruction in logic. For this purpose the author has adopted the genuine words of Aristotle, in which the philosopher has laid down his elementary logical principles. The logic of Aristotle is not antiquated, though it is both misunderstood by some, and blamed by others who do understand it. It is not the formal logic of Kant, which would confine us to the forms of thought without any reference to the object into which the thought penetrates. Such a limitation of the subject is entirely at variance with the system of Aristotle, and opposed to its real character. 'We have,' says Trendelenburg, 'attempted to restore this real character, and thus brought Aristotle nearer to the objective demands of modern times.' Those who view logic as purely formal, view it differently from Aristotle, and they may consider their mode of viewing the subject to be better than his. Those who say that Aristotle has, in some matters, erroneously extended the province of logic to things beyond its limits, and has not always kept close to the real subject, appear to have conceived that he viewed it merely as formal, and sometimes transgressed the boundaries of the science which he recognised. This is however an erroneous view of Aristotle's system.

The advantage of studying these elementary principles in the words of Aristotle is, that in his writings the language of philosophy is formed into a scientific terminology, which is the basis of that which we now use. We cannot therefore lay a sure foundation for our logical and philosophical studies on any other basis than a full comprehension of the meaning of Aristotle's terms.

The author remarks that a learner of logic there meets with those fundamental notions (begriffe) in their simple nakedness, which lie hidden in all our knowledge and govern it. As these notions are hid or concealed in our knowledge, they appear dry and lifeless when they are produced in their naked form. It is therefore the business of the teacher to show to the pupil their real significance, to make him see their actual value in their application. Now the instruction in the German Gymnasia, as in the higher schools in Great Britain and Ireland, is in the learned languages and in mathematics; and accordingly the teachers in both these departments, if they are to make use of such a work as Trendelenburg's, must be able to apply logical principles to instruction in language and in mathematics. To facilitate this method of instruction is the object of the learned author in the 'Illustrations (Erläuterungen) to the Elements of Aristotle,' not, as he modestly observes, that this is precisely the form in which he supposes that they ought to be presented to the pupil, but 'merely to render clear the fundamental notion of the logical relationship in the objects of scientific observation.'

The mode in which the author suggests that his two works should be used is probably the best; but they cannot be used at all in ordinary instruction, except under the guidance of a competent teacher. They will however be useful to those who have a competent knowledge of the Greek and German languages, and possess some elementary notions of logic; and those who cannot read Greek with facility will probably find the following translation sufficiently exact to give them the meaning of Aristotle. A translation of such extracts is not easy, and it is possible that there may be some errors in it. A careful study of these extracts however will convince a student how meagre and unsatisfactory an exhibition of the elementary principles of logic even our best works on the subject contain.

Outlines of Logic.

(1.) In things in which there is both falsehood and truth, there is a composition of ideas as though they were one. (*De Anim.* iii. 6.) For falsehood and truth are concerned with composition and separation. Accordingly nouns and verbs by themselves resemble the idea without composition and separation, as 'man' or 'white,' when nothing is added: for there is so far neither falsehood nor truth. (*De Interpret.*) Consequently he thinks truly who considers that which is separated to be separated, and that which is compounded to be compounded; but he thinks falsely whose thoughts have a different relation from that which the things have. (*Metaph.* ix. 10.)

(2.) All speech (λόγος) is significative, but not all enunciative (ἀποφαντικός), but only that in which there is either truth or falsehood. But it is not in all; for example, prayer is speech, but neither true nor false. The enunciative alone belongs to the present inquiry. (*De Interpr.* c. 4.)

(3.) Of things said with no connexion, each signifies either substance (οὐσία) or quantity, or quality, or relation, or where (space), or when (time), or position, or possession, or acting, or being acted on. And substance (οὐσία) is, to give an example, such as 'man,' 'horse:' and quantity is, such as two cubits, three cubits: and quality, such as white, grammatical: and relation, such as double, half, greater: and where, such as in the Lyceum, in the agora: and when, such as yesterday, last year: position, such as he is lying, he is sitting: and possession, such as he has shoes on, he is armed: and acting, such as he cuts, he burns: and being acted on (πάσχειν), such as he is cut, he is burnt. (*Categ.* c. 4.)

(4.) Simple enunciative speech is firstly an affirmation, secondly a negation. And affirmation (κατάφασις) is an enunciation of something towards another thing; and negation (ἀπόφασις) is the enunciation of something away from another thing. And the speech is true in like manner as the things are true. (*De Interpr.* c. 5. 6. 9.)

(5.) 'Not-man' is not a noun; for indeed there is no name to call it by; for it is neither affirmative speech nor a negation. But let it be called 'name or noun indefinite,' because it can be said equally of anything, both of what is and what is not.

Every affirmation and negation will consist either of a noun and a verb or of an indefinite noun and a verb. But without a verb there is neither affirmation nor negation. (*De Interpr.* c. 2. 10.)

(6.) Of things some are universal and some particular. I call that universal which can be said of more things (than one); and I call that particular which cannot: thus, man belongs to the universal, and Callias to the particular. (*De Interpr.* c. 7.) A Proposition (πρότασις) then is speech either affirming or denying something about something. And this speech is either universal or particular or indefinite. I call that universal which belongs either to all or to none; I call that particular which belongs either to some one, or not to some one, or not to all; and I call that indefinite which either belongs or does not belong, without the universal or particular, as, for instance, of opposite things that there is the same science, or that pleasure is not a good. (*Analyt. Pr.* i. 1.)

It is very evident that the universal is more efficient, because, knowing the first of two propositions we know in a manner the second also and have it potentially; for example, if a man knows that the angles of every triangle are together equal to two right angles, he knows in a way that the angles of an isosceles triangle also are together equal to two right angles potentially (δυνάμει), even if he does not know that the isosceles triangle is a triangle. But he who knows this proposition (the second) by no means knows the universal, either potentially or in reality (ἐνεργείᾳ). And the universal is an object of the intellect, but the particular terminates in the sensuous perception. (*Analyt. Post.* i. 24.)

(7.) Every proposition belongs either to what is, or to what must be, or to what can be. (*Analyt. Pr.* i. 2.)

(8.) Of all things indeed which exist there are some of such a kind that they can be predicated with truth universally of nothing else, such as Cleon, Callias, and a single thing, and what is an object of sense; but of these things others can be predicated (for each of these persons is both man and animal); and some things are themselves predicated of other things, but of them there is no further predication by other things; and some are both themselves predicated of others, and others of them, for example, 'man' is predicated of 'Callias,' and 'animal' of 'man.' Accordingly that there are somo things which exist which cannot be predicated of anything is manifest. For of sensuous objects nearly every one is such that it can be predicated (κατηγορεῖσθαι) of nothing. (*Anal. Pr.* i. 27.)

The genera are predicated of the species, but not the converse, the species of the genera. (*Categ.* c. 5.)

(9.) It is impossible for the same thing at the same time to belong (ὑπάρχειν) and not to belong to the same thing and in the same manner. This indeed of all principles is the most certain; for it is impossible for any one to conceive that the same thing is and is not. Wherefore all who demonstrate, carry back (their demonstration) to this ultimate notion. (*Metaphys.* iv. 3.)

Every thing which is true must agree with itself in every way: for with truth all which is true is in harmony, but with falsehood the truth is soon at variance. (*Eth. Nic.* i. 8.)

(10.) And since it is possible for what belongs to be enunciated as not belonging, and what does not as belonging, and what belongs as belonging, and what does not belong as not belonging, and with respect to other times than the present in like manner, it is possible to deny both all that a man has affirmed, and to affirm what he has denied. So that it is manifest that to every affirmation a negation is opposed, and to every negation an affirmation; and let the contradiction (ἀντίφασις) be this, affirmations and negations opposed.

And I call opposition (ἀντικεῖσθαι) the contradiction of the same thing about the same thing, but not ὁμωνύμως. (Comp. *Categ.* c. 1; *De Interpr.* c. 6.)

Contradiction is opposition (ἀντίθεσις) in which there is no mean in itself. And as parts of contradiction, there is on one side affirming something of something, and on the other side denying something from (ἀπό) something. (*Analyt. Post.* i. 2.)

In affirmation and negation always, whether it is a thing that exists or does not exist, the one will be false and the other true: for of the two that Socrates is sick and that Socrates is not sick, when Socrates exists it is manifest that one of them is true and the other false, and if he does not exist in the same manner: for that he is sick, when he does not exist, is false, and that he is not sick is true.

Accordingly, to these things alone, which are opposed as affirmation and negation, it will be peculiar for one of them always to be true or false. (*Categ.* c. 10.)

(11.) Things included in the same genus which differ most from one another, are defined to be contrary (ἐνάντια). (*Categ.* c. 6.)

(12.) Therefore I say that affirmation is opposed to negation in the way of contradiction, when the one signifies that a thing is universal and the other signifies that the same is not universal: as for example, every man is white—not every man is white; no man is white—a certain man is white. And I say that the universal affirmation and negation are opposed as contraries: as for example, every man is white - no man is white; every man is just—no man is just. Therefore it is not possible for these to be true at the same time. (*De Interpr.* c. 7.)

(13.) And I say that propositions opposed are in common expression (κατὰ λέξιν) four—namely, all and none, all and not all, some and none, some and not some; but in truth three; for some is opposed to not some merely in expression. And of these three propositions the universal, all and none, are contrary: for example, all knowledge is excellent, no knowledge is excellent; but the other propositions are opposed (as contradictory). (*Analyt. Pr.* ii. 15.)

(14.) And since every proposition is either of being or of necessarily being or of the possibility of being, and of these some are affirmative and some negative in every mode, and again of the affirmative and negative propositions some are universal and some particular and some indefinite, of necessity the proposition which is universally negative can be converted (ἀντιστρέφει) in its terms (ὅροι): for example, if no pleasure is a good thing, neither is any good thing pleasure; but the affirmative proposition must be converted, not indeed universally but particularly; thus if all pleasure is good, some good also is pleasure. And of particular propositions the affirmative proposition must be converted particularly, for if some pleasure is good, some good also is pleasure: but as to the negative, it is not of necessity, for, if 'man' does not belong to (cannot be predicated of) some animal, it does not follow that 'animal' cannot be predicated of 'some man.' (*Analyt. Pr.* i. 2.)

(15.) The things which are sought are equal in number to the things which we know. And we seek four things—the That, the Why, If it is, What it is. For when we seek whether this or that is, referring it to number, for example, whether the sun is eclipsed or not, we seek the That. And there is proof of this; for when we have found out That it is eclipsed we cease inquiring; and if from the beginning we know That it is eclipsed, we do not inquire whether it is. And when we know that it is, we inquire the Why: for example, when we know that the sun is eclipsed and that the earth moves, we inquire Why the sun is eclipsed or Why the earth moves. These things accordingly we inquire after thus; but some things we inquire after in another manner, as for example, Whether there is or is not Centaur or God. I simply mean if there is or is not, but not if he is white or not. And when we know that there is, we inquire What it is, for example, What is God or what is man. (*Analyt. Post.* iii. 1.)

(16.) To know That a thing is and to know Why it is are different; and the knowledge of the Why refers to the first cause. The chiefest of knowledge is to contemplate the Why. (*Analyt. Post.* i. 13, 14.)

(17.) And we think that we know each thing simply when we think that we both know the cause by which the thing is, that it is its cause, and that it cannot be otherwise. (*Analyt. Post.* i. 2.)

(18.) All instruction and all rational learning come from knowledge preceding. And this is manifest to them who contemplate all (sciences); for both those of the sciences which are mathematical by these means exist, and every one of the other arts. (*Analyt. Post.* i. 1.)

(19.) And things are prior and better known in two ways: for it is not the same thing to be prior by nature and prior as regards us, nor yet to be more known by nature and more known by us. And I call those things prior and more known as regards us which are nearer the sense, but I call simply prior and more known those things which are farther from the perception And the farthest off are the most universal, and the nearest are the particular. (*Analyt. Post.* i. 2.)

(20.) We get certainty in all things either by syllogism (συλλογισμός) or by induction (ἐπαγωγή). (*Analyt. Pr.* ii. 23.)

We learn either by induction or demonstration (ἀπόδειξις); and demonstration proceeds from the general, but induction from the particular. (*Analyt. Post.* i. 18.)

(21.) And syllogism is speech, in which when somo things are laid down, something else different from what are laid down results by virtue of their being laid down; and by virtue of their being laid down I mean that it results through them; and I mean by resulting through them, that there is no need of any external term for the necessity to be. (*Analyt. Pr.* i. 1.)

(22.) And I call Term that into which the proposition is resolved, as the predicate and the thing of which it is predicated (subject). (*Analyt. Pr.* i. 1.)

(23.) Whatsoever is affirmed of the predicate, will be affirmed of the subject also. (*Categ.* c. 5.)

(24.) When three terms are so related to one another that the last is in the whole of the middle, and the middle is either in or not in the whole of the first, of necessity there is a perfect syllogism of the extremes. And I call middle that which is both itself in another and another in it, and which also by position becomes middle: And I call extremes both that which is in another, and in which another is. For if A can be predicated of all B, and B of all C, necessarily A can be predicated of all C. And I call a figure (σχῆμα) of such description the first. (*Analyt. Pr.* i. 4.)

(25.) And when the same thing belongs to all of one thing and to none of another, or to all or none of each, such a figure I call the second, and that which is predicated of both I call the middle term in it—And the middle term is placed without the extremes (ἄκρα), but the first in position—And a syllogism will be possible both when the terms are universal and when they are not universal. When they are universal, there will be a syllogism, when the middle is in all of one, and in none of the other, if the negative be in one of the two terms: but otherwise the syllogism cannot be.

For let M be predicated of no part of N, but of all X. Since then the negative proposition can be converted, N will belong to no part of M: but M by the supposition was predicated of all X. Accordingly N will be no part of X: for this has been shown before. Again, if M shall belong to all N, but to no part of X, neither will N belong to any part of X: for if M belongs to no part of X, neither will X belong to any part of M: but M by the supposition belongs to all N. Therefore X will belong to no part of N: for this also has become the first figure. And since the negative proposition is convertible, neither will N belong to any part of X, so that there will be the same syllogism. An affirmative syllogism is not produced by means of this figure, but they are all negative, both the universal syllogisms and the particular syllogisms. (*Analyt.* i. 5.)

(26.) But if one thing belongs to the whole of the same thing and another belongs to no part of it, or both to the whole or to no part, such a figure I call the third; and I call that the middle in it of which both the predications are made, and I call the extremes the predicates:—And the middle is placed without the extremes, and last in position—And a syllogism will be possible both when the terms are universal and when not universal with reference to the middle.

Accordingly if they are universal, when both P and R belong to all S, P will belong to some part of R of necessity: for since the affirmative is convertible, S will belong to some part of R, so that since P belongs to all of S, and S to some part of R, of necessity P belongs to some part of R: for the syllogism is produced by means of the first figure.

To form a syllogism universally by means of this figure is not possible, neither in the negative nor in the affirmative. (*Analyt. Pr.* i. 6.)

(27.) And it is manifest that every demonstration will be by means of three terms and not more. And since this is clear, it is manifest that it consists of two propositions and not more: for the three terms are two propositions. (*Analyt. Pr.* i. 25.)

(28.) It is necessary in all the figures that the middle be in both the propositions. If then the middle term both predicate and be the subject of predication, or itself predicates and anything is denied of it, it will be the first figure: but if it both predicates and is denied of something, it will be the middle figure: and if other things are predicated of it, or one thing is denied and another predicated, it will be the last figure. (*Analyt. Pr.* i. 32.)

(29.) Moreover in all syllogisms one of the terms must be affirmative and it must be universal: for without the universal there will either be no syllogism, or it will not relate to the thing proposed, or the very thing to be proved will be assumed. For let it be proposed to prove that music is an honourable pleasure; if then any one should assume that pleasure is honourable without adding the 'all,' it will not be a syllogism: and if he should assume that some pleasure is excellent, if he means other pleasure, it has nothing to do with the subject proposed, and if he means the very pleasure itself, he assumes the very thing which is to be proved. (*Analyt. Pr.* i. 24.)

(30.) The science of what a thing is, it is possible to investigate by means of this figure alone (the first). For in the middle figure the syllogism is not affirmative, and (the question) what science is, requires the affirmative: and in the last figure there is a syllogism, but not a universal syllogism, and the question what a thing is, belongs to the universal. (*Analyt. Post.* i. 14.)

(31.) All who attempt to syllogize from things less credible than the conclusion, manifestly do not syllogize rightly. (*Top.* viii. 6.)

(32.) From what is true it is not possible to form a false conclusion, but from what is false it is possible to form a true conclusion; not however 'why' but 'that' the thing is. (*Analyt. Pr.* ii. 2.) Accordingly it is manifest that, if the conclusion be false, of necessity those things are false either wholly or partly from which the argumentation (λόγος) is derived; but when the conclusion is true, it is not a matter of necessity for either anything or all to be true, but it is possible when none of the things in the syllogism are true, for the conclusion to be true notwithstanding, but not as a matter of necessity. And the reason is, that, when two things are so related to one another, that when one is, of necessity the other is, when this other is not, neither will the first be, but when it is, it is not a matter of necessity that the first be. (*Analyt Pr.* ii. 4.)

(33.) And a Philosophema is a syllogism demonstrative, and an Epicheirema a syllogism dialectic, and a Sophisma a syllogism contentious, and an Aporema a dialectic syllogism of contradiction. (*Top.* viii. 11.) Demonstration then is, when from true and first things the syllogism comes, or from things of such a kind which by means of some first and true things have received the beginning of the knowledge concerning them; and a Dialectic syllogism is that syllogism which is derived from common notions. (*Top.* i. 1.)

And speech is called false in one manner, when it appears to be conclusive but is not conclusive, which is called a contentious syllogism (ἐριστικὸς συλλογισμός). (*Top.* viii. 12.)

Contentious speech is the syllogizing from notions that appear to be common notions, but are not; or it is merely apparent syllogizing. (*Soph. Elench.* 2.)

The equality of opposite arguments (λογισμοί) would appear to be productive of doubt. (*Top.* vi. 5.)

(34.) Induction (ἐπαγωγή) is the progress from the particular to the universal: thus if a pilot who is skilled is the best, and if a charioteer who is skilled is so, universally also the person who is skilled in each thing is the best. And induction is the more persuasive and more clear, and more intelligible to sense, and in vogue among the many; but the syllogism has more force and is more effective against opponents in argument. (*Top.* i. 12.)

(35.) Induction then and the syllogism from induction, is through one extreme to syllogize the other with the middle term; for example, if B is the middle term of A and C, by means of C to show that A may be predicated of B: for thus we make Inductions.—But C must be considered as composed of all things individually: for induction is made through all. (*Analyt. Pr.* ii. 23.)

(36.) In a manner induction is opposed to syllogism; for the one (syllogism) by means of the middle term proves the first term to be predicated of the third, but the other (induction), by means of the third term, proves the first to be predicated of the middle term. Naturally then the syllogism through the middle term is prior and more familiar; but to us the syllogism through induction is the clearer. (*Analyt. Pr.* ii. 23.)

(37.) Probable (εἰκός) and Sign (σημεῖον) are not the same, but Probable is a proposition conformable to opinion: for what for the most part men know to be produced in a particular way or not produced, or to be or not to be, this is probable; for example, that men hate the envious, or like those who love. And Sign must be considered to be a proposition demonstrative either necessary or conformable to opinion: for if when any thing is, the thing is, or when anything has happened, the thing happens before or after, this is a sign of the thing having happened or being.

Enthymema then (ἐνθύμημα) is a syllogism from probables or signs. (*Analyt. Pr.* ii. 27.)

(38.) And an example is, when the first is shown to belong (ὑπάρχον) to the middle through one like the third. But it must be known that both the middle belongs to the third and the first to the like. For example, let A be bad, and B be to take up war against neighbours; and C, the Athenians, taking up war against the Thebans; and D, the Thebans, taking up war against the Phocians. If then we wish to show that to make war on the Thebans is a bad thing, we must assume that to make war on neighbours is bad. And the evidence of this is from the like things for example, that the war of the Thebans against the Phocians is bad. Since then to make war on neighbours is bad, and since the war against the Thebans is against neighbours, it is manifest that to war against the Thebans is bad. Accordingly it is clear that B belongs to C and to D (for both C and D are to take up war against neighbours), and that A belongs to D (for the war of the Thebans against the Phocians was not good); but that A belongs to B will be shown through D.

And in the same manner also if through more like things, the evidence should exist of the middle belonging to the first. Accordingly it is manifest that the example is neither as a part to the whole, nor as a whole to a part, but as a part to a part, when both are included in the same notion, and the one is known. And it differs from induction, in as much as induction by means of all the particulars shows that the first belongs to the middle, and does not connect the syllogism with the first, but the example both connects it and does not derive its evidence from all the particulars. (*Analyt. Pr.* ii. 24.)

(39.) Both modes of proof, that by syllogisms and that by induction, teach by means of things known before; the one taking its assumptions from the general notions of mankind, and the other showing the universal through the evidence of the particular. And in the same manner rhetorical arguments persuade; for they (the arguments) are either by means of example, which is induction, or by means of enthymemata, which is syllogism. (*Analyt. Post.* i. 1.)

(40.) Refutation (*ἔλεγχος*) is a syllogism of contradiction. (*Analyt. Pr.* ii. 20.)

(41.) And objection (*ἔνστασις*) is a proposition contrary to a proposition. And it differs from the proposition, in as much as it is possible for the objection to be particular, but the proposition either cannot be so at all, or at least not in the universal syllogisms. (*Analyt. Pr.* ii. 26.)

(42.) Since it is the nature of some things through themselves to be known, and of some through other things (for principles (*ἀρχαί*) are known through themselves, but other things subordinate to principles are known through other things), when any one attempts to show through itself a thing not known through itself, then the thing to be proved (*τὸ ἐξ ἀρχῆς*) is assumed. (*Analyt. Pr.* ii. 16.)

And people appear to assume what is to be proved in five ways. Most manifestly and first, if a person should assume that which requires to be proved. And this in itself does not easily escape notice; but in common names (*συνώνυμα*)* and in all those things in which the name and the notion (*λόγος*) have the same meaning, it is more easy to escape detection. And the second way is when a person assumes the universal when it is necessary to prove the particular; for example, if a person attempting to show that of contrary things (*ἐναντία*) there is one science, should universally assume that of opposed things (*ἀντικείμενα*) there is one science; for he appears to assume with many other things that which it was requisite to prove by itself. The third way is, if any one, when the thing proposed is to show the universal should assume the particular; for example, if he had to prove that of all contrary things there is one science, he should assume that there is one science of some particular contrary things; for such a one also appears to assume separately by itself that which it was requisite to prove together with others. Again, if any one should assume the problem (*τὸ προβληθὲν*) by dividing it; for example, if, when it was required to show that the art of medicine concerned both health and sickness, he should assume each separately. Or if any one should assume one of two things which follow one another of necessity; for example, that the side (of a square) has no common measure with the diagonal, when it was required to show that the diagonal has no common measure with the side. (*Top.* viii. 13.)

(43.) The affirmative (demonstration) is prior to the negative, and more easily known, for through the affirmation the negation is known, and the affirmation is prior, as being also is prior to not being. Further, it is nearer to a first principle; for without the positive proof there is no negative proof. (*Analyt. Post.* i. 25.)

(44.) All persons who form a conclusion through that which is impossible, form indeed a false conclusion, but they show what has to be demonstrated by virtue of an hypothesis, when anything impossible results by the assumption of the contradiction (*ἀντίφασις*) (10). (*Analyt. Pr.* i. 23.)

The demonstration which leads to an impossibility is thus:—If it were required to show that A does not belong (*ὑπάρχει*) to B, it must be assumed that it does, and that B belongs to C, so that it follows that A belongs to C. But let this (that A belongs to C) be known and agreed to be impossible. Then it is not possible for A to belong to B. If then it is granted that B belongs to C, it is impossible for A to belong to B. And since the affirmative (*κατηγορική*) demonstrative is better than the negative, it is manifest that it is also better than the demonstrative which leads to impossibility. (*Analyt. Post.* i. 26.)

* See *Categ.* s. 1, definition of *ὁμώνυμα* and *συνώνυμα*.

(45.) The object of science and science differ from the object of opinion and opinion, in as much as science is universal and is of necessity, and the necessary can not be otherwise, but opinion is unsettled. (*Analyt. Post.* i. 33.)

(46.) Induction is not possible when there is no sensuous perception; for sensuous perception belongs to the particular. Nor yet through sense nor through perception is it possible to attain science. For though sensuous perception refers to a thing as being of a certain quality, and not to any definite thing, nevertheless it is necessary to have some one definite thing as the sensuous object, and the where and the when. But what is universal and in all things it is impossible to have sensuous perception of, for it is neither any particular thing nor now; for, if it were, it would not be universal; for we affirm that the always and the everywhere are universal. Wherefore also if we were in the moon and saw the earth intercepting (the light of the sun), we should not know the cause of the eclipse, for we should perceive that it is eclipsed now, but we should not know why at all, for there would be no sensuous perception of the universal. (*Analyt. Post.* i. 18, 31.)

(47.) And I call universal whatever belongs to all both of itself and in itself. It is manifest then that whatever is universal of necessity belongs to the things. And the 'of itself' and 'in itself' are the same; for example, of itself a point belongs to a line inasmuch as it is a line; and to a triangle, inasmuch as it is a triangle, there belong two right angles; for of itself the triangle (as to angles) is equal to two right angles. And the universal then is, when it can be demonstrated of any individual (of the class) and of no class prior to that. (*Analyt. Post.* i. 4.)

(48.) To what thing anything of itself belongs, that very thing is its own cause (*αἴτιον*); and the universal is first, therefore the universal is the cause. (*Analyt. Post.* i. 24.)

(49.) Universally, of all things it is impossible for there to be demonstration; for it would proceed indefinitely, so that thus there would be no demonstration at all. (*Metaph.* iv. 4.) And it is not possible for the thought to go through the infinite. (*Analyt. Post.* i. 22.)

(50.) And those things are true and first which not through other things, but through themselves receive assent; for it is not necessary in scientific first principles for the 'wherefore' to be inquired after, but each of the principles must itself of itself receive assent. (*Top.* i. 1.) And in two ways it is necessary first to know: for as to some things it is necessary first to admit that they are; but as to others it is necessary to understand what the thing spoken of is; and as to others again both; for example, in the proposition that either to affirm or deny every thing is true, we must assume the 'is'; and in the triangle, that it signifies this particular thing; and in the monad both, both what it means and that it is. (*Analyt. Post.* i. 1.)

(51.) But we assert that all science is not demonstrative, but that that of the immediate (*ἄμεσα*) is incapable of demonstration. And that this is a matter of necessity, is clear: for if it is necessary to understand the prior and those things from which the demonstration comes, and the immediate at any time enter into the demonstration, it is a matter of necessity that the immediate are not capable of demonstration. And this then we so affirm, and that there is not only science, but also some first principle (*ἀρχή*) of science by which we know the terms (*ὅροι*). It is necessary not only to know first the first things, either all or some, but also to know them more: for always that through which each thing is, is more (in a higher degree); for example, that through which we love, is more love. So that if we know by the first things and believe, those things also we know and believe more, since by them we know also the things which come after. (*Analyt. Post.* i. 3. 2.)

(52.) And an immediate proposition (*πρότασις ἄμεσος*) is a beginning (*ἀρχή*) of demonstration, and an immediate proposition is that to which there is no prior proposition. (*Analyt. Post.* i. 2.)

(53.) And of an immediate syllogistic beginning I call that the Thesis which need not be demonstrated, and which it is not necessary that he who is going to learn anything should possess; but what he who is going to learn anything must necessarily possess, is an axiom (*ἀξίωμα*). (*Analyt. Post.* i. 2.)

(54.) The first things will be definitions (*ὁρισμοί*) incapable of demonstration. For definition is of what the thing is and of essence: but all demonstrations appear to go by hypothesis and to assume what a thing is, for example, mathematical demonstrations take for granted what a unit is and what odd is, and other kinds of demonstration in like manner.

The definition is a certain notification (γνωρισμός) of essence. (*Analyt Post.* ii. 3.)

(55.) He who defines shows either what a thing is or what the name means. (*Analyt. Post.* ii. 7)

All who in any way by a name give an account of a thing, manifestly do not give the definition of the thing, since every definition is speech (λόγος). (*Top.* i. 3.)

What a triangle means, the geometer assumes; but that it is, he proves. (*Analyt. Post.* ii. 7.)

(56.) And it is necessary to investigate, when considering things which are alike and do not differ, in the first place what they all have in common, then again with respect to other things what things they have which are of the same genus as the former, and are the same as one another in species, but different from the first named. And when in these things it has been found what they all have in common, and in the other things in like manner, we must consider again if there is anything in common in these things which have been taken, until you come to one notion (λόγος): for this will be a definition of the thing. But if a man does not come to one notion, but to two or more, it is manifest that what is sought cannot be one, but more than ono. For example, if we should inquire what magnanimity is, we must consider in the case of some magnanimous persons whom we know, what one thing they all have by which they are such. For example, if Alcibiades is magnanimous, or Achilles, and Ajax, what one thing thoy have all in common? Non-endurance of insult; for the first made war, and the second was enraged, and the third killed himself.

Again in the case of others, such as Lysander or Socrates; if indifference in prosperity and adversity are the things that they have in common, these two things I take and consider what same things are contained in the absence of all feeling (ἀπαθεία) as to fortune, and non-endurance of insult. If they have nothing in common, there must be two species (εἴδη) of magnanimity. (*Analyt. Post.* ii. 13.)

(57.) Of the things indeed which are in the definition each will extend further, but all will not extend further. For of necessity there must be this essence (οὐσία) of the thing: for example, there is number in every Three (τριάς), odd (περιττόν), and the prime in both ways, both so as not to be measured by any number and not to be composed of numbers. This then is Three, number odd, and prime, and prime in this manner: for of each of these things some are in all odd numbers also, but the last is in Two also, but all are in none. (*Analyt. Post.* ii. 13.)

(58.) And it is necessary, when a person is labouring at any whole thing, to divide the genus (γένος) into things indivisible in species, the first; for example, to divide number into Three and Two. (*Analyt. Post.* ii. 13.)

All genus is divided by differences which aro opposed to one another in division, as a living animal by the difference of quadruped and bird and fish. (*Top.* vi. 6.)

That everything should fall under the division, if they be things opposed in which there is no middle, is not an assumption, for it is necessary that everything should be in one of them, if there shall bo a difference (διαφορά) in it (the genus). (*Analyt. Post.* ii. 13.)

It is requisite moreover to divide by privation (στέρησις), and those who cut into two parts divide by privation. And there is no difference in privation, so far as it is privation, for it is impossible that there should be species of a thing which does not exist; for example, of animals without feet or animals without wings, as there is in the case of winged animals and quadrupeds. (*De Partib. Animal.* i. 3.)

(59.) Definition consists of genus and differences. (*Top.* i. 8.)

It is requisite that he who defines well define through genus and differences, and these belong to those things which are plainly clearer than and prior to the species (εἶδος).

And there are three ways in which the definition is not from prior things. The first is, if through what is opposed that which is opposed is defined; for example, if through evil good is defined; for tho opposed exist by nature. But to some the knowledge of each of them appears to be also the same, so that neither is one better known than the other. But it should not escape notice that some things perhaps it is not possible to define otherwise, for example the double without the half, and all those things which of themselves are said in relation to anything (πρός τι): for in all such things to be is the same thing as to be related to something in some manner, so that it is impossible without the one to know the other; wherefore it is necessary in the notion (λόγος) of the one that the other also be included.

Another way is, if a man uses the very thing which is defined. But this escapes notice, when he has not used the name itself of the thing defined; for example, if he defined the sun to be a star which appears in the day time; for he who employs the word day employs the word sun. And it is requisite in order that such errors may be detected to exchange the name (ὄνομα) for the notion (full speech, λόγος), for example, that day is the passage of the sun above the earth: for it is manifest that he who has spoken of the passage of the sun above the earth has spoken of the sun. So that he who has employed the word day has employed the word sun. A third way is, if that which is opposed in division is defined by that which is opposed in division, for example that odd is greater than even by a unit. For things of the same genus opposed in division exist by nature, and odd and even are opposed in division: for both are differences of number. (*Top.* vi. 4.)

(60.) To know what a thing is, is the same as to know why it is. What is an eclipse? Privation of light from the moon through the earth intercepting (the light.) What causes an eclipse? or why is the moon eclipsed? Because the light fails, owing to the interposition of the earth. What is symphony? A proportion (λόγος) of numbers in sounds high or deep (ὀξύ, βαρύ). Why is the high symphonious with the deep? Because the high and deep sounds have a proportion (λόγος) of numbers. (*Analyt. Post.* ii. 2.)

(61.) We seek the cause after we know that a thing is; but sometimes they are manifest at the same time also; but it is not possible to know the cause before we know that the thing exists. (*Analyt. Post.* ii. 8.) For it is impossible to know what a thing is when we are in ignorance whether it exists or not.

And both the notion or expression (λόγος) appears to give evidence to phænomena, and phænomena to the notion. (*De Coel.* i. 3.)

(62.) The cause is the middle (μέσον), and in all things this is sought. (*Analyt. Post.* ii. 2.)

(63.) Not only that a thing 'is' ought the definition (ὁριστικός λόγος) to show, as the most part of definitions declare, but the cause also ought to be in it, and to be clear. But the notions of the definitions are as conclusions: for example, what is quadrature? It is a rectangular equilateral figure being equal to a figure of unequal sides * And such a definition is an expression of the conclusion. But the definition which says that quadrature is invention of a middle, states the cause of the thing. (*De Animal.* ii. 2, § 1.)

(64.) And it appears that not only what a thing is, is useful towards knowing the causes of the accidents of essences (τῶν συμβεβηκότων ταῖς οὐσίαις), as in mathematics what a straight line is and what a curved line is, or what a line and a plane are, is useful towards seeing how many right angles the angles of a triangle are equal to, but conversely also the accidents help in a great degree to perceiving what the thing is: for when we are able by the appearance (φαντασία) to give an account of the accidents either of all or of the greater part, then concerning the essence also we shall be able best to speak: for of all demonstration what a thing is (τὸ τί ἐστιν), is the beginning. So that in all definitions in which it does not happen that we can recognise the accidents, and cannot even form a conjecture of them easily, it is manifest that they are all enunciated dialectically (διαλεκτικῶς) and emptily (κενῶς). (*De Animal.* i. 1, § 8.)

(65.) And of some things some other thing is the cause, and of other things not.

Accordingly it is manifest that of those also which belong to the class of what a thing 'is,' some are immediate (ἄμεσα) and first principles (ἀρχαί), which we must assume (ὑποθέσθαι) both to be, and we must assume what they are, or in some other way make clear, which the arithmetician does: for both what unity is and that it is he assumes. But as to those things which have a middle (μέσον), and of which something else is the cause of the essence, we can, as we have said, show by demonstration. (*Analyt. Post.* ii. 9.)

(66.) And of proposition (putting, placing, θέσις) that which takes for granted either of the parts of the enunciation, for example, that a thing is, or is not, is Hypothesis (ὑπόθεσις); but the proposition without this is Definition: for the defini-

* This is what the 14th Proposition of the Second Book of Euclid shows.

tion is proposition (θέσις); for the arithmetician lays down (puts, places, τίθεται) that the unit is indivisible, as far as quantity is concerned: but it is not hypothesis: for what a unit is and that there is a unit is not the same thing. (*Analyt. Post.* i. 2.)

(67.) All demonstrative science is about three things, two of which are assumed to be; and these two are genus, the affections (παθήματα) of which by themselves it contemplates, and what are called common axioma (ἀξίωματα) from which first principles science demonstrates; and thirdly, the affections (πάθη) of which what each means it takes for granted. (*Analyt. Post.* i. 10.)

(68.) It is clear that it is not possible to demonstrate the peculiar first principles of each thing: for those first principles will be the first principles of all things, and knowledge of those is that which is supreme over all. For he knows more who knows from the higher causes: for he knows from the prior when he knows from causes which depend not on other causes. So that if he knows more and most, that science also will be both more and most. (*Analyt. Post.* i. 9.)

(69.) Accordingly that it is impossible to have science from demonstration, if a man does not know the first principles which admit of no middle (ἀρχαί αἱ ἄμεσαι), has been said before. But as to the knowledge of things which want a middle, a man may be in doubt. All animals have an innate discerning faculty, which men call perception (αἴσθησις). And as they have perception, in some animals there is a permanence (μονή) of the thing perceived (αἴσθημα); and in others there is not. In those animals, then, in which it is not, there is either wholly, or with respect to things of which there is no permanence in them, no knowledge except of what they perceive: but in those animals in which there is, there is the faculty of having the perception in the mind, though they do not then perceive. And many animals being such, there results a difference among them, so that some have reason owing to the permanence of such things, and some have not. Accordingly from perception comes memory (μνήμη), as we call it, and from the frequent remembrance of the same thing comes experience (ἐμπειρία): for many remembrances in number are one experience. And from experience, or from a whole thing remaining tranquil in the mind as one thing apart from the many, whatever thing in all these things is as one and the same thing, is the beginning of art and of science; if about production (γένεσις), of art; if about that which is or being (τὸ ὄν), of science. Neither indeed do the faculties (ἕξεις) exist in the mind separate, nor do they proceed from other faculties which are more intelligent, but they proceed from perception; as in battle when a flight has taken place, when one stops, another stops, and then another, until order is restored: and the mind exists in such a manner as to have the faculty of being so affected. For when one thing of things which are not different stands, it first of all is in the mind as universal (for the mind perceives the individual, but the perception belongs to the universal, for example, it belongs to mankind, but not to a man (*Callias*)): and again it abides in these until the undivided and the universal have abided: for example, such or such an animal abides, until animal generally abides; and in this in like manner. It is manifest then that it is necessary for us to know the first things by induction: for perception also in this manner produces the universal in the mind.

And since of the faculties that concern the understanding (διάνοια), by which we learn the truth, some are always true, and some admit of falsehood, as opinion and reasoning (λογισμός); and since science and intellect (ἐπιστήμη καὶ νοῦς) are always true, and there is no other kind of science more exact than intellect, and since the first principles are clearer than the demonstrations, and since all science is together with reason (λόγος),* there can be no science of the first principles: and since nothing can be truer than science except intellect, intellect must be intellect of first principles: and this appears both from considering these things, and that the beginning of demonstration is not demonstration, so that neither is science the beginning of science. If then we have no kind of truth which exists independent of science, intellect (νοῦς) must be the beginning of science. (*Analyt. Post.* ii. 19.)

ORES, DRESSING, &c. OF. [MINING, P. C., pp. 236, 244, 245; COPPER, P. C., p. 502; TIN, MANUFACTURE OF, P. C., p. 471.]

* The word λόγος is rendered 'ratio' by the Latin translation. Trendelenburg translates the passage thus:—'jede wissenschaft aber mit einem grunde verknüpft ist.' Perhaps λόγος may be understood as in No. 2. Λογισμός should be related to λόγος as ὁρισμός (defining, terming) is to ὅρος (finis, term).

ORI'GANUM (from ὀρίγανον), a genus of plants belonging to the natural order Labiatae. It has an ovate tubular calyx, 10-13 nerved, striated, with nearly 5 equal teeth, the throat villous inside. The corolla has a tube equal in length to the calyx; the upper lip sub-erect, emarginate; the lower spreading, trifid, with nearly equal lobes. There are 4 protruding stamens, distant, somewhat didynamous. The lobes of the style are nearly equal. The species are herbs.

O. vulgare, Marjoram, has stalked ovate obtuse leaves, ovate bracts longer than the calyx, the heads of the flowers roundish, panicled, and crowded. The bracts are usually purple, ovate, obtuse, and at least half as long again as the calyx. It is a native of Great Britain in dry uncultivated places, and of Europe, North of Africa, and of Middle Asia and America. It is an ornamental and aromatic plant, and yields what is sold as oil of thyme in the shops, a common remedy for toothache. It is frequently used mixed with olive oil as a stimulating liniment against baldness, in rheumatic complaints, and against strains and bruises. The dried leaves used instead of tea are very pleasant; they are likewise employed in fomentations. The essential oil is so acrid that it has been used by farmers as a caustic. It is the ὀρίγανον μέλαν of Theophrastus, lib. vi., cap. 2, and the ἀγριορίγανος of Dioscorides, 3. 31.

O. heracleoticum is a very variable species, but is recognised by the bracts being longer than the calyxes, by the loose spikes, and small flowers. The stamens are more or less villous, the leaves pale green, glabrous or pubescent. The flowers are white and one half the size of the preceding species. This, the Winter Sweet Marjoram, seldom ripens seed in this country, and is propagated by slips and cuttings. It requires a dry and sheltered situation. It is a native of the region of the Mediterranean, Greece, and about Odessa on the Black Sea. It has an aromatic sweet flavour, and is much used as a relishing herb in cookery. This is the Culina gallinacea of Pliny, 20, 16; Cato, *De Re Rustica*, c. 127; Seren, v. 909; and the ὀρίγανον ἡρακλεωτικὸν of Dioscorides, 3. 29.

O. creticum, Linnæus, is the ὀρίγανον of Hippocrates, *Morb. Mul.*, 1. 609; the ὀνῖτις of Dioscorides, 3. 30; and the λευκὸν ὀρίγανον of Theophrastus, 6. 2.

O. Majorana of Linnæus is the *Marjorana hortensis* of Moench, and the ἀμάρακον of Theophrastus, *Hist. Plant.* 6, 7; the σάμψυχον of Dioscorides, 3. 41. It has nearly glabrous racemosely panicled branches, petiolate oblong ovate leaves clothed with heavy tomentum on both surfaces, oblong sessile spikelets glomerate on the branchlets. This plant is a tree or shrub in its native country, but an annual in our gardens. It is native of the North of Africa near Mascar, on hills, and of Asia, on the mountains of Kumaon. The bracts and calyxes are complanate, closely imbricate. The corollas small, purplish or white. As the seed seldom ripens in this country, it is generally procured from France. When in blossom, the plant is cut and dried for winter use, as a savoury ingredient in cookery.

O. Dictamnus, the *Amaracus dictamnus* of Bentham; the Δίκταμνος κρητικός of Hippocrates; the δίκταμνον of Theophrastus, *Hist. Plant.* 9. 16; and the δίκταμνος of Dioscorides, 3. 37. It has almost sessile leaves, clothed with dense wool on both surfaces as well as the branches. The leaves are broad, ovate, obtuse, quite entire, rounded at the base; the floral leaves are small, almost glabrous. The corolla purple, without a spur. The heads of the flowers nutant.

O. Smyrnaeum vel *Syriacum* is the ὕσσωπος of Dioscorides, 3. 27, and of Hippocrates, *Morb. Mul.*, 3. 490. The antient plant is usually referred to Hyssopus officinalis, but according to Fraas this plant does not grow in Greece, Asia Minor, or Syria.

O. sipyleum of Linnaeus is the μάρον of Dioscorides, 3. 42.

All the species are of easy cultivation. A sandy soil and dry situation suit them best. The herbaceous species are readily propagated by dividing them at the root, and the shrubby kinds by cuttings or slips, or by separating the rooted shoots.

(Don's *Gardener's Dictionary*; Babington's *Manual of British Botany*; Lindley's *Flora Medica*; Fraas, *Synopsis Plantarum Florae Classicae*.)

ORNI'THOGALUM, a genus of plants belonging to the natural order Liliaceae and the tribe Asphodeleae. It has a perianth of six patent leaves, the stamens inserted upon the receptacle, and adhering only slightly to the perianth. The anthers are incumbent, attached by their backs. The flowers are white or yellow, never blue.

O. umbellatum, Common Star of Bethlehem, has corymbose flowers, the peduncles longer than the linear lanceolate bracts, lanceolate simple filaments, linear glabrous leaves. The flowers are white, with a broad green longitudinal band externally. It is found in meadows and pastures in Great Britain, and is the βολβίνη of Theophrastus, *Hist. Plant.* 7. 13; the ὀρνιθόγαλον of Dioscorides, 2. 173; and the Bolbine alba of Pliny, 29. 5.

O. pyrenaicum, Spiked Star of Bethlehem, has flowers in an elongated raceme; the peduncles at first spreading, afterwards erect; lanceolate acuminate bracts; the filaments dilated below with an elongated point. The flowers are of a greenish white, the segments of the perianth variable in breadth. The leaves wither before the stalk appears; they are rarely contemporaneous. It is extremely common near Bath, and in Sussex and Bedfordshire. This species is the ἐπιμενίδειος σκίλλα of Theophrastus, *Hist. Plant.* 7, 10. 7, 11.

O. nutans has but few leaves in a lax nodding raceme; the peduncles shorter than the bracts; the filaments flat, membranous, and trifid; the lateral points acute, the middle one very short, bearing the anther; the leaves linear lanceolate; the flower large, white, and greenish externally. It is occasionally found in fields and orchards in Great Britain. It is the βολβὸς ἐμετικὸς of Dioscorides, 2, 201.

O. maritimum, Squill, is described under SQUILLA, P. C. and SCILLA, P. C.

(Lindley, *Flora Medica;* Babington, *Manual of British Botany;* Burnett, *Outlines of Botany;* Fraas, *Synopsis*, &c.)

ORNUS. [FRAXINUS, P. C.]

OROBANCHE (from ὄροβος, a kind of vetch, and ἄγχω, to strangle, because its species grow on the roots of vetches, and were supposed to destroy them by strangulation), a genus of plants, the type of the natural order Orobanchaceæ. It has 2 lateral, undivided or cloven permanent sepals; a ringent withering corolla, the upper lip concave, notched, the lower reflexed, in three unequal wavy lobes; a gland under the ovary; the anthers sagittate with the lobes pointed at the base; the filaments almost as long as the tube of the corolla, downy and glandular; the capsule ovate, pointed with 4 parietal parallel placentæ. The species are parasitical, usually simple, rarely branched, scaly erect herbs.

O. major, Greater Broom-Rape, has the sepals 2-nerved equally bifid, nearly as long as the tube of the corolla, the corolla bell-shaped, ventricose at the base, in front arcuate; the lips wavy, obsoletely denticulated (not fringed), upper lip helmet-shaped, scarcely emarginate; sides patent, middle lobe of the lower lip much longer than the lateral lobes; the stamens inserted at the base of the corolla, glabrous below, their upper part and the style glandular pubescent. This plant is a native of Europe, growing parasitic upon broom, furze, and other shrubby leguminous plants, on a barren and dry soil. It is abundant in some parts of Great Britain. This plant is very bitter and is a powerful astringent. It has been used internally in dysentery and other fluxes, and applied externally as a detergent to foul sores.

O. minor, Lesser Broom-Rape, has the sepals many-nerved, the lobes of the lower lip equal, the stigma bi-lobed. The lobes of the stigma are purple, the anthers yellow when dry. It is found in Europe parasitical upon the roots of the *Trifolium pratense*. Although it is sometimes very abundant, it does not appear to injure the crop of clover. It is constantly found in many parts of England with the clover crops.

O. rubra has the corolla glandular, pubescent externally, and the upper lip internally, the lips acutely denticulated, the stamens inserted near the base of the corolla. It is a native of the north of Ireland and of Cornwall in England. It has a sweet scent, and is found parasitical upon the *Thymus serpyllum*, common Thyme.

O. caryophyllea has the corolla tubular, bell-shaped, curved on the back; the stamens inserted above the base; the corolla hairy within. The stigmas are of a dark purple, the anthers at first purple, yellow when dry. It has been found in Siberia and Italy, and on the Himalaya. It has been found also in the county of Kent in England, where it is parasitic on the roots of *Galium Mollugo*.

O. elatior has the corolla curved, tubular, slightly compressed above; the upper lip 2-lobed, toothed; the lobes inflexed; the stigma yellow. It is a native of Europe, and is parasitical on the *Centaurea scabiosa*. It grows in Great Britain, but is a rare plant.

O. barbata has the middle lobe of the lower lip of the corolla longest; the stigma yellow. Found in Europe, parasitical upon ivy (*Hedera Helix*).

Two other British species, *O. caerulea* and *O. ramosa* are described by Babington. These are referred by many systematists to the genus Phelipæa, which is distinguished from Orobanche by the possession of a tubular bibracteate, 4-5-toothed or 4-5-cleft calyx. *P. caerulea* has a calyx of 4 sepals, tubular, with triangular subulate teeth shorter than the tube of the corolla; the corolla tubular, slightly curved in front, the middle of the tube compressed on the back; the throat slightly inflated externally; glandular lobes of the lips obtuse with reflexed margins, lower lip hairy within, suture of the anther hairy. It is a native of Europe, in Austria, Italy, Germany, and the south of France. It has been rarely found in Great Britain in the fields of Hampshire and Norfolk, and in Jersey. The flowers have a bluish colour. It is parasitical upon *Achillæa millefolium*.

P. ramosa has a calyx of 4 sepals, tubular, with triangular ovate acuminate teeth, the anthers glabrous, the stem branched. This plant is a native of Europe, and has been found in Great Britain in Norfolk and Suffolk, where it grows on the roots of hemp, and the *Galeopsis Tetiatut*. There are several other species of Phelipæa, which were formerly described as belonging to the genus Orobanche. All the plants belonging to Orobanchaceæ, have the habits and general character of Orobanche. The genera belonging to this order are distinguished as follows:—

Tribe I.

OROBANCHIEÆ. Parasitical leafless herbs.

1. *Orobanche.* Calyx bractless, somewhat 1-2-parted.
2. *Phelipæa.* Calyx tubular, bibracteate, 4-5-toothed or 4-5-cleft.
3. *Anoplon.* Calyx bractless, 5-cleft, sub-bilabiate.
4. *Boschniakia.* Calyx truncate, unequally 5-toothed.
5. *Canopholis.* Calyx ventricose, 5-parted, bibracteate, corolla incurved; upper lip entire, lower one bifid.
6. *Epiphegus.* Calyx short, 5-toothed, bractless.
7. *Lathræa.* Calyx bibracteate, campanulate, 4-cleft.
8. *Hyobanche.* Calyx tubular, 7-cleft, unequal, bibracteate.
9. *Alectra.* Calyx bilabiate, bractless? upper-lip 2-cleft, lower one bifid.
10. *Æginetia.* Calyx spathaceous, capsule many-celled.
11. *Amblatum.* Calyx campanulate, 4-cleft, both lips of corolla entire.

Tribe II.

OBOLARIEÆ. Terrestrial leafy plants.

12. *Obolaria.* Calyx 5-cleft, bibracteate, corolla campanulate.
13. *Tozzia.* Calyx 5-toothed, bractless (?) corolla ringent, tubular; capsule 1-seeded by abortion (?)

(Don, *Gardener's Dictionary;* Lindley, *Vegetable Kingdom;* Babington, *Manual of British Botany.*)

OROBUS. [VICIEÆ, P. C.]

ORRIS ROOT. [IRIS, P. C. S.]

ORSOVA. [SERVIA, P. C.]

OSMUNDA, a genus of plants belonging to the natural order Filices, and to the sub-order Osmundaceæ. It has clustered thecæ arranged in a branched spike terminating the frond.

O. regalis, the Flowering Fern, has bipinnate fronds, pinnules oblong, nearly entire, dilated, and slightly auricled at the base; the clusters panicled, terminal. This fern is a native of Great Britain in boggy places, and often attains a height of from 1 to 8 feet. It is very common in many parts of England, and especially on the lakes of Killarney in Ireland. It is common throughout Europe, and a plant of the same name is found in the United States.

(Babington, *Manual of British Botany;* Newman, *British Ferns.*)

OSSIFEROUS BRECCIA, OSSIFEROUS CAVERNS. The existence of large fissures and caverns in rocks is a fact known to miners and quarrymen in all parts of the world; that these cavities are frequently filled with stalactical sparry and earthy accumulations, and sometimes with the bones of animals, is another fact on which modern geologists have based a long train of ingenious inferences. Fully to examine these facts and inferences would be to discuss one of the most comprehensive and unsettled problems of geology; it is possible however to present in a small compass the leading considerations which belong to the subject.

Great fissures and caverns, though not absolutely confined to limestone rocks, are yet by far of most frequent occurrence in these deposits. They are not common in all limestones, but have certain determinate relations to their mass and the positions which they occupy. It is peculiarly in *thick masses* of limestone, (whether magnesiferous or purely calcareous) that we find great caverns in England, Ireland, France, Belgium, North Germany, the Tyrol, Carinthia, Italy, Greece, North and South Africa, India, Australia, North and South America. It is sometimes observed that great cavities abound in limestone rocks, not so much at as near to points and lines where the ordinary position of the strata is violently disturbed by great faults, and axes of elevation and depression. Thus the numerous caverns of Derbyshire and Yorkshire, and the Mendip Hills, are situated in or near to situations of violently disrupted strata, and by accumulating observations of this nature we gradually come to perceive, in many cases, a real dependence of the chasms in the rock on the fractures which have broken it.

But there are few caverns or great fissures *all whose features* can be thus explained. The disturbance has not so often produced the caverns as the conditions necessary for their production. On the contrary, in very many cases we perceive, even in caverns now dry, forms of internal surface which mark the decomposing influence of air and moisture and the erosive power of running water. Through many of them water now runs, through more of them it formerly ran, *conducted into these subterranean channels* by the fractured condition of the strata. The great caverns of the Peak at Castleton and Buxton may be quoted as examples. Other caverns occur, nearly or entirely exempt from the direct influence of fractures passing through them. Such a case occurs at Kirkdale in Yorkshire, a cave which has for great lengths an even floor and roof, and is connected, not with faults or axes of movement, but with *great joints* in the limestone. This cave has been traversed by water conducted by these joints. Water dropping, trickling, or running through the fissured limestone rocks dissolves (by the almost constant carbonic impregnation which it derived from the atmosphere and decomposing vegetation) its calcareous channels, and transports away, to the surface of the ground, the materials of petrifying springs, the tufaceous mounds of Matlock, and the travertino of southern Europe. In certain classes of limestone rocks there is reason to conjecture that the caverns have not been occasioned by violent *fractures*, nor yet by the influence of *joints*, but that they are a part of the *original structure* of a coral reef (in which cavities were left by the polypean builders), or have been generated by those chemical processes which we have as yet imperfectly traced and classed as *metamorphic effects*. This may be the case in certain magnesiferous (dolomitic) limestones in Derbyshire, Franconia, &c.

In regard to the filling of these cavities, we must again, in a great majority of instances, appeal to the action of water—an *inverse action*, new circumstances causing water to deposit where once it excavated; or an *indirect action*, occasioning new accidents. Stalactical depositions and many varieties of sparry accumulations, which are now happening in caverns and fissures, exemplify the former case, and as an instance of the latter we may describe what is happening on a part of the Yorkshire coast. Here the chalk is cavernous; the caverns, connected above with small fissures reaching to a mass of diluvial clay, pebbles, &c., are continually enlarged by the waves and spray of the sea, and sometimes their roof, thus weakened, falls in, and the diluvial masses from above pour down into the cave, but are soon removed by the agitation of the tide.

Another instance is of familiar occurrence in the mining districts of the north of England, where limestone, more or less cavernous and fissured, is covered by shales or argillaceous toadstones. Near the edge of these argillaceous beds, many rather regular pits ('Swallow holes') occur, through which the surface drainage reaches the limestone, and carries into its cavities some of the materials which are dislodged in its course.

The geologist, who takes into consideration the possible origin of caverns in limestone from original hollows, the influence of joint fissures, and the effect of violent displacements; and considers further the various degrees and circumstances of their communication to the surface, the various action of water within them, their level in relation to that of the sea, and the nature of the strata or other matter superincumbent on the limestone, will be at no loss to comprehend how various, complicated, and interesting are the sparry and earthy contents of subterranean cavities. These contents have in some cases *fallen* in, so as to constitute confused heaps or masses of *breccia:* in other cases they have been *drifted* by water and arranged into shallow and irregular *beds;* and in addition, certain matters have been *dissolved*, and deposited in crystallized and *stalagmitic* forms.

The occurrence of bones in these breccias, sediments, and stalagmitic incrustations is sometimes to be explained by supposing them to have fallen with the other materials of breccia, or to have been drifted with sediments by water; but in a considerable proportion of the cases which have been examined there is no avoiding the conclusion that animals retired by choice, or through fear, or were dragged by violence into these cavities, and there have left their bones. This conclusion, established by the sagacity of Buckland for the hyæna caves of Kirkdale and Torquay, applies to the numerous bear caverns of the Harz, Franconia, and Westphalia, and to some caves in Brazil and Virginia. It is a conclusion of the highest importance in geology and zoology. It assures us of the *habitat* of many extinct races of quadrupeds, and thus furnishes authentic data for a survey of the geographical distribution of Mammalia in one definite period of high antiquity, under physical and climatal conditions of the globe much different from what we now behold. Thus for instance we find among the perished races of British quadrupeds, the lion, hyæna, and bear; the elephant, rhinoceros, and hippopotamus; the urus and the elk.

To allow of the introduction of these animals to Britain, we must suppose this island joined to the continent: to allow of their long continued existence here (which the phenomena in Kirkdale cave substantiate), we must suppose certain climatal and physical conditions of the country, and certain habits of life among the animals. Migrations may be supposed for the deer and the lion, but settled abodes must be ascribed to the hyæna and perhaps to the pachydermata. The extinction of these animals requires other admissions. It is not a local, but a general phenomenon, extending over a great part of the northern zones of the world, and of such startling magnitude as to have suggested hypotheses of diluvial catastrophes, and glacial periods, to geologists; while zoologists may perhaps regard it as a great example of the law of limited duration and successive predominance, to which, judging from the whole course of palæontological discovery, all the races of the animal creation are made subject. The reader may consult, for the facts and inferences thus briefly noticed, Cuvier, *Ossemens Fossiles;* Buckland, *Reliquiæ Diluvianæ;* Meyer, *Palæologica;* Owen, *On British Fossil Mammalia*, in *Transactions of the British Association;* and a variety of Memoirs by different authors in the *Transactions and Proceedings of the Geological Society of London.*

OSTRA'CION. [SCLERODERMI, P. C. S.]

OTTMER, KARL THEODOR, an architect to whom Brunswick is indebted for what ranks almost among the largest, and certainly among the most elegant palaces in all Europe, was born in that city, January 19th, 1800. He was the son of a physician, who intended him for the same profession; but his father's death leaving him free to follow his own inclination, he made choice of architecture as his future destination, and certainly had no cause to repent of doing so, being eminently favoured even from the commencement of his career by opportunities that fall to the lot of few. While he was completing his studies in his profession, at Berlin, in 1822; he competed for, and was employed to erect the new theatre there, called the 'Königstädter Theater,' which was begun in July 1823, and opened in the August of the following year. This decided success on the part of one so young,—it being in fact his *coup d'essai*,—brought Ottmer forward at once: it should, however, be mentioned that, although it was not known at the time, his designs were corrected by Schinkel. [SCHINKEL, P. C. S.] In his next work of note, the 'Sing-academie' at Berlin (erected 1826-7), his design obtained preference of that of Schinkel, although the latter was in very superior taste, and indeed, one of the happiest ideas of the 'great master,' as may be seen by the published drawings of it in his 'Entwürfe.' Flattering as all this was, it was not without its disadvantages, as by immersing him too early and too completely in matters of mere business, it hindered that calm application to study which is so important to an artist at the outset. There was besides very great danger of his being spoilt by the exaggerated praises bestowed on his first efforts,—praises which, it has been suspected, proceeded partly from a desire to lessen the reputation and keep down the influence of Schinkel. Fortunately, Ottmer felt the necessity for improving himself; and after first studying a short time in Paris, he visited Italy, where he remained nearly two years (1827-9); and where he was so far inspired as to conceive the project and work upon the designs for a palace that should surpass every known edifice of the kind in extent and magnificence.

He was recalled to Germany by an invitation from Dresden, when it was intended to build a new 'Theater,' and he proposed designs accordingly; but the scheme was dropped for several years, and then Semper was the architect employed on the noble structure since erected there. The designs produced for that occasion procured, however, for him while he was at Dresden, a commission from the Duke of Saxe-Meiningen to make others for a theatre and casino for him, and the buildings were forthwith commenced. On his return to Brunswick he published in 1830, the first part of his 'Architektonischen Mittheilungen,' containing plans, &c. of his Theatre at Berlin. At that time his professional occupation consisted of little more than his official duties as Hofbaumeister, nor had he much prospect of ever being called upon to execute any work of importance, when during a popular tumult which took place in September, 1830, the palace at Brunswick was set fire to and destroyed. He was thereupon directed by the new Duke, Wilhelm (the successor of his brother Karl, who was expelled by the revolution), to make designs for rebuilding the palace; and the edifice was begun the following year, and prosecuted with such activity as to be ready for habitation in 1837. The principal mass is 400 feet in extent, by upwards of 200 in depth, and 80 high, and in the centre considerably loftier, though the design has not yet been fully carried out, the open colonnades intended to form a place before the principal façade not being yet erected. Still, should nothing further ever be done, this palace is a most stately and elegant pile as it is; and even now it has been objected to it that it is upon too extravagant and costly a scale. The architect's labour must have been prodigious, for besides that he was obliged to superintend every department of the works personally, from first to last, he designed all the numerous details both of the exterior and interior, which display considerable inventive power as well as refined taste. The principal entablature of the exterior—extending altogether two thousand feet in length—is entirely of cast-iron, and much equally excellent and novel construction is displayed in other parts. The interior is distinguished by many striking pieces—the lower entrance vestibule, a Grecian Doric hall 150 feet in length; the parade staircase; the upper vestibule, a rotunda seventy feet in diameter, and sixty high; gallery; theatre; concert room; banqueting room, &c.

Besides the palace, Ottmer erected at Brunswick several other structures, both public and private, all of them, more or less, of architectural note: viz. the Theater-Intendantur, the Infantry Barracks, in the Florentine style, with a façade of 350 feet; the Iron Bridge, the Villa Bulow, New Richmond, the Schmidtsche-Haus, the Interim Railway-station,' &c. He also made a design for Cavalry Barracks at Brunswick, in similar style to those for the infantry; which design was published in Ronsberg's 'Zeitschrift für praktische Baukunst,' 1842. Other designs which he left behind him will perhaps remain unedited. Naturally of a delicate constitution, Ottmer sank under the barass of business and the multiplicity of his tasks in the prime of life, August 22nd, 1843; but had he lived to the close of the century, hardly would he have had such another opportunity as that afforded him by the Palace of Brunswick.

OVAL, or as the name imports, egg-shaped, is the name given originally to such a form as the section of an egg presents, round, but not circular. In mathematics it has received some extension of meaning. Any curve, or isolated branch of a curve, which returns into itself, would be called an oval: perhaps even a figure of eight would receive the name.

The curve having for its equation

$$y=\sqrt{x(x-a)(x^2-b)}$$

(a and b being positive; and a less than b) has an oval extending from $x=0$ to $x=a$: but there is no curve whatever from $x=a$ to $x=b$, or from $x=-b$ to $x=0$. If a be small, the dimensions of the oval are small: and when $a=0$ the equation becomes

$$y=x\sqrt{(x^2-b^2)}$$

in which the oval has become a point (the origin), and is a *conjugate point* [CURVE, P. C.], an isolated point which is not on any continuous branch.

Some conjugate points have none but imaginary values of $dy{:}dx$, some have one or more finite values. Thus when $y=x\sqrt{(x^2-b^2)}$, there is a conjugate point at the origin, and $dy{:}dx$ is then imaginary: but when $y=x^2\sqrt{(x^2-b^2)}$ there is also a conjugate point at the origin, but $dy{:}dx$ is 0. The meaning seems to be (as far as we can judge from a few instances) that when the oval during its diminution, has axes which preserve a finite ratio to one another, so that its tangents fall in all directions, the ultimate value of $dy{:}dx$ is imaginary. But when one of the axes diminishes without limit as compared with the other, so that, except near the ends of that axis, the tangents tend to assume one direction, there is an ultimate value of $dy{:}dx$ which defines that direction. If our surmise be correct, a double or triple value of $dy{:}dx$ at the conjugate point would indicate the evanescence of a star-shaped oval, or of one which tends to assume that form as it diminishes. But this, with other points relating to the singular values of algebraic functions, has yet to be fully considered.

OWEN, JOHN, DR., was born in 1616, at Stadham in Oxfordshire, of which parish his father, Henry Owen, was for some time minister. At the age of twelve he was admitted a student at Queen's College, Oxford, where he took his first degree in 1632. During the period of his university life he is represented as having so diligently applied himself to study that he never allowed himself more than four hours repose. In the year 1637, when Hampden resisted illegal taxation [HAMPDEN, P. C.], Archbishop Laud, the chancellor of the university, made some new regulations, of which Owen disapproved, and, as he refused to comply with them, he was obliged to leave Oxford. Brought up by his father in the strictest school of Puritanism, he considered the new statutes an attempt to enforce the observance of superstitious rites. On leaving the university he accepted the situation of chaplain to Sir Richard Dormer, of Ascot in Oxfordshire, having been some time previous to his expulsion admitted into holy orders by Bishop Bancroft. He afterwards became chaplain to John, Lord Lovelace, of Hurley in Berkshire, with whom he remained till the outbreak of the civil war, when, as he warmly espoused the cause of the Parliament, he forfeited the protection of his patron. Left to his own resources, Owen retired to London, where he appears to have joined the non-conformists. In 1642 he published his first work, entitled 'A Display of Arminianism,' which soon recommended the author to the notice of the Parliament, and became the foundation of his future advancement. He was shortly afterwards presented by the committee appointed 'to purge the Church of scandalous ministers' to the preferment of Fordham in Essex. He enjoyed this living little more than a year, having been deprived of it by the patron, to whom it had reverted on the death of the sequestered incumbent. The Earl of Warwick then bestowed upon him the living of Coggleshall in the same county. Owen had not been long at Coggleshall before he abandoned the Presbyterian party to join that of the Independents. On the 29th April, 1646, one of the frequent fast days instituted by the Puritans, he was called to preach before the Parliament, and his sermon, on that occasion evinced a larger spirit of religious toleration than was prevalent among his party at that period. He still more strongly manifested his tolerant disposition when he was appointed to the critical task of preaching before the same assembly on the day after the execution of Charles I. In this sermon he solemnly warns his hearers 'against oppression, self-seeking, and persecution.' On the 28th February following, a day set apart for humiliation and prayer on account of the intended expedition to Ireland, he was again appointed to preach before Parliament and the chief officers of the army; on that occasion, Cromwell, who heard him for the first time, received so favourable an impression of his merit, that he named him his chaplain, in which capacity he accompanied the expedition. In 1651 Owen was, by an order of the Parliament, promoted to the dignity of dean of Christ Church, and the following year he became vice-chancellor of the University of Oxford, Cromwell being at that time chancellor. He appears to have discharged the peculiarly difficult duties of this office with much moderation, and his conduct met with the approval of many of the Episcopalian party. After holding it five years, on the death of Cromwell he was deprived of it, as well as of his deanery, to which Dr. Reynolds, a Presbyterian, was appointed.

At the Restoration Owen retired to a small estate which he had purchased in his native place, where he employed himself in preaching as often as an opportunity was afforded him. He was, however, soon obliged to abandon an occupation so congenial to his feelings by the interruption of the Oxford militia, and he determined upon settling in London. It was there that he published a work entitled 'Fiat Lux,' in answer to the writings of a Franciscan Friar, which attracted the attention of Lord Clarendon. This statesman, who was anxious to reconcile the most moderate of the non-conformist party [HYDE, P. C.], offered Owen immediate preferment if he would conform; which proposal, however, was firmly though respectfully declined. He then formed a congregation, among which he assiduously laboured, and in conjunction with Baxter, Bates, and other leading men of his persuasion, instituted the Pinner's Hall Weekly Lecture. In 1677 he contracted a second marriage, by which he was enabled to live in comparative affluence on an estate at Ealing, in Middlesex, where he died on the 24th of August, 1683.

The private character of this divine has been praised equally by those who were united with him by similarity of religious feeling, and by those who differed most widely from him in opinion; they all bear testimony to the temperance of his language and the mildness of his disposition. This character is in a great measure reflected in his works, which, though strongly tinctured by the peculiarities of the Calvinistic system, are remarkable for their devotional spirit and are calculated to encourage practical piety. He certainly belonged to that section of his party whom Lord Clarendon designates as 'the more learned and rational.' (Clarendon 'History of the Rebellion,' vol. v. p. 513; see Warburton's note.) His works are very numerous: among the best known of those not already alluded to may be mentioned, 1, his 'Exposition of the Epistle to the Hebrews;' 2, 'A Discourse on the Holy Spirit,' 1674; 3, 'Vindiciæ Evangelicæ, &c., in answer to T. Biddle,' 1655; 4, 'Θεολογόυμενα, sive de Naturâ, Ortu, Progressu et Studio veræ Theologiæ,' 1661; 5, 'An Exposition of cxxx Psalm,' 1660; 6, 'On the Doctrine of Justification,' 1677; 7, 'The Nature of indwelling Sin,' 1668; 8, A large collection of Sermons and Tracts. His last production was entitled 'Meditations and Discourses on the Glory of Christ,' which it is stated was sent to the press the day he died.

(For further particulars of his life and writings the following works may be consulted: 'Biographia Britannica,' vol. v., London, 1709; 'Memoirs of the Life of Dr. Owen,' prefixed to a Collection of his Sermons, Tracts, &c., London, 1721; and Wood's 'History and Antiquities of Oxford.')

OWNERSHIP. [PROPERTY, P. C.]

O'XALIS (from ὀξύς, sharp, acid; the leaves have an acid taste), a genus of plants belonging to the natural order Oxalideæ or Oxalidaceæ. It has 4 sepals connected below, and 5 petals which are likewise frequently connected below. The stamens are 10 in number, and monadelphous; the 5 outer ones shorter than tho rest. The styles 5, and the capsules oblong and 5-cornered.

O. acetosella, common Wood-Sorrel, is a small perennial plant with a subterranean rootstock consisting of many scaly joints; the leaves are ternate, leaflets obcordate and having the peduncles longer than the leaves, with two scaly bracts at about the middle; the corolla is about 4 times as long as the calyx, and of a white colour beautifully veined with purple. Mr. Curtis remarks that the leaves are often purplish beneath, and that the fruit darts forth its seeds at the smallest touch when ripe. This species of wood-sorrel has a pleasant acid taste, dependent on the presence of oxalic acid, and is frequently used in salads; its flavour approaches near to that of lemons or tartaric acid, with which its medicinal effects also correspond, as it is esteemed a refrigerant antiscorbutic and diuretic. The expressed juice of this species, evaporated and set in a cool place, affords a crystalline salt, which may be used whenever vegetable acids are wanted. It is sold in the shops under the name of Essential Salts of Lemons, and is employed to take iron-moulds and ink-spots out of linen. This salt, which is a binoxalate of potassa, is however seldom to be obtained in a genuine state, cream of tartar and vitriolic acid being frequently substituted for it.

O. corniculata, Horned Wood-Sorrel, has a decumbent stem, branched and rooting; the leaves are ternate with obcordate leaflets; oblong stipules united to the base of the petioles; the peduncles are two-flowered, and shorter than the leaves. It is s native of Europe, particularly in Spain, Italy, and Greece, as well as of Japan, Mexico, North America, and England. The flowers are yellow; those of the North American plant are larger than the European.

O. stricta has an erect leafy stem, umbelliferous peduncles rather shorter than the leaves. It is native of North America, and is naturalized in Cornwall and Devonshiro in England. The flowers are yellow and about the size of those of *O. corniculata*. Browne says, this plant is also a native of Jamaica, and he recommends it as a pleasant cooler and diuretic; formerly it was given in inflammatory cases, but has been superseded by the more agreeable fruit-acids which are now cultivated in the West Indies. Professor Morren of Liege attributes to this species of Oxalis the peculiar properties of a sensitive plant, which are referred to in the article SENSITIVE PLANTS, P. C. He also observed the same movements in *O. acetosella* and *O. corniculata*, and some other species. The *Oxalis sensitiva*, called by De Candolle *Biophytum* on account of its sensitive properties, has long been known to possess this quality. The whole genus of Oxalis is curious and beautiful, and well worthy cultivation. There are above 220 species described, which are distributed in every quarter of the globe. The hardy species require no care. If the roots are planted in a shady border, they will grow and multiply. The greenhouse kinds are mostly bulbous from the Cape of Good Hope. A mixture of sand, loam, and peat is best suited for them; they require no water after they have done flowering until they begin to grow afresh; they are propagated by offshoots from the bulbs or by seed. They may be grown in the frame, but must be protected from frost during the winter.

(Don, *Gardener's Dictionary;* Babington, *Manual of British Botany;* Lindley, *Flora Medica.*)

OXY'RIA, a genus of plants belonging to the natural order Polygoneæ. It has a 4-parted perianth, the 2 interior segments larger; 6 stamens; 2 stigmas; a 1-seeded nut, compressed, with a membranous wing, larger than the persistent segments of the perianth; embryo central.

O. reniformis, Mountain-Sorrel, is the only species. It is found on the highest mountains of Great Britain, and is an inhabitant of Europe. It is the *O. digynia* of many botanists.

(Babington, *Manual of British Botany;* Koch, *Flora Germanica.*)

OZONE (from the Greek ὄζω, to smell) is the name given by Professor Schönbein of Basle to an odour evolved during the progress of certain electro-chemical decompositions. It is also produced by common electric sparks, and by the working of an ordinary electrical machine in the air. This odour attracted no particular notice until M. Schönbein called the attention of the British Association to it in 1840, since which time it has undergone much examination, and various theories have been propounded as to its nature and composition.

Ozone is evolved at the anode, or positive polo of a galvanic battery, at the same time with oxygen, during the electrolization of any of the following bodies, viz. water, dilute sulphuric acid, solutions of phosphoric and nitric acids, potassa, and many oxysalts. Of these dilute sulphuric acid yields it in the greatest quantity. It may also be obtained from atmospheric air, oxygen, nitrogen, hydrogen, carbonic acid, and nitrous oxide, by passing the electrodes through a closely fitting cork into a jar filled with these gases, and frequently making and breaking contact. Under the influence of heat ozone disappears, and it cannot be obtained from heated solutions, or solutions of hydracids, chlorides, bromides, or iodides, the presence of which, even in small quantities, prevents its evolution from solutions otherwise yielding it abundantly. It may be developed by electrolizing a solution of muriate of soda with platinum electrodes, by placing the gas collected at the anode over ammonia and water to absorb the chlorine. Ozone can be preserved for a length of time with the oxygen collected with it in well closed bottles. It possesses the property of bleaching litmus-paper and paper coloured with indigo or a solution of that substance. It is readily absorbed by mercury and the oxidizable metals, forming oxides with them; and when the solutions employed are heated its affinity for metals is so greatly increased that it combines with platinum and gold. Water absorbs it. The inspiration of ozone is very injurious, and the effects similar to those resulting from chlorine and bromine. A mouse is killed with it in five minutes, and M. Schönbein states that he was seriously affected by breathing an atmosphere charged with it.

The electrodes employed in these experiments have a great influence in respect to the evolution of ozone. With water or acid solutions they must be of platinum or gold; for when the more oxidizable metals are used it enters immediately into combination with them. It can be obtained from air or the gases above enumerated when the positive electrode is copper, iron, silver, or platinum, and zinc negative, but not when these arrangements are reversed, or both electrodes are of zinc. With zinc, when either positive or negative, a peculiar scent is produced in nitrogen and hydrogen. On electrolizing a solution of sulphuric acid the following results are obtained:—with platinum electrodes the odour is very powerful; but it is not produced when copper, zinc, or iron electrodes are employed. With boxwood charcoal the gas given off from the positive pole has no smell; but when absorbed by lime-water it turns it milky, proving the gas to be carbonic acid. With gas charcoal, sulphuretted hydrogen is evolved at the negative pole and carbonic acid at the positive; but no odour of ozone is produced. With a solution of muriate of soda the odour is not perceptible until the gas obtained from platinum electrodes at the positive pole is placed over ammonia and water to absorb the chlorine. The residual gas emits the peculiar odour.

There exists much variance in the experimental results with this new substance; and not less in the opinions concerning its nature. Professor Schönbein considers it to be a tritoxide or peroxide of hydrogen. Marignac controverts M. Schönbein's conclusion, that it is to be derived from the decomposition of nitrogen, as he obtained it from water free from this latter gas. Mr. Williamson would prove that it is a compound, and that hydrogen is one of its elements, he having obtained it from a salt of copper, and passing the oxygen with the ozone over metallic copper which had been reduced by carbonic oxide gas, a sensible formation of water resulted. His view of the subject is, that ozone is a higher oxide of hydrogen than water, although not the peroxide of hydrogen of Thénard, which is not volatile like ozone, but inodorous and fixed. Mr. Gann says concerning it, 'I am induced to think that this peculiar odour may be emitted from all metallic bodies in such a manner as to prevent oxidation or combination with other bodies;' and 'that all metals have the power of emitting it, when put into a peculiar electrical state, that is, when the metals are in a state of transition previous to oxidation or combination;' and Mr. Lake, who claims to have demonstrated that the electric fluid is a substance, to which he has given the name of pyrogen [Pyrogen, P. C. S.], considers that it is a compound of this substance with oxygen, that is, an oxide of pyrogen. He says, 'It would seem indeed the necessary inference of Mr. Gann's experiments (the evolution of ozone from oxygen and the other gasses) that oxygen enters into the composition of nitrogen and hydrogen, for ozone is developed, except in these two instances, from oxygen and its compounds, by the combination of oxygen with pyrogen, and hence it would follow that nitrogen and hydrogen contain oxygen.'

The inquiry concerning the substance is of great importance to chemical science, as it involves the question of the nature of oxygen, hydrogen, and nitrogen, from each of which it can be obtained. It is agreed by all that oxygen is one of the elements of ozone. If, therefore, hydrogen is the other, it follows that oxygen is a compound into the composition of which hydrogen enters; that oxygen is an element of hydrogen; and that both oxygen and hydrogen are elements of nitrogen, since ozone can be evolved from each of these gases: and it is to be remarked that this last circumstance agrees with Mr. G. J. Knox's discovery, that nitrogen is a compound of hydrogen and silicon. This also overthrows M. Marignac's opinion, that it cannot be obtained by the decomposition of nitrogen, and confirms M. Schönbein's to the contrary effect.*

Mr. Gann's opinion, in substance and as far as it goes, coincides with Mr. Lake's, for he considers ozone to accrue between the oxidation or combination of the metals with the substances exhibited to them and the time when chemical action commences. According to the views of the latter, ozone must be present and of paramount importance in the processes of acidifaction and oxidation, for he shows that both oxygen and the electric fluid (which he considers the elements of ozone to be) are required to form an acid [Pyrogen, P. C. S.], and of course an oxide. If this view be correct it accounts for the disappearance of ozone where the more oxidizable metals are exhibited to it, and also for the formation of carbonic acid when acid solutions are electrolized with carbon as the positive electrode.

Some singular phenomena connected with ozone were observed by Professor Schönbein, strongly indicative of its electric origin, if not of its electric composition. When perfectly clean and dry plates of gold or platinum are immersed in oxygen containing ozone, they acquire a negatively electric state of polarity. Silver and copper also become thus electric, but in a far less degree than gold or platinum. The plates thus polarized retain their electric powers in air for a considerable time, but rapidly lose them when plunged into hydrogen gas, in which, if retained a sufficient time, they acquire an opposite state, becoming positively polarized.

When a perfectly clean and dry plate of gold or platinum is exposed to an electric brush it becomes positively polarized, the degree of polarity depending on the nature of the point and the time the plate is exposed to the brush issuing from it. This power may be attributed, according to the last of the above theories, to the formation of ozone by the combination of the electric fluid of the brush with the oxygen of the air. If the point from which the electric brush is issuing be moistened with water, the electricity still continues to be given off, but the power of polarizing the plates is lost, which effect is no doubt produced by the water absorbing the ozone. Heat, which destroys, or exposure to hydrogen, which inverts, the electricity of a plate that has been polarized by exposure to oxygen containing ozone, exerts a precisely similar action on plates polarized by the electric brush.

(*Proceedings of London Electrical Society*, 1841-42, p. 160; *Reports of the British Association*, 1840; *Polytechnic Review*, New Series, vol. ii. p. 260; *Athenæum*, 1845, pp. 590, 674, 723; *Chemical Gazette*, September, 1843.)

* According to Professor Schönbein, nitrogen is a combination analogous to hydrochloric acid, and is composed of ozone and hydrogen.

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PACCHIAROTTO, JACOPO, one of the most distinguished of the old Sienese painters, was born at Siena in the latter part of the fifteenth century; but though he belongs chronologically to the painters of the sixteenth century, he is one of the *quattrocentisti* in style; his works much resemble those of Pietro Perugino; at the same time they are more fully developed in form and of wonderful force of colouring; in expression also many of his heads are admirable.

He lived in Siena until the year 1535, when, owing to his being one of the principals in a conspiracy of the people against the government, he was compelled to fly, and he took refuge in France. Lanzi says that he would certainly have been hanged, had he not been protected by the Osservanti monks who concealed him for some time in a tomb. He succeeded in making his escape, and joined Il Rosso in France, where he in all probability ended his days not very long afterwards, as nothing further is known of him, and he does not appear to have left any works in France.

There are still several excellent paintings, both in oil and in fresco, by Pacchiarotto, in Siena. There is a beautiful altar-piece in San Cristoforo; and some excellent frescoes in Santa Caterina and San Bernardino. Speth takes particular notice of these frescoes in his 'Art in Italy,' and terms Pacchiarotto the second hero of the Sienese school—Razzi, called Sodoma, being the first. They are highly praised also by Lanzi. In Santa Caterina is the visit of St. Catherine of Siena to the body of St. Agnes of Montepulciano, in which are heads and figures worthy of Raphael. According to Speth these works can be justly compared with Raphael's alone, and he adds that designating Pacchiarotto as of the school of Perugino, is only magnifying the injustice he had already undergone in having his works long reported as the works of Perugino. If therefore he were the pupil of Perugino, what Perugino supplied was only the spark, says Speth, which in Pacchiarotto grew into a flame.

Pacchiarotto has suffered the same misfortune that many other excellent masters have undergone, owing to their being omitted by Vasari—their merits have remained long unrecognised. Pacchiarotto is probably the Girolamo di Pac hia who is casually mentioned by Vasari in speaking of Il Sodoma; they painted together in San Bernardino.

There are two beautiful small easel pictures in oil and on wood in the Pinacothek at Munich by Pacchiarotto—San Francesco d' Assisi, with two angels in the background; and the Madonna and Child, with four angels in the background; half-length figures in both. They are two of the best pictures in the collection, in character, colour, and execution, and are among the best specimens of the beauties of the early Italian schools of painting. They were formerly in the church of San Bernardino at Siena, but were purchased about 1818 by the present King of Bavaria, Ludwig I., then crown-prince.

(Lanzi, *Storia Pittorica*, &c.; Speth, *Kunst in Italien*, vol. ii.)

PACHECO, FRANCISCO, was born of a good family at Seville, in 1571, according to his own account, which is nine years earlier than the date given by Palomino. He was nephew of Francisco Pacheco, canon of the cathedral of Seville, a distinguished divine and a celebrated Latin poet.

Pacheco's master was Luis Fernandez, a painter of serges &c. at Seville: he never was in Italy, as Palomino has wrongly inferred from two passages in his treatise on painting; he studied exclusively in Seville. His first works worthy of notice were two large flags or standards for the Spanish fleets of New Spain and Tierrafirma, painted in 1594, in oil on crimson damask, each thirty yards by fifty; the paintings were the royal arms of Spain, and St. Iago on horseback, with rich borders and other decorations. He was one of the principal painters employed on the great decorations of the funeral or catafalque of Philip II. of Spain in the cathedral of Seville in 1598. He was also the first, says Cean Bermudez, in Seville who properly painted and gilded statues—'el primero en encarnar y estofar bien las estatuas'; thin colour was painted over the gold. He was the first likewise who painted the figures and grounds of bassi-rilievi; there are several works of both descriptions by Pacheco in Seville.

In 1600 he was appointed, together with Alonzo Vazquez, to paint a series of large pictures illustrating the life of St. Ramon for the cloister of the convent of the Merced. In 1603 he executed some works in distemper in the palace of Don Fernando Henriquez de Ribera, third duke de Alcala, from the story of Dædalus and Icarus.

It was not till 1611 that he visited Toledo, Madrid and the Escurial, and saw the great works of Titian and other celebrated masters, Spanish and Italian. The sight of the excellent works which he saw on this occasion impressed him forcibly with the varied and incessant application requisite to form a great painter. Accordingly upon his return to Seville he opened a systematic academy of the arts, as well for his own improvement as for the benefit of the rising artists of Seville; and the fact alone that Alonzo Cano and Velazquez were two of his scholars, shows that his system worked with some effect. The improvement he himself acquired by such elementary instruction, and from the true principles of art, is shown by his great picture of the Last Judgment, an altarpiece finished in 1614 for the nuns of the convent of St. Isabel, which he has himself described at great length in his treatise on painting. Soult made a magazine of this convent during his occupation of Andalucia, and the picture was probably removed. It was a large work containing many figures and many incidents, but Pacheco received only 700 ducats for it. On one part of it was inscribed 'Futurum ad Finem Saeculorum Judicium Franciscus Paciccus Romulensis depingebat. Saeculi a judicis natali xvii. anno xl.'

In 1618 Pacheco was appointed by the Inquisition one of the guardians of the public morals, in as far as he was made censor of all the pictures which were exposed for sale in Seville; nakedness was prohibited, and it was Pacheco's business to see that no pictures of the naked human form were sold. It is to such formal morality as this that the Spanish school of painting owes its characteristic ponderous sobriety, and is so directly opposed to Italian painting. There is not probably in the whole art of Spain such a thing as a naked female of the size of life, if of any other size. It reflects the jealous morosity of the Inquisition even in its portraits. Prudery was carried so far in Spain, that in the time of Ferdinand VII. even all the great Italian works which could be reproached with nudities were removed from the galleries, and were condemned to a distinct set of apartments called the Galeria Reservada, and only opened to view to those who could procure especial orders. There is a 'Cabinet des Objets Réservés' at Naples, and though this is separated from the rest of the collection with reason, there is no difficulty whatever in obtaining admission into it; but the Galeria Reservada of Madrid is of a very different nature, and comparatively innocent, and the separation of such works from the general collection is a greater evidence of subjective immorality than of objective indecency. Mr. Ford, in his 'Handbook of Spain,' terms this gallery a sort of Magdalen or penitentiary, into which were banished all peccant pictures whose nudities might corrupt the purity of Madrid; where the Italian and Flemish Ledas, Danaës, and other improper ladies, blushed unseen, lumped together like the naughty epigrams of Martial when collected into one appendix in well-intentioned editions. All these pictures were the works of foreigners. 'Nothing,' says Mr. Ford, p. 116, 'gave the holy tribunal greater uneasiness than how Adam and Eve in Paradise, the blessed souls burning in purgatory, the lady who tempted St. Anthony, or the Last Day of Judgment, were to be painted, circumstances in which small-clothes and long-clothes would be highly misplaced. Both Palomino (ii. 137) and Pacheco (201) handle these delicate subjects very tenderly. Describing the celebrated Last Judgment of Martin de Vos, at Seville, Pacheco relates how a bishop informed him that he had chanced, when only a simple monk, to perform service before this group of nakedness; the mitre had not obliterated the dire recollections; he observed (he had been a sailor in early life) that rather than celebrate mass before it again, he would face a hurricane in the Gulf of Bermuda; the moral effect of the awful Day of Judgment was so much counter-balanced by the immoral deshabille.'

In 1623 Pacheco again visited Madrid, in company with his distinguished scholar and son-in-law Velazquez, and he remained two years in the Spanish capital. Velazquez went to Madrid by the Invitation of the duke de Olivares, who procured him the appointment of painter to the king, Philip IV. It was at this time that Velazquez painted his equestrian portrait of Philip, upon which Pacheco wrote a sonnet, in which Philip was compared with Alexander, and Velazquez with Apelles. (Cean Bermudez, *Diccionario*, v. 161.)

Pacheco, during this visit to Madrid, among many other works, executed one which hardly accords with the present notions of the occupation of a great painter, though it has been the practice of great artists from very early ages to paint their statues: it was common in the time of Plato and of Alexander. [NICIAS, P. C. S.] Pacheco dressed, gilded, and painted (estofó) for the duchess of Olivares, a statue, probably of wood, of the Virgin, by Juan Gomez de Mora, for 2000 reals. The work was much admired, and by none more than Eugenio Caxes, who, says Cean Bermudez, estimated the decoration at 500 ducats. What this process exactly was it is not evident from this mere mention; but the object generally in these painted wooden images appears to have been to obtain an exact imitation in the minutest detail, perpetual facsimiles. The effect of such images, called *Pasos*, must be experienced to be comprehended. The Spaniards dress them as well as paint them. Their churches were crowded with such works; but most have now been removed to museums.

Pacheco returned to Seville, where his house became a chief resort of all men of art, of literature, and of taste, and among his most intimate associates were the Jesuits of Seville, who assisted him in his 'Arte de la Pintura,' and were indeed the authors of that part which is devoted to sacred art; and doubtless to them is due the austere morality which characterises Pacheco's principles of art. He is noticed above as having been the first artist who painted images properly. He published an essay partly on this subject in 1622, complaining of sculptors painting their own statues. But the generality of *Doradores* and *Estofadores* worked so badly, that such sculptors as Juan Martinez Montañes and Alonzo Cano felt compelled to dress and colour their own statues. Pacheco however coloured many statues for Montañes, including the St. Jerome of the monastery of Santiponce. Montañes generally made a contract with his employers, to be allowed to superintend the toilet of his own statues. Mr. Ford gives some curious details about the toilets of these Spanish images. No man is allowed in Spain to undress the *Paso*, or *Sagrada Imagen* of the Virgin; and some images had their mistresses of the robes (*Camerera Mayor*) and a chamber (*Camerin*) where their toilet was made. The duty has, however, now devolved upon old maids; and 'ha quedado para vestir imagines'—she has gone to dress images, has become a term of reproach. Embroidering rich dresses for images of the Virgin is still a great occupation with the rich and pious ladies of Spain. Similar customs prevailed with the antients. But the antients, says Mr. Ford, paid much more attention to the decorum and propriety of costume than the Spanish clergy. In the remote villages and in the mendicant convents the most ridiculous masquerades were exhibited, such as the Saviour in a court dress, with wig and breeches. Some figures have only heads, feet, and arms, the bodies being mere blocks, because destined to be covered with drapery; they are called 'imagines a vestir.' Before the French occupation of Spain there were fifty of these images in Seville alone, which were carried in various processions in the holy week, and on other great occasions.

Pacheco died at Seville in 1654. His works, though not vigorous, are correct in form, effective in light and shade, studied in composition, and simple in attitude; but they have little colour, are dry, and rather feeble or timid in their handling. These defects are more apparent when his pictures are seen together with the works of other Andalucian painters, who have generally made colouring their principal study, and have comparatively neglected purity of form. Besides many religious pictures, he painted or drew in crayons nearly four hundred portraits, the best of which is that of his own wife. One of his sitters also was Miguel Cervantes.

His *Arte de Pintura, su Antigüedad, y Grandezas*, 4to., Seville, 1649, pp. 641, a remarkably scarce book, is considered an indispensable guide by the painters of the school of Seville; it is very elementary, and is said also to be a work of great learning on the subject, and is held throughout Spain to be the best work on painting in the Spanish language: it is in three parts—history, theory, and practice. His works are seldom seen out of Seville; and he is even very inadequately represented in the splendid gallery of the Prado at Madrid. His masterpiece is, or perhaps rather was, the altarpiece of the Archangel Michael expelling Satan from Paradise, which was in the church of San Alberto at Seville; but this church was one of Soult's magazines. There are still at Seville an altarpiece of the Conception at San Lorenzo, two pictures of San Fernando in San Clementi; and a picture in San Alberto. The methodic system of Cean Bermudez to mention the locale of all the most celebrated works of the great Spanish masters, eventually cost Spain the greater portion of these works, for his dictionary was used by the French generals and others as an inventory of what was valuable, and directed them to the places where these works were to be found. Not a moiety of the works of Pacheco described by Bermudez as at Seville is now to be found there. Pacheco's own portrait by himself is in the Spanish museum in the Louvre.

Pacheco collected the poems of his friend Hernando de Herrera, and published them with a portrait, in 1619 His own poems do not appear ever to have been published in a collected form. Bermudez has printed a few in his Dictionary.

(Cean Bermudez, *Diccionario Historico de los mas Ilustres Profesores de las Bellas Artes en España.*)

PACHYCO'RMUS, a genus of Ganoid fossil fishes, from the lias of England and Wirtemberg. (Agassiz.)

PACHYCE'PHALUS, a genus of fossil fishes from Sheppey. (Agassiz.)

PACHY'ODON, a genus of Dimyarian Conchifera, fossil in the lias and oolites. (Strickland.) This is the genus Cardinia of Agassiz, and includes part of the Unionidæ of Sowerby.

PACHY'PTERIS, a genus of fossil Ferns, from the oolite of Yorkshire. (Brongniart.)

PACKING-PRESS. The hydraulic press invented by Mr. Bramah, besides being used to draw piles, trees, &c. from the ground, or to prove the strength of materials, is frequently employed to pack or compress bales of linen, cotton, and the like goods into small dimensions for the convenience of transport. A description of this machine has been given under HYDRAULICS, P. C.; and it is intended here merely to notice the method employed by Mr. Barlow to determine the thickness which the cylinder should have in order that its strength may be in equilibrio with the strain to which it is subject from the pressure of the fluid within it.

Within any horizontal section of the cylinder the tendency of the contiguous particles of metal to separate from one another in a direction perpendicular to a diameter passing through them, in consequence of the expansion produced by the pressure of the fluid, becomes continually less from the interior to the exterior circumference of the section, and is inversely proportional to the distances of the particles from the axis of the cylinder; and the cohesive power of the particles is, by the laws of elasticity, proportional to their separation, while the strain produced by the pressure of the fluid varies, at any part of the section, with the distance of that part from the axis. It follows that the resistance opposed at such part of a section to the momentum of the pressure is inversely proportional to the square of the distance from the axis.

Therefore r representing the radius of the interior surface of the cylinder, t the whole thickness, and x any variable distance from the interior surface towards the exterior, all in inches; then $\int \frac{r^2\,dx}{(r+x)^2}$, if multiplied by $2\,\pi$, the circumference (rad. $=1$), and by the force of cohesion on a square inch of the metal, will express the resistance produced by an annulus which is one inch deep in a direction parallel to the axis.

That integral, for the whole thickness t, is $\frac{rt}{r+t}$; therefore f (in pounds) denoting the force of cohesion, $\frac{2\pi\,rtf}{r+t}$ expresses the whole resistance.

If f' (in pounds) represent the force on a square inch of the interior surface, by which the pressure of the fluid tends to strain the cylinder, $2\pi rf'$ will denote the whole strain on the same annulus; therefore, equating the strength and strain, there is obtained

$$t=\frac{rf'}{f-f'}$$

This value of t expresses the required thickness.

PACO. [LLAMA, P. C.]

PADDLES, PADDLE-WHEELS. [STEAM-VESSEL, P. C., pp. 493, 495, 508.]

PAEDE'RIA, a genus of plants belonging to the natural order Cinchonaceæ. It has a small 5-toothed permanent calyx, a funnel-shaped corolla, hairy inside, 5-lobed, and with a plaited æstivation. There are 5 stamens, sometimes abortive; the anthers oblong, nearly sessile in the middle of the tube. The style is not protruded, and the stigma bifid. The berry is small, roundish, and globose, tri-celled, with a seed in each cell. The flowers are small, white, and usually unisexual.

P. fœtida has a woody twining stem, round and smooth. The leaves are oblong or lanceolate, cordate at the base and glabrous. The panicles axillary, terminal, opposite, short, and few flowered. The flowers are usually of a deep pink, the bracts ovate, the calyx 5-toothed, the corolla with a long tube somewhat gibbous and woolly inside; the limb narrow and divided into 5-cordate crenulate segments. The berry is dry, compressed, having 5 lines on each side, 1-celled, and 2-seeded. The seeds are smooth, compressed, enlarged with a somewhat membranous ring all round. The leaves have a very fœtid and alliaceous odour when bruised, yet they are used to impregnate baths and are administered in a decoction medicinally in cases of retention of urine and some febrile complaints. According to Roxburgh the root is used by the Hindus as an emetic. It is a native of the East Indies, and of Japan and the Moluccas.

P. ternata has an erect smooth trichotomous stem with triangular branchlets; leaves 3 in a whorl; oblong lanceolate axillary trichotomous corymbs shorter than the leaves; the limb of the calyx campanulate and obscurely 5-toothed. It is a native of the East Indies on the mountains which border on Silhet. The flowers are rather large, funnel shaped, white, on long filiform pedicels, each pedicel having a pair of linear ciliated bracts above the middle. The flowers are said to be fragrant when fresh, but emit a very offensive smell on being steeped in water after they have been dried.

The species of Paederia are free growers and will strike root in any kind of light rich soil under a hand-glass.

(Don, *Gardener's Dictionary*; Lindley, *Flora Medica.*)

PAGA'NI, GREGO'RIO, was born at Florence in 1558: his father, Francesco Pagani, died aged only thirty, when his son was but three years old. Gregorio was an excellent colourist, was first the pupil of Santi Titi, and afterwards of Cigoli, and became one of the first and most able reformers of the Florentine school from the low state to which it had been reduced by the blind followers of the anatomical school of Michael Angelo. [TUSCAN SCHOOL OF PAINTING, P. C.] Barocci and Santi Titi were the leaders of the new school, but Cigoli was its principal representative, and Pagani adhered so closely to the style of his friend and master Cigoli, that he used to be termed the second Cigoli. His masterpiece, however, the Finding of the Cross by St. Helena, in the Carmine, was burnt in the fire which destroyed that building in 1771, and Pagani's reputation has greatly suffered in consequence, though there is a print of it by G. B. Cecchi and B. Eredi. Few of his works still remain; one of the principal is a fresco in Santa Maria Novella: his easel-pictures in oil are also rare. He died at Florence in 1605: Matteo Roselli was his scholar.

(Baldinucci, *Notizie dei Professori del Disegno*, &c.; Lanzi, *Storia Pittorica*, &c.)

PAGANI'NI, NICOLO, whose European fame as a violinist, whether justly acquired or not, entitles him to notice among distinguished characters, was born at Genoa, in 1784. His father, a commission-broker, played on the mandoline, but fully aware of the inferiority of an instrument so limited in power, he put a violin into his son's hands, and initiated him in the principles of music. The child succeeded so well under parental tuition, that at eight years of age he played three times a week in the church, as well as in the public saloons. At the same period he composed a sonata. In his ninth year, he was placed under the instruction of Costa, first violoncellist of Genoa; then had lessons of Rolla, a famous performer and composer; and finally studied counterpoint at Parma under Ghiretti, and the celebrated *maestro* Paer. He now took an engagement at Lucca, where he chiefly associated with persons who at the gaming-table stripped him of his gains as quickly as he acquired them. He there received the appointment of director of orchestra to the court, at which the Princess Elisa Bacciochi, sister of Napoleon, presided, and thither invited, to the full extent of her means, superior talent of every kind. In 1813 he performed at Milan; five years after, at Turin; and subsequently at Florence and Naples. In 1828 he visited Vienna, where a very popular violinist and composer, Mayseder, asked him how he produced such new effects. His reply was characteristic of a selfish mind:—'Chacun a ses secrets.' In that capital he was accused of having murdered his wife. He challenged proofs of his ever having been married, which could not be produced. Then he was charged with having poignarded his mistress. This he also publicly refuted. The fact is that he knew better how to make money than friends wherever his thirst of gold led him. Avarice was his master-passion, and, second to this, gross sensuality in his intercourse with the female sex.

The year 1831 found Paganini in Paris, in which excitable capital he produced a sensation hardly inferior to that created by the visit of a truly great musician, Rossini. Even this renowned composer was carried away by the current of popular opinion. Being asked how he liked the new violinist, he replied, 'I have wept but three times in my life: first, on the failure of my earliest opera; the second time, when in a boat with some friends, a turkey stuffed with truffles (*une dinde aux truffes*), provided for our dinner, tumbled into the water; and, thirdly, on hearing Paganini for the first time.' The public of Brussels, however, were moved in a very different manner. According to M. Fétis, Paganini's performance at a concert given by him in that city, produced only laughter, which continued during the whole of it. He arrived in England in 1831, and immediately announced a concert at the Italian Opera-House, at a price which, if acceded to, would have yielded 3391*l.* per night. He had heard, all over the Continent, of the gullibility of the British public, of the wealth of the aristocratic classes, and of their lavish expenditure on foreign performers; but the attempt was too audacious, even for these, and he was compelled to abate his demands; though he succeeded in drawing audiences fifteen nights in that season at the ordinary high prices of the King's Theatre. He also gave concerts in other parts of London, and performed at benefits, always taking at these a large proportion of the proceeds, and frequently the whole. He visited most of our great towns, where his good fortune still attended him. He was asked to play at the Commemoration Festival at Oxford, in 1834, and demanded 1000 guineas for his assistance at three concerts. Need we add that his terms were scornfully rejected?

Paganini died at Nice in 1840, of a diseased larynx (*phthisie laryngée*). By his will, dated 1837, he gave his two sisters legacies of 60,000 and 70,000 francs; his mother a pension of 1200; the mother of his son Achillino (a Jewess of Milan) a similar pension; and the rest of his fortune, amounting to four millions, devolved on his son. These and other facts before related, we give on the authority of the *Biographie Universelle.*

Paganini certainly was a man of genius and a great performer, but sacrificed his art to his avarice. His mastery over the violin was almost marvellous, though he made an ignoble use of his power by employing it to captivate the mob of pretended amateurs by feats little better than sleight-of-hand. His performance on a single string, and the perfection of his harmonics, were very extraordinary; but why, as was asked at the time, be confined to one string when there are four at command that would answer every musical purpose so much better? His tone was pure though not strong, his strings having been of smaller diameter than usual, to enable him to strain them at pleasure; for he tuned his instrument most capriciously. He could be a very expressive player: we have heard him produce effects deeply pathetic. His arpeggios evinced his knowledge of harmony, and some few of his compositions exhibit many original traits. But money was his object, and he attained it. Were the French, continuing their not uncommon practice, to put the principal incidents of Paganini's life into a dramatic form, 'All for gain, or fair fame well lost,' would make an appropriate title to the piece.

(*Biographie Universelle, Supplement*; *Harmonicon.*)

PAGGI, GIOVANNI BATTISTA, was born of an antient and noble family at Genoa, in 1554. He was the pupil of Luca Cambiaso, and was distinguished chiefly as a painter, but he was also a sculptor and architect. About the year 1580 he was obliged to fly from Genoa in consequence of an unfortunate homicide which the absurd conduct of a friend brought upon him. Paggi went to Florence, and, under the protection of the grand-dukes Francesco I. and Ferdinando, there lived in peace and with reputation, until he was recalled through Archbishop Sinnasio, afterwards cardinal, to Genoa about 1600, where he executed several excellent works, and gave a great impulse, especially in colouring, to the Genoese school of painting, of which he was the best master in his time. His masterpieces are considered two pictures in San Bartolomeo, and the Slaughter of the Innocents belonging to the Doria family, painted in 1606. Paggi died in 1627. In 1607 he published a short treatise on the theory of painting, entitled 'Definizione, o sia Divisione della Pittura:' he wrote it in consequence of his objecting to some of the statements of Lomazzo in his 'Trattato' and his 'Idea del Tempio della Pittura.' Paggi's treatise is extremely scarce.

(Soprani, *Vite de' Pittori, &c. Genovesi;* Lanzi, *Storia Pittorica*, &c.)

PAJOU, AUGUSTIN, a distinguished French sculptor, was born at Paris in 1730, and was the pupil of J. B. Lemoine, likewise a sculptor of eminence. Pajou obtained the grand prize for sculpture in the French Academy, in 1748, and accordingly went as a pensioner of the French government to Rome, where he remained twelve years. Gabet mentions that Pajou was the sculptor of about two hundred works, in bronze, marble, stone, wood, and even in paper or pasteboard; and he gives a list of some of those which he exhibited. In 1768 he exhibited a sketch of the tomb of Stanislaus, King of Poland, and father-in-law of Louis XV.; a statue in lead, of the natural size, for the Duchess of Mazarin, representing Love as ruler of the elements; and four large colossal figures in stone for the garden of the Palais-Royal, representing Mars, Prudence, Liberality, and Apollo. The following are some of his principal works:—Pluto holding Cerberus, chained (for this work he was elected a member of the Academy); Psyche abandoned (in the Luxembourg); statues of Pascal, Turenne, Bossuet, Buffon, and Descartes; the sculptures of the façade of the Palais-Royal, ordered by Louis XVI. He executed also the sculptures of the Salle de l'Opera at Versailles; the ornaments of the Palais Bourbon; and of the Cathedral of Orleans; and also the Naiades of the south and west faces of the Fontaine des Innocens. He died at Paris in 1809. He was made one of the professors of the French Academy of Arts in 1767; and was subsequently a member of the French Institut. His style was natural and manly, and was so far the exponent of his own character. His son Jacques Augustin Pajou was a painter of great merit.

(Gabet, *Dictionnaire des Artistes de l'École Française*, &c.)

PALÆOGRAPHY (from παλαιός, 'old,' and γραφή, 'writing') is a term applied to express the knowledge of the antient styles of writing, or the study of the characters and illuminations of ancient manuscripts. Palæography is a comparatively recent study respecting its ornaments, but it has very lately been the subject of much laborious application in all respects; and the age of a MS. may be now approximated from the form and style of its character, though it cannot be strictly ascertained. The present article is directed particularly to the ornament and general illumination of antient MSS., and their connection with the progress of painting, and not to calligraphy or to the study of MSS. historically, which is treated of in the 'Penny Cyclopædia.' The whole subject is perfectly illustrated, generally, in the splendid work recently published in Paris by Champollion Figeac, and Aimé Champollion, Fils, which contains fac-similes from most of the principal MSS. extant in Europe, admirably executed by Silvestre (*Paléographie Universelle, Collection de Fac-Similes d'Ecritures de tous les Peuples et de tous les Temps*, par M. Silvestre, 1839-42, 4 vols. folio).

The first work which treats of this subject with regard to ornament is Dibdin's *Bibliographical Decameron*, published in 1817, which was followed by the more comprehensive work of D'Agincourt in 1823, *Histoire de l'Art par les Monuments*, but which treats chiefly of Greek and Italian MSS., and the illustrations are uncoloured. D'Agincourt was the first to promulgate the treasures of the Vatican Library in this department of art. A very beautiful work in colours, by Mr. Shaw, on this subject was published in London, in 1833, *Illuminated Ornaments selected from MSS. and early Printed Books, from the Sixth to the Seventeenth Century*, drawn and engraved by Henry Shaw, with descriptions and an introduction by Sir F. Madden, keeper of the MSS. in the British Museum. There are many papers on this subject in the Archæologia; and a series of articles on the 'Progress of the Art of Illuminating Manuscripts,' with illustrative woodcuts, was published in the *Penny Magazine* of 1839.

The illumination of MSS. was in practice among the antient Romans. This is known from passages in antient writers, though there are no MSS. extant of an earlier date than about the third century of the Christian æra. Portraits were sometimes prefixed to the writings of authors: Martial (xiv. 186) mentions one of Virgil which was prefixed to a MS. of his works; and Varro, says Pliny (*Hist. Nat.*, xxxv. 2), inserted the portraits of 700 distinguished men in his writings, and dispersed them over all parts of the world.

The illuminating of MSS. is generally considered as a connecting link between antient and modern painting, but though at the revival of painting MSS. were illuminated by painters, the calligraphists must have been always a distinct class, and even the initial letters and borders were executed by distinct persons from those who wrote the MSS., which is evident from the fact that some MSS. want the initial letters altogether, the spaces being left to be filled in by the proper artist. Though many illuminators of MSS., or *miniatori*, at about the revival of painting became subsequently great painters, it is not likely that painters became the illuminators of MSS. at any time, beyond the execution of the miniatures which were attached to them. There are few even moderately good miniatures as works of art to be found in any MSS., and the best of all are those executed by the celebrated Memling and his nearly contemporary Giulio Clovio, a native of Croatia, who died 1578, aged eighty; executed therefore at the time when painting was at its highest state of perfection, which shows that the influence of the great works with which Flanders and Italy then abounded reached the decoration of MSS. as well as other objects of taste, the less influenced by the greater; but the reverse was probably never the case, and it would be difficult to show that painting was ever in any way improved or even preserved by the illumination of MSS. The *miniatori* (from minium or minio, red lead; Pliny and Vitruvius sometimes mean vermilion by minium) are said to have been the only painters of the middle ages, but this is an incorrect assumption, and that the *miniatori* also were the revivers of painting in the tenth and eleventh centuries is a mere theory founded on assumption. Constantinople always had its painters, and there is a Latin work extant, of as early a date probably as the ninth century, which treats of painting in all its branches, 'De Omni Scientiâ Artis Pingendi,' not omitting painting in oil. There is a MS. of this work now in the British Museum; it is by Theophilus Presbyter, whom Lessing supposes to be the same person as Tutilo or Tuotilo, a monk and painter, 'picturæ artifex,' of the convent of St. Gall in Switzerland. The work is printed in Lessing's *Beiträge zur Geschichte und Litteratur*, No. vi., Brunswick, 1781. [TUTILO, P. C.]

Vasari, in the Life of Don Lorenzo, evidently informs us that the writers of letters were a distinct class after the revival of painting, for he notices Don Jacopo of Florence, a monk of the convent degl' Angeli, of the fourteenth century, as the most celebrated letter-writer, 'scrittore di lettere grosse,' not only in Tuscany but in the whole of Europe. He left his convent sixteen folio choral books with miniature illuminations by another monk of the same convent, Don Silvestro, and their skill was so much venerated by their brother monks, that their right hands were embalmed after their death and preserved in a tabernacle.

It appears that the earliest MSS. extant of Greek and Roman origin are not much ornamented, their embellishment consisting in little more than the occasional use of red ink for titles or commencements of books. No ornaments have been found in the Herculaneum papyri. The Egyptian papyri are written in various colours; they contain mythological figures in red, blue, yellow, green, and white.

The most celebrated collection of Illuminated MSS. is that of the Vatican, already noticed, which, among its 24,000 MSS., contains many interesting works. D'Agincourt notices upwards of fifty valuable MSS. in this collection, and gives specimens of the style of decoration, in design, from most of them. The following are the most remarkable of this collection according to Platner (*Beschreibung der Stadt Rom*, vol. ii. pt. 2, p. 345-363):—Of the Western or Latin MSS. the earliest is probably the Virgil (Vaticana, No. 3225), containing 50 miniatures, 44 of which are from the Aeneid, but they are much damaged, and five are nearly wholly ruined; in D'Agincourt ('Peinture,' vol. v. pl. xx.-xxv.) the damaged parts are restored. P. S. Bartoli published prints from these miniatures, but they are mannered and altered. The designs are supposed to be copied from antient works; the conceptions are better than the execution, which is very coarse; the lights on the draperies, arms, and other accessories are picked out with gold: the date of this MS. is supposed to be not earlier than the fourth centnry. Another celebrated MS. is a Terence (Vaticana, No. 3868), formerly in the possession of Cardinal Bembo. At the commencement of the MS. is a portrait of Terence, and at the beginning of each comedy is a picture of masks: in the text are representations of the scenes with the names of the characters attached. This MS. is supposed to be of the ninth century; and the illustrations are thought to be copies of earlier works, on account of the superiority of the designs to the execution, and the antient costume of the figures; the drawing is very bad. (D'Agincourt, pl. xxxv., xxxvi.) The writer of the MS. was Hrodgarius (Rodgar), from his name apparently a German. There is another Virgil in this collection (Vaticana, No. 3867) of the twelfth or thirteenth century, in which according to Rumohr and Platner the illuminations are also copied from earlier works. It was formerly in the Abbey of St. Denis: it contains sixteen illustrations, with the full-length portrait of Virgil three times, in the same attitude, but the drawing is thoroughly bad in every instance. (D'Agincourt, pl. lxiv.) Vaticana, No. 4922, is an Italian MS. of the year 1125; a eulogistic poem on the celebrated Countess Matilda, by Donizo; the subjects of the illustrations are written against them; they relate to the genealogy and history of the countess: the prints in D'Agincourt (pl. lxvi.) are improved; the originals both in form and colour are poor in the extreme. There is a MS. of the Tragedies of Seneca (No. 355, Biblioteca d'Urbino), with somewhat better illustrations, by an Englishman, with the commentary of an English Dominican, Nicholas Treveth, which is dedicated to Niccolo, Cardinal bishop of Ostia and Velletri, probably Niccolo da Prato, who died at Avignon in 1321 (D'Agincourt, pl. lxxii.). No. 1071 of the Palatina is a treatise of the 13th century, on falconry, by the Emperor Frederick II.; in the illuminations to this work the hawks are well executed, but the horses and the human figures, particularly, are bad. (D'Agincourt, pl. lxxiii.)

The Byzantine MSS., of which there are many in the Vatican, are better illustrated than those of the western empire; their illustrations are strictly in what is called the Byzantine style, but they are often executed with great care, and finished with remarkable detail. No. 405 Vaticana, is a MS. of the book of Joshua, on a roll of parchment 32 feet long, of the seventh or eighth century. Rumohr (*Italienische Forschungen*, i. 167) is of opinion that these illnminations are copies of earlier works, and, though certainly much inferior to their originals, are the best of the early Christian illustrations: in the extremities they have all tho characteristic imperfections of Byzantine art, but in treatment, in costume, and in the military equipments they approach the fine works of antiquity. The Jordan, the cities of Jericho and Ai, and Mount Hebal, are personified, and indicated in writing. (D'Agincourt, pl. xxviii.-xxx.)

Among these MSS. is also the celebrated Menologium (Vaticana, No. 1613), or part of a Greek Calendar, from September to February, with 430 miniatures upon gold grounds, illustrating the life of Christ, and of all the saints whose holidays occur in these months of the year. The miniatures, according to names inscribed upon them, were painted by — Pantaleon, Simeon, Michael Blachernita, Georgius, Menas, Simeon Blachernita, Michael Micros, and Nestor. They are extremely poor in invention, but have considerable merit in the expression of the heads, in the draperies, and detail of execution: the figures in action are the most defective; those in repose are frequently natural. Their martyrdom is generally the subject represented in tho lives of the saints. There are many characteristic Byzantine buildings introduced in the backgronnd. This MS. was executed by the order of the Emperor Basilius II. called Porphyrogennetus (989 – 1025), and is supposed to have been procured from Constantinople by Lodovico Sforza, Duke of Milan. It was presented to Paul V. by Cardinal Sfondrato, and placed in the Vatican Library in 1615. Cardinal Annibale Albani, nephew of Clement XI., published it in 1727, together with a Latin translation, but the engravings of this edition are very inferior to the originals. (D'Agincourt, pl. xxxi.-xxxiii.) The rest of the Calendar was supplied from a MS. in the Library of Grotta Ferrata, in which there are no illustrations.

Platner is of opinion that the best Greek MSS. are those of the period of the Comnene emperors (1056—1204), from Michael VI. to the conquest of Constantinople by the Crusaders; and particularly during the reigns of Alexius I., Johannes II., and Manuel I., and this opinion is borne out by the illustrations of d'Agincourt. Of these MSS. are the Homilies of St. Gregory Nazianzenus (Vaticana, No. 463), finished in 1063, and distinguished for its writing, initial letters, and arabesque marginal decorations; it contains only one miniature—the author writing. A still more important MS. for its illuminations is tho Dogmatica Panoplia, fortifications against heresies (Vaticana, No. 666), executed by order of the Emperor Alexius Comnenus (1081—1118). In this MS. are three large illustrations on gold ground: two, representing one subject, are on the opposite sides of the same leaf—on one the fathers of the Greek church are bringing the materials of the book, and on the other, the emperor is receiving them; above is an apparition of the Saviour, a half figure, with his hand in the act of benediction:—in the third illustration, the emperor is presenting the finished work to the Saviour seated on his throne. The figures of these paintings are perhaps the best extant of this or any preceding period; they are abont nine inches high, are brilliantly coloured, and the heads have much character: the costume of the emperor is on both occasions very complete; it is quite oriental, and bears no resemblance to the antient costume. (D'Agincourt, pl. lviii.) There is also a beautiful MS. of the four gospels, or Evangelium, executed in 1128, in the reign of Johannes Comnenus. The illustrations of this MS. are—Christ seated between Justice and Love, both crowned—the Saviour is blessing with his right hand the emperor, with his left the emperor's son Alexius; the Evangelists writing; the birth of the Saviour; his baptism; the birth of John the Baptist; and the Saviour releasing the souls from purgatory or limbo, the devil lying chained under his feet. The draperies are good, as also are the heads of the emperor, his son, and the Evangelists, which are the best: this MS. is also ornamented. (D'Agincourt, pl. lix.) Another MS. of this period is (Vaticana, No. 394) one of St. Johannes Climacus, which is called the ladder, κλίμαξ, from the work itself, which treats of the virtues as the steps of the ladder to heaven; the vices are also personified accompanied by devils, and causing precipitation from the ladder: the vices are blue, the devils black. The figures are very small, but carefully executed, and the colouring is likewise good. The male are better than the female figures. (D'Agincourt, pl. lii.) Platner remarks that short plump figures are a characteristic defect of the inferior Byzantine MSS.

There are no Latin MSS. of the fourteenth century in the Vatican with illuminations of any value as monuments of art, but there is a commentary on the New Testament, executed in 1358, with illustrations, by Niccolo da Bologna, an artist otherwise unknown. Of the fifteenth century, when the rapidly increasing improvement in painting throughout Italy gradually raised the common standard of mediocrity in all matters of taste, there are some illustrations of a very superior character. Among the most remarkable are those of a Pontificale ('Liber Pontificalis,' Biblioteca Ottoboni, No. 501), generally attributed to Pietro Perugino, but in the opinion of Platner they belong rather to Bartolommeo della Gatta, a celebrated miniature painter of the same time. (D'Agincourt, pl. lxxvi.) With these may be mentioned the illuminations, both miniatures and arabesque and other decorations, of a MS. (Vaticana, No. 2094) of a Latin translation of Aristotle's book on animals; the book is dedicated to Sixtus IV., of whom there is an excellent medallion portrait on the title-page; Aristotle is also represented on the title-page, writing, and surrounded by men, women, and animals, indicating the subject of the treatise: the lights of these illuminations are picked ont with gold and silver. (D'Agincourt, pl. lxxvi.) Another valuable MS. of this century is the Latin Bible of Federigo, duke of Urbino, in two volumes, royal folio, finished by Hugo de Cominellis (Hugues de Comines) in 1478. The ornamental part of this MS. is very elaborate: the miniatures were probably execnted by different artists; they are unequal in their execution, and those in the first volume are inferior to those in the second. (D'Agincourt, pl. lxxviii.) From the Urbino library (No. 112) is also the breviary of Matthias Corvinus, king of Hungary, of which some have supposed the miniatures to be executed by Gherardo of Florence, a celebrated miniature painter, noticed by Vasari as having executed such works for Matthias Corvinus. The MS. was written by the presbyter Martinus Antonius in 1487, but the miniatures were probably not completed until some years afterwards; one is dated 1492, when Corvinus was already dead: every page of the MS. is illuminated. Vante, or Attavante, a celebrated miniature painter, also executed miniatures for Matthias Corvinus, but Vasari adds that all the MSS. belonging to Corvinus, which were in the hands of these artists, were purchased by Lorenzo de' Medici, and afterwards placed in the Laurentiana at Florence. There is only a missal in the Laurentiana which belonged to Corvinus; it was written by tho priest Zanobi Moschino in 1394. Lorenzo de' Medici was probably not the only purchaser of these works. There is an illustrated Dante in this collection, likewise from the Urbino library (No. 365) which was executed for the duko Federigo between the years 1476 and 1482; the last is that of his death, and 1476 is the year in which he was presented with the order of the Garter by Edward IV. The decoration of this order is emblazoned with the arms of the duke on the title-pages of the three parts. (D'Agincourt, pl. lxxvii.) Of the sixteenth century there are, with the exception of Julio Clovio's and Memling's, scarcely any MSS. worthy of the time, and those of Clovio are injured by their excessive finish. Tho miniatures of Clovio have one particular distinction from those of other earlier masters; they are executed in what is at present understood by water-colours, while those of earlier masters are done in body colours, or a species of distemper, a guazzo or a colla: the lights are relieved in white, gold, and silver. The design is in both cases previously put in in fine outline. In Champollion's *Paléographie Universelle* one of the illustrations of a Dante in the Vatican is given as Clovio's; it is extremely highly finished. This painter, according to Vasari, spent nine years in painting the twenty-six miniatures in a breviary of the Virgin (Uffizio della Madonna), executed for the Cardinal Alessandro Farnese, now in the Royal Library at Naples. The works of Clovio, however, are not superior, and in some respects are not even equal to those of his predecessor Memling, which are more masculine in their execution.

The illuminations of Memling and his scholars are in the opinion of Schorn the finest paintings of their class extant: they have all the excellences of his oil paintings; they are painted in body colours, are quite free from the dark outlines of the Greek and Italian MSS., and have no gold but what is put on with the pencil. The most remarkable work of this class by Memling, in which he was assisted by Gerhard of Ghent and Livin of Antwerp, is the celebrated missal of Cardinal Grimani in the Library of St. Mark at Venice (it is described in the Kunstblatt of 1823); Memling died considerably advanced in age in the beginning of the sixteenth century. [MEMLING, P. C. S.] There were also several good miniatori or miniature painters of earlier centuries, who can be mentioned by name. Oderigi of Gubbio, and his pupil Franco Bolognese, who are noticed by Dante, are two of the earliest:—

> Oh, diss' io lui, non se' tu Oderisi,
> L' onor d' Agobbio e l' onor di quell' arte
> Ch' *alluminare* è chiamata in Parisi?
> Frate, diss' egli, più ridon le carte
> Che pennelleggia Franco Bolognese:
> L' onore è tutto or suo, e mio in parte.
> *Purgatorio*, Canto xi.

Oderigi died about 1300, Franco was still living in 1313. Simone Memmi, the painter of Laura, and the friend of Petrarch, was likewise an illuminator of MSS. There is a MS of Virgil with the Commentary of Servius in the Ambrosian Library at Milan, preceded by a miniature of the poet writing with various illustrative accessories, and it is inscribed with the following couplet:—

> Mantua Virgilium qui talia carmina finxit,
> Sena tulit Simonem digito qui talia pinxit.

Memmi died at Avignon in 1342. [MEMMI, SIMONE, P. C. S.] In the fourteenth century Don Lorenzo and Don Silvestro, already mentioned, Florentine monks, were also celebrated illuminators. Some of the choral books of Don Silvestro still exist, and are among the best in Italy. Don Bartolomeo and Gherardo, of Florence, already mentioned, died at about the close of the fifteenth century. Francisco Squarcione, also of Padua, and his school, were celebrated illuminators. Attavante, their contemporary, is the illuminator of some of the most valuable MSS., in respect of their illuminations, now extant. Vasari attributes to him the MS. of Silius Italicus in the library of St. Mark at Venice, but this is disputed by Morelli and others, who are of opinion that its illuminations are superior to other known works by Attavante. It contains many historical figures and a variety of friezes ornamented with birds and children: among the historical figures or portraits are—Silius Italicus himself, Scipio Africanus, Hannibal, Hanno, Hasdrubal, Caelius, Massinissa, L. Salinator, Nero, Sempronius, M. Marcellus, Q. Fabius, the younger Scipio Africanus, Vibius, Mars, Neptune, &c., and Pope Nicholas V. In the library of St. Mark also is a MS. of Marcianus Capella, with illuminations by Attavante; it is signed 'Attavantes Florentinus pinxit.' Tiraboschi praises some illuminations by Attavante in the Este Library, in some MSS. belonging formerly to Matthias Corvinus. In the royal library at Brussels there is a magnificent missal which Attavante illuminated for this king: it is a large folio parchment volume, every page of which is nobly ornamented with arabesques, flowers, and figures. The miniatures of the two first pages and those at the beginning of the canon mass are the most highly praised and are said to be of extraordinary beauty: on the first page is written—'Actavantes de Actavantibus de Florentia hoc opus illuminavit, A. D. MCCCCLXXXV.' and on another is written—'Actum Florentia, A.D. MCCCCLXXXVII.' The Hungarian arms are often repeated, but those of Austria and Spain have been since glued over them: there are gold medallion portraits of Corvinus and his queen Beatrice of Aragon towards the end of the volume. The former regents of Belgium used to take their official oath upon this volume; the first to do so were the archduke Albert and Isabella in 1599; and the prince of Saxen-Teschen, in the name of Joseph II., was the last, in 1781. It was probably brought to Brussels by Maria, sister of Charles V.; she obtained the government of the Netherlands after the death of her husband Ludwig II. of Hungary. It is described by Chevalier in the *Mémoires de l'Académie Royale de Bruxelles*, vol. iv.

Cosimo Tura, or Cosmè da Ferrara, was also a celebrated *miniatore* of this century, but he was not equal to the Florentines. Liberale da Verona and Girolamo da' Libri were, after Clovio, the most eminent *miniatori* in Italy of the sixteenth century.

There was an antient geographer of the name of Agathodaemon, who delineated and illuminated some maps for manuscripts of the Geography of Ptolemy. There is a MS. with these coloured maps at Vienna, and another at Venice. Agathodaemon's time is not known. (Heeren, *Commentatio de Fontibus Geograph. Ptolemaei*, &c.)

The ornamental and initial letter decorations of MSS. are almost infinite, and but very few of the names of these decorators have been preserved. Some of the arabesque and floral decorations are extremely elaborate and beautiful, and there are also many classes of initial letters which display extraordinary ingenuity, skill, and patience. There are many specimens of initial letters in Shaw's *Ornaments*, &c.; Sir F. Madden, keeper of MSS. in the British Museum, in his *Introduction* to that work, enters at some length into a review of the various kinds of letters which prevailed in various times and various countries, and from this the substance of the following remarks is taken. The red ink or minium, cinnabar, was long used very sparingly by the Greeks of the lower empire; it was the sacred *ἔγκαυστον*, and was at one time used only by the emperor or for his name to imperial rescripts, as confirmed by Leo, A.D. 470. This continued until the 13th century. The custom was imitated in the West by Charles the Bald in the ninth century, but was not continued by his successors. Gold and silver letters were common in the earlier centuries, sometimes written on vellum of a purple or rose colour. Julius Capitolinus, in his Life (c. 4) of the Emperor Maximinus the younger, mentions a present to the emperor from his mother, of the poems of Homer written on purple vellum in gold letters; this was at the beginning of the third century. By the end of the fourth century such MSS. of devotional books became common, but in other classes of literature they were still rare. The Codex Argenteus of Ulphilas, in gold and silver letters on purple vellum, of the year 360, is the most antient specimen extant of this magnificent description of calligraphy: other early specimens are the book of Genesis in the library at Vienna; the Psalter of St. Germain des Près; and the fragment of the New Testament in the Cottonian Library in the British Museum (Titus, c. xv.); all of the fifth and sixth centuries. Eddius, the biographer of Wilfrid, archbishop of York, mentions a copy of the Gospels of this description, which that prelate presented to his church: this was in the seventh century. In later times only parts of MSS. were thus richly executed, as the titles. In some Greek MSS. the vellum was burnished with gold on both sides where it was to be written upon, and was then richly ornamented with coloured arabesques or borders: there is such a MS. in the British Museum: see Shaw's *Illuminated Ornaments*, &c., pl. 1-4.

The more beautiful MSS. of the eighth, ninth, and tenth centuries are executed in the gold letter on white vellum. The Harleian copy of the Gospels, No. 2788, and the Bible and Hours of Charles the Bald, at Paris, are among the finest examples of this kind of writing extant. (There are specimens of all the above kinds of MSS. in Silvestre's *Paléographie Universelle.*) The Charter of King Edgar to the new minster, or Hyde Abbey, at Winchester, in the year 966 (*MSS. Cott.*, Vesp. a. viii.), is the only remarkable instance that occurs of gold writing in England: prefixed is a portrait of Edgar between the Virgin and St. Peter. This MS. is much damaged, and the ink has fallen off in many places. In the fourteenth century gold and silver writing became again comparatively common. When MSS. were written altogether in capitals, the initials were in general not larger than the other letters. The large illuminated initials are said to have commenced first among the Greeks about the close of the seventh century. In subsequent centuries large initials were usual, and they gradually became more complicated and elaborate down to the twelfth century, when they attained such a degree of size, ornament, and intricacy, that they have not in these respects been surpassed. These letters are ornamented with all kinds of fanciful figures, composed of men, animals, birds, fish, and flowers. Montfaucon, in his 'Palaeographia,' gives a complete alphabet from MSS. of the ninth and tenth centuries, of what the Benedictines call, from their illustration of the text, *Lettres Historiées;* they occur most frequently in Visi-gothic and Franco-gallic MSS. In this alphabet a T is represented by a fox on its hind legs holding a pole in its mouth horizontally, from the ends of which hang two cocks.

Charlemagne and his grandson Charles the Bald were great patrons of illuminations of MSS. Charlemagne's Bible in the church of St. Paul at Rome is considered by some the best example of ornamental calligraphy extant. There is another very inferiorly ornamented Bible, which is said to have belonged to Charlemagne, now in the British Museum, but which, according to Sir F. Madden, is of the time of Charles the Bald. It is described by Sir F. Madden in the *Gentleman's Magazine* for 1836; see also *Penny Magazine*, vol. viii., p. 52, 1839. It was purchased of M. de Speyer-Passavant, who had spent several years in vain in trying to dispose of it for a large amount, for the comparatively small sum of 750*l.*: he asked the trustees of the Museum originally 12,000*l.* The twelfth century is remarkable, says Sir F. Madden, for profusion of ornament and a graceful but intricate mode of illuminating capital letters, which renders it more easy to recognise MSS. of this period than any other. See specimens in Shaw's *Illuminated Ornaments*, &c., pl. ix.—xvii., where there are many varieties of initial letters. The prevailing colours are red, blue, and green, with gold and silver. In the following century red, blue, and white were most frequently used, and the letters of this time have a very inferior effect: they are mostly German and French. Illuminators were very numerous in the thirteenth century. In the library of Sir Thomas Phillips, Bart., there is a MS. of this century, entitled 'Mappae Clavicula,' which is a manual for illuminators. In French and English MSS. of the fourteenth century, initials in purple, red, and gold are very frequent, which contain figures of men and animals, and terminate in spiral scrolls, which extend along the upper and lower margins of the page, and support small groups or single figures of dogs, hares, apes, &c. much resembling the decorative etchings and woodcuts which have recently appeared in Germany, and also occasionally in England. A Psalter of Lord Braybrooke has beautiful examples of this style of decoration (Shaw's *Illuminated Ornaments*, &c., pl. xxi., xxii.).

English illuminators were in no way behind their continental neighbours. Among the Saxons, at the close of the tenth century, says Sir F. Madden, a peculiar style of ornament prevailed, which, for boldness, correctness of design, and richness, is not surpassed by any works executed on the Continent at the same period. The Benedictional of St. Ethelwold, belonging to the Duke of Devonshire, written and illuminated between 963 and 970, is the most complete example of this art in England. It was executed by a monk of Hyde Abbey (then the most celebrated place in England for such works), named Godeman, for Ethelwold, bishop of Winchester. It is a folio of 119 leaves of vellum, measuring 11¼ inches in height by 8¼ in width, containing thirty large richly coloured drawings; and it is considered the most valuable MS. of the Cavendish collection. See Mr. Gage's 'Dissertation on the St. Ethelwold Benedictional,' in the 'Archaeologia' (vol. xxiv., p. 22), where all these illustrations are engraved. Another curious MS. of this time, now in the British Museum (Cott. MSS., Tib. b. v.), valuable for the pictures it presents of old English habits and costume, is a Saxon calendar, in which the account of each month is headed by a drawing illustrating the agricultural occupations of the respective months of the year. Julius A. vi. is a MS. of a similar class. Cott. MSS. Claudius B. iv. is also a remarkable MS. It contains the first six books of the Bible in Saxon and Latin, with notes by Bede and others, and many drawings illustrating the principal passages; it is of the eleventh century. No. 603 of the Harleian MSS. contains a long series of illustrations of Anglo-Saxon customs, in very curious designs in outline, executed in various coloured inks; and though the execution is ridiculous, the attitudes and proportions are in many of the figures very good. In the Cott. MSS. Cleopatra C. viii. of the same period there is a comparatively very superior drawing of a party at meat drinking together; the poses of the figures are excellent, and the heads and hands are perfectly intelligible and expressive: it is engraved in the *Penny Magazine*, vol. viii., p. 70, 1839, where there are also a few other cuts from some of these MSS. In the thirteenth and fourteenth centuries Saxon MSS. are comparatively rare: the majority of the MSS. of this period are French.

There is a Psalter in the British Museum, supposed to be of English origin, of the latter part of the thirteenth century, or more probably of the early part of the fourteenth (Reg. 2, b. vii.), in which the drawing of the period is much better represented than in MSS. generally: some of the illuminations are in this respect fair specimens of the design of the Italian frescoes of the fourteenth century, but it is very rarely that the illuminations of MSS. at all correspond in design with the highest state of the arts of their time. It is an octavo volume, containing 320 leaves of vellum; on the first sixty-five are illustrations from the Old Testament, in transparent water-colours, in the usual style of such decorations, the designs being drawn in black outline, and the colours lightly washed in. These are followed by drawings of saints in body-colours, which are likewise prepared in black outlines; but in these body-colour drawings the outline is frequently painted over: then follows a Calendar. The greater part of the volume however is taken up by a Psalter, which is profusely ornamented with designs, many illustrating the history and habits of the time. This book was presented to Queen Mary in 1553, by its then possessor, Baldwin Smith. There are some French MSS. of the same period in which the illustrations are equally good, as the 'Life of St. Grael' and 'Les Gestes des Roys de France,' both folio volumes, with numerous illustrations. On the last page of the second is written 'C'est livre est a moy Homfrey Duc de Gloucestre du don des executeurs de Sr. de Fauchere.' There is also a French MS., called the Metrical History of the Life of Richard II., preserved in the British Museum, with many interesting illustrations. It is translated in the 'Archæologia,' vol. xx., by the Rev. John Webb. There are three cuts from these MSS. in the volume of the 'Penny Magazine' already quoted.

One of the most interesting French MSS. of the fifteenth century is the celebrated Bedford Missal, executed for John Duke of Bedford and regent of France, in the reign of Henry VI., now in the possession of Sir John Tobin at Liverpool. It is 11 inches high and 7½ wide, and contains 59 illustrations nearly of the size of the page, and about 1000 very small illustrations, with borders and foliage, &c.: there is a copy of it in the British Museum. In this MS. is the only known portrait of the Duke of Bedford: the portrait of the duke, engraved by Vertue for the translation of Rapin's 'History of England,' was taken from the illustration, in which the duke, in a crimson robe embroidered with gold, is represented kneeling before St. George, who is dressed in a suit of armour, over which is the mantle of the Order of the Garter; behind the saint is his armour-bearer. This MS. was presented by the Duke of Bedford to Henry VI., at his coronation in France: after passing into various hands, it was several times sold by public auction, and was last bought by Sir John Tobin in 1833 for 1100*l.*

There are also in the British Museum many illuminated French romances of the fifteenth century, which are particularly interesting as regards costume. Among the most attractive of these are the celebrated 'Romance of the Rose' (Harl. MSS. 4425), the collection presented by Talbot Earl of Shrewsbury to Margaret of Anjou (Royal MSS., 15 E. vi.), and the poems of Christine of Pisa (Harl. 4431), while the feats of arms and chivalry, by the same authoress, 'Livre des

Fais d'Armes et de Chevalerie,' written in French in London in 1434 (Harl. MSS. 4605), is so inferior in its illustrations, that it presents a great contrast between the states of the art of illuminating in the two countries at this time. The 'Romant de la Rose' is rich in beautiful miniatures; it is supposed to have been executed towards the close of the fifteenth century; it is a folio volume, measuring 15½ inches high by 11½ wide, and contains 183 leaves of vellum, written in double columns, the initial letter of every paragraph being illuminated. This French poem is of the thirteenth century; it is a dream, and was commenced by William de Lorris and finished by John de Meun, and is divided into 100 chapters, and contains 22,000 verses. It has been several times printed, and last at Paris in 1814, in 4 vols. 8vo. The British Museum MS. is considered the most beautiful of the poem extant; the illustrations are probably Flemish. (Dibdin, *Bibliographical Decameron.*)

The Anglo-Saxons were for many centuries among the best illuminators, and the Irish also obtained great celebrity in this art at an early period. This British or Hiberno-Saxon school of illumination shows a distinct character, as seen from the so-called 'Durham book, or St. Cuthbert's Gospel,' of the beginning of the eighth century, now in the British Museum. The initials, observes Sir F. Madden, are characterised by an extreme intricacy of pattern, interlacing of knots, in a diagonal or square form, sometimes interwoven with animals, and terminating in heads of serpents or birds, to which may be added the use of red dotted lines round the edge of the larger letters. The Lombardic and Visi-Gothic letters are tessellated and embroidered. There are no British illuminations later than the reign of Henry VII., and at this time they were much degenerated.

After the establishment of printing and consequent multiplication of books, MSS. became gradually more rare, though they were still occasionally executed as articles of luxury even as late as the eighteenth century; but their immense price, compared with that of printed books, must naturally have so limited the demand, that they can only have been required as works of art and curiosities in calligraphy, not as books. The writing of many MSS. is so beautifully executed, that probably no moveable type has ever equalled the manuscript characters in beauty, and they have perhaps not even been surpassed in equality of execution and finish. See the fac-similes in Sylvestre's *Paléographie Universelle.* Perhaps the latest, says Sir F. Madden, or one of the latest illuminated missals, is the immense folio in the library of Rouen, which is nearly three feet high, and cost the monk of St. Andoen, who illuminated it, thirty years of labour: it was completed in 1682.

PALÆOZA'MIA, a genus of fossil Cycadeous plants, from the oolitic and lias deposits of Yorkshire, Dorsetshire, and Oxfordshire.

PALANQUIN (sometimes written *Palankeen*, *Palanquen*, and *Palkee*), a kind of covered litter carried, by means of poles, upon the shoulders of men, which forms the principal vehicle for personal transport in Hindustan. A very minute description of an ordinary palanquin, together with an amusing account of a *dâk* or *dawk* journey, which is the name given to the mode of travelling long distances by the palanquin, is given in Captain Basil Hall's 'Fragments of Voyages and Travels,' third series, vol. ii., chap. vi., where the palanquin is described as about six feet long by two and a half feet wide, and provided with conveniences which enable it to serve at night-time for a bed, and in the day-time for a parlour. In the front part is usually a broad shelf, with a drawer underneath, and a net stretched above it; and in the hinder part is often a shelf for books, a net for fruit and other loose articles, and hooks for hats, towels, &c. In each side of the palanquin are two doors, or sliding partitions, with Venetian blinds in the upper pannel, and in each end are two small windows. As, owing to the heat of the country, travelling is performed much by night, palanquins are often furnished with a lamp at one corner, so fixed as to throw its light into the interior, but to be trimmed from outside. The bottom, or seat, is made of strips of rattan, like that of a cane-bottomed chair, and is covered with a light elastic mattress stuffed with horse-hair or shavings produced in dressing the bamboo and rattan. Across the palanquin, at about eighteen inches from the hinder end, is hung a flat square cushion for the traveller's back to rest against when sitting up, and towards the other end is a moveable bar against which the feet may be planted as against the stretchers in a boat, which may be shifted nearer to or farther from the end of the palanquin, according to the length of the traveller's legs or his choice of position. In the space behind the back-cushion the bed-clothes and pillow are stowed away during the day; and the shelves, drawers, and nets afford facilities for the conveyance of teapots, canisters, shaving apparatus, scientific instruments, sketching materials, and a sufficient supply of clothing to prevent inconvenience if the traveller be separated for a time from his heavy baggage. Flat articles may be laid beneath the mattress, and bottles and glasses carried in sockets attached to the corners of the palanquin. A cover of waxed cloth is affixed to the top in such a way that it may be rolled up when not wanted, and let down so as completely to envelop the palanquin, in rainy weather or when the night air is cold. A pole is attached to each end of the palanquin, near the top, to carry it by; and to the foremost of these poles is suspended a rattan basket containing a water pitcher, or *goglet*, of porous earthenware; and as the water which exudes through the pores of the goglet is rapidly evaporated by the current of air, its contents are always kept cool in the hottest weather. The action of this apparatus is identical with that of the *alcarrazas* of Spain, described under COOLER, P. C., p. 495. On the hinder pole are carried, in like manner, a kettle, coffee-pot, and wooden wash-hand-basin. As the poles, which rest upon the shoulders of the bearers, are not elastic like those of a sedan-chair, Captain Hall states that a palanquin has not the same unpleasant motion as that vehicle; and Bishop Heber also, who gives an account of dâk travelling in the 'Narrative of a Journey through the Upper Provinces of India,' published after his death, observes that 'the motion is neither violent nor unpleasant,' but that, being incessant, it is impossible to draw in a palanquin, and not very convenient to read, excepting a large print. In the first edition of this work there is also a good representation of dâk travelling. Only four bearers can, in an ordinary palanquin, place their shoulders beneath the poles, two at each end; but in passing over difficult ground two others will occasionally bear part of the weight by thrusting a bamboo under the body of the palanquin. In most cases the bearers follow one another in a straight line; but in some districts it is the custom to proceed obliquely, in which case the sideways motion is said to be exceedingly unpleasant to the traveller. While walking or running with their load, the bearers, who form a peculiar caste among the Hindus, keep up an incessant noise, sometimes like grunting or groaning, and sometimes approaching the character of a song, or of wild vociferation. Captain Hall has some curious remarks on this subject.

In the 'Pictorial Bible,' in illustration of a note on Solomon's Song, iii. 9, are representations of the J'Halledar, or state palanquin of Hindustan, and also of a similar vehicle used by the antient Egyptians; and some further information on conveyances of this character is given in the article 'Litter' in Dr. Kitto's 'Cyclopædia of Biblical Literature.'

PALECHI'NUS, a genus of fossil Echinodermata, from the mountain-limestone of Ireland. (Scouler.)

PALESTRI'NA, GIOVANNI PIERLUIGI, DA, a composer of the greatest renown in the annals of music, was born at Palestrina, near Rome—the antient Præneste—in the year 1524, a date which, though with some hesitation for want of distinct evidence, has been fixed by the Abbé Baini, who devoted thirty years to collecting materials for the Life of Palestrina. Of his family nothing is known, except that his parents were mean in rank, and in circumstances corresponding to their station. The name of the master who is entitled to the credit of having instructed him in an art in which he became so famous was involved in some doubt, but after diligent research the honour seems to have been justly awarded to Claude Goudimel, a native of Besançon, a disciple of the Franco-Belgic school, a Huguenot, and one of the victims of religious bigotry in the massacre of 1572, the Catholics on St. Bartholomew's day having thus resented his heresy in setting to music Clement Marot's and Theodore Beza's metrical version of the Psalms.

Palestrina was appointed Master of the Chapel to Pope Julius III. in 1551, to whom in 1554 he dedicated his first work, consisting of four masses for four voices. Julius, to reward the composer, placed him among the singers of the Pontifical Chapel, who were well paid for their services. The college of chaplain-singers remonstrated, and pleaded the law that no new member could be associated with them unless elected by a majority of themselves. But in vain. The mandate of the infallible tiara was obeyed, though not without a kind of protest. In 1555, however, Cardinal Caraffa succeeded to the papal throne, under the title of Paul IV., who, finding that Palestrina had quitted a state of celibacy, which all the higher appointments in the apostolic chapel enjoined, abruptly dismissed him, and for some time he felt severely his straitened circumstances; then gladly accepted the place of Maestro di Capella of St. John in the Lateran, which he exchanged in 1561 for a more lucrative situation at Santa Maria Maggiore; and in 1571 was restored to his post in the Vatican. Up to the year 1560 he composed many works for the church, among which Baini especially mentions those *Improperij*, 'so remarkable for depth of science and perfect adaptation of music to the sense of the words.' 'To hear them as executed on Good Friday in the Sistine Chapel,' says the abbé, 'the mind is subdued by emotions of tenderness and awe.' But, judging from the *Improperia* published by Dr. Burney, in his collection of music performed in the Capella Pontificia, it seems to us that these much-extolled compositions, consisting of the simplest counterpoint, must owe their effect to place and high-wrought feelings.

During the above period, however, the Council of Trent, among other matters, took the state of ecclesiastical music into serious consideration, and appointed two cardinals whom they charged with its reform, who called to assist them a committee of eight selected from the college of chaplain singers. Much discussion arose out of the case. The cardinals reasonably demanded the abolition of all the secular tunes which had been recklessly foisted into the sacred service, many of them vulgar, some obscene, and required more simplicity in the music. The singers irrationally defended the melodies, and contended for the florid and elaborate. At length it was agreed that Palestrina should write a mass on the principle laid down by their Eminences, and on his success depended the fate, at that time, of music in the Catholic church. In consequence of this determination he produced three masses for six voices. The two first were rather coldly approved, but the third was considered as the perfection of art, and the singers, on whom a ray of common sense had now fallen, could not restrain their expressions of admiration even during its performance. This is known under the title of 'the Mass of Pope Marcellus.' He applied all his powers on the work, and wrought himself up to the most enthusiastic pitch. On his manuscript were found the words 'Domine, illumina oculos meos.' The pope, 'before whom this mass was performed, was enraptured, and compared it to the heavenly melodies which the apostle John heard in his ecstatic trance.' 'By this one great example the question was now for ever set at rest,' says Ranke (in his 'History of the Popes,' acknowledging Baini as his authority); 'a path was opened, in following which the most beautiful, the most touching works, even to those who are not of the church, were produced. ...... This art, which had been perhaps more completely alienated from the spirit and service of the church than any other, now became the most closely connected with it. Nothing could be more important to Catholicism....... Spiritual sentimentality and rapture were the favourite themes of poetry and painting. Music, which speaks a language more direct, more impressive, more adapted to ideal expression than any other art, became the interpreter of these emotions, and thus subjugated all minds to her empire.' (Mrs. Austin's translation of *Ranke*, vol. i.) We here again find the warm expressions of an enthusiast, no doubt; but it must be borne in mind that the writer heard these compositions performed under peculiar circumstances of a very influencing nature—under the roof of the grandest temple in the world, with every advantage that the finest execution, a solemnity unequalled for imposing effect, and the most exciting religious associations could bestow.

On the restoration of Palestrina to his office, his fame spread widely. Cardinal Pacecco announced to him that Philip III. of Spain would receive with satisfaction any work from the composer that he might dedicate to him. To his other appointments was now added that of *Maestro* to the congregation of the Oratory. He also undertook the direction of the school established by Gio. Maria Zannini. Soon after this he was charged by Pope Gregory XIII. with the task of reviving the Roman Gradual and Antiphoner, which, however, he did not live to complete—a duty performed by his son, an only surviving child. Rather late in life his pecuniary circumstances must have been much improved, for on his death-bed, after blessing his son, he added, 'I leave many unpublished works, and thanks to the Abbé de Baume, the Cardinal Aldohrandini, and the Grand Duke of Tuscany, I leave you also the means of publishing them.' In January, 1594, it became evident that his life was rapidly drawing to a close; and on the 2nd of the following month, after receiving the last rites of the church from the hands of his friend (the future Saint) Filippo di Neri, he expired. Of his funeral, Torrigio (*Grotte Vaticano*, ii. 166) says, 'In St. Peter's church, near the altar of St. Simon and St. Jude, was interred, in consequence of his extraordinary abilities, Pierluigi da Palestrina, the great musical composer, and *Maestro di Capella* of this church. His funeral was attended by all the musicians of Rome, and "*Libera me, Domine*," as composed by himself, was sung by five choirs. On his coffin was this inscription:—"Johannes Petrus Aloysius Prænestinus, Musicæ Princeps."'

Palestrina's music is learned and grave, and that written for the church—as well, indeed, as much that proceeded from the same school—when heard in the kind of place for which it is adapted, and attended by pomp and pageantry, is strongly felt by all, and acts with irresistible force on sensitive minds. But in the concert-room or chamber, his compositions, whether sacred or secular, have, with few exceptions, no charms for hearers who have not cultivated a taste for simple, solid, airless harmony, or for the intricacies of fugal points well woven with a skill that owed more to study than genius. His works are exceedingly numerous, chiefly ecclesiastical; but including also many madrigals, now rarely performed, even in societies devoted to this species of music. Clever as these are, their dryness is undeniable, and they are praised by many who derive no pleasure from their performance. Three of his motets are in use in our cathedrals, adapted by the learned and all-accomplished Dean Aldrich to the English version of the 44th, 63rd, and 115th Psalms. Of these the first, 'We have heard with our ears,' and third, 'Not unto us,' are printed in Dr. Arnold's *Collection of Cathedral Music:* the second appears in its original state in Hawkins's History, iii. 175. Of his madrigals but one is found in Yonge's *Musica Transalpina* (1588), a work containing twenty madrigals by Italian masters; and this is the only composition of Palestrina noticed in *La Musa Madrigalesca* (1837); an elegant, interesting volume, comprising the words of 395 compositions, chiefly madrigals, 'of the Elizabethan age,' together with many translations from the Italian, and much curious matter. The Padre Martini, in his *Saggio di Contrappunto*, has given two madrigals, and several extracts, from the works of this celebrated master, all of them evincing his deep knowledge of the art, as understood and practised in his time, but all exclusively confined to that style now distinguished by his cognomen—by the term *alla Palestrina*.

(Baini, *Vita di G. P. da Palestrina;* Burney, iii. 188; *Harmonicon*, x. 71.)

PALI. [SANSCRIT LANGUAGE AND LITERATURE, P. C.]

PALICOU'REA, a genus of plants belonging to the natural order Cinchonaceæ. The limb of the calyx is 5-toothed or 5 lobed, or nearly entire; the corolla tubular and cylindrical, and a little gibbous at the base or curved, 5-cleft, bearded beneath the middle inside. The teeth of the calyx and corolla sometimes rather unequal. The species are American shrubs wholly destitute of pubescence. The leaves often whorled and of considerable size. The flowers are yellow or white in terminal sessile or stalked panicles, thyrses, or cymes.

P. Marcgraavii is a shrub from 5 to 6 feet high, and has smooth quadrangular branches. The leaves are short-stalked, oblong, acuminate, obtuse at the base, smooth; the stipules interpetiolar and trifid. The calyx is 5-toothed and downy; the corolla from 5 to 7 lines long, slightly curved, gibbous at the base, roughly downy yellow-coloured below, purplish above, closely bearded with hairs inside. Sometimes the leaves are downy beneath. It is a poisonous plant, used in Brazil to kill rats and mice. Very little is known of its real properties.

P. crocea has a smooth stem, ovate or oval lanceolate leaves. The stipules are connected by a short ligula, two on each side, linear, acuminate, twice as short as the petiole. The panicle is corymbose, terminal, and saffron-coloured. The corolla is obconical and tubular, the anthers projecting from the tube shorter than the limb. The berry somewhat double. It is a native of Porto Rico, Trinidad, Cuba, and Guadaloupe. According to Von Martius this species is emetic.

P. speciosa has smooth round branches, oblong acuminate leaves acute at the base, membranous, roughish, shining, with smooth stipules. The panicles are stalked, their angular branches and corollas hairy and downy. The leaves have by their yellow colour obtained for the plant the name of Gold-shrub, highly spoken of in Brazil as an antisyphilitic. 'The decoction, which in large doses forms a real poison, acts especially by an increased action of the skin and kidneys, and the digestion is not injured by moderate doses.' (Martius.)

P. officinalis is a shrub clothed with harsh yellow down in every part. The leaves are narrow, elliptical, short-stalked, acute, or rounded at the apex with a mucrone tapering a little at the base. The corymbs are contracted into a panicle. It is native of Brazil, and is reported to be a powerful diuretic, and is used both in human and veterinary medicine.

Other species of this genus are said to have qualities similar to the last. *P. diuretica*, *P. strepens*, *P. sonans*, and *P. longifolia* are amongst those reported to possess medicinal virtues. *P. tinctoria* forms a fine red dye much valued in Peru. There are fifty-five species enumerated, all of which are of easy culture and propagation. They grow best in a mixture of loam, peat, and sand, and will strike root readily under a handglass.

(Don, *Gardener's Dictionary;* Lindley, *Flora Medica;* Burnett, *Elements of Botany.*)

PALIU'RUS (the Greek παλίουρος, and Latin *paliurus*), a genus of plants belonging to the natural order Rhamnaceæ. It has a spreading 5-cleft calyx, 5 obovate convolute petals, 5 protruding stamens, ovate 2-celled anthers, and a flat pentagonal disk. The fruit is dry and indehiscent, expanding into a membrane round the disk, containing a 3-celled nut. The species are shrubs or trees, with alternate simple leaves.

P. aculeatus, Christ's Thorn, is a very common plant in Palestine, and on the borders of the Mediterranean Sea. It has pubescent bractless ovate serrulated leaves, quite smooth, 3-nerved, and with 2 spines at their base—one erect, the other hooked. The flowers are of a greenish-yellow colour. The fruit has a very singular appearance, resembling a head with a broad-brimmed hat on; the French call the tree 'Porte Chapeau.' In the districts where it grows there is a tradition that this is the plant from which the crown of thorns was made which was placed on the head of our Saviour. Hasselquist however is of opinion that it was rather the *Zizyphus spina Christi*. This species of *Paliurus* is one of the most common thorns in the hedges of Asia, and its flexible spiny branches form an impassable kind of fence. The seeds are sold in the herb-shops of Constantinople, and the native doctors prescribe them in many complaints under the name of 'Xalle.' They are also used as a dye. There are two or three other species of this genus, which are handsome shrubs, and well fitted for shrubberies. They will grow in any common soil, and may be propagated either by layers, cuttings, or seed.

(Don, *Gardener's Dictionary;* Burnett, *Outlines of Botany.*)

PALLA'DIUS, a Roman writer on agriculture, whose complete name is Palladius Rutilius Taurus Æmilianus. The place of his birth and his period are uncertain, but it is probable that he lived about the time of Valentinian and Theodosius. He is author of an extant work entitled 'De Re Rustica' in fourteen books. The first book contains general rules about agriculture; the twelve following books are respectively devoted to the agricultural labours of each month; the fourteenth book is in elegiac verse and treats of grafting trees. The work of Palladius appears to be mainly a compilation from previous writers, such as Columella and Martialis Gargilius, whose work on agriculture and garden cultivation is lost. The style is inferior to that of Columella, and indicates a late period. The work of Palladius, probably owing in some degree to the convenience of the division, was much used in the middle ages, and the 'Speculum' of Vincent of Beauvais has borrowed much from it.

Palladius and the other Roman writers on Agriculture are contained in the edition of the 'Scriptores Rei Rusticae' by J. M. Gesner, Leipzig, 1735, and in the improved edition of the same work by Ernesti, 1773. The latest edition and the best is by J. G. Schneider, Leipzig, 1794-7, 4 vols. 8vo.

(Bähr, *Geschichte der Römischen Literatur.*)

PALMA, one of the Canaries, is situated between 28° 29′ and 28° 53′ N. lat., and between 18° 24′ and 18° 43′ W. long. From north to south it extends about 26 miles, and from east to west about 16 miles in the widest part. The average width is about 14 miles. This gives a surface of 364 square miles. Humboldt assigns to it 324 square miles.

The island is one mass of volcanic rocks. The shores are rocky and steep, and generally rise to a considerable elevation from the shore; the country rises in terraces towards the interior, where it attains a great height. Nearly in the middle of the northern portion of the island is an immense crater, the Caldera de Tahuriente, which is seven miles in diameter; the bottom of it is 2406 feet above the sea-level. It is surrounded by steep masses of rocks, which rise 4000 feet above its bottom. In its vicinity are the highest summits of the island, the Pico, the Muchachos, which attains 7712 feet, the Pico de Sta. Cruz, which is 7549 feet, and the Pico del Cedro, which rises to 7252 feet above the sea-level. Farther southward the mountains decrease in elevation. The Paso de Lavanda, situated nearly in the centre of the island, is 4536 feet above the sea. Towards the southern extremity the heights are much lower. These rocky masses are split by deep ravines, called barancas, whose bottoms are frequently 500 feet below the adjacent masses, and the sides very steep. They are most frequent in the high mountains which surround the caldera, around which they are disposed like rays diverging towards the sea; but they have no communication with the crater, with the exception of the Baranca de Angustias, on the west side of the island, which originates in the crater itself, and extends south west to Tazacorte, and in which the only river runs which has water all the year round. It waters the Los Llanos, an uneven plain situated on that side of the island which is the best portion of the whole, and at present contains the only plantations of sugar-cane in the Canaries. The sides of the mountains are very steep, and covered with high forest-trees that yield several kinds of good timber. This is especially the case in the northern districts, where the soil retains the moisture, and in these parts springs are frequent and abundant all the year round. In the southern districts the soil consists partly of lava or of other dry volcanic matter, and there are no springs. The soil, where cultivable and cultivated, exhibits a great degree of fertility; but with the exception of the Llanos, the cultivated tracts occur only on the very shores of the sea, or at a few places on the lower terraces of the mountains.

The climate of Palma is superior to that of the other Canaries in its neighbourhood. This is partly attributed to the extent of the mountains, which for several months are covered with snow, and to the forests, which cover a large portion of its surface. The north-east trade-wind, which blows from spring to autumn with considerable force, diminishes the heat, which otherwise would be insupportable along the coast. The winter, except in the most elevated parts, is so mild that it is compared with the spring in southern Europe. Earthquakes are not rare, and two volcanic eruptions in the southern districts, in 1586 and in 1678, are recorded.

Palma resembles Teneriffe in its productions. Wheat, barley, rye, and potatoes are cultivated to some extent, and also a small quantity of Indian corn, but the crops are far from being sufficient for the consumption. The deficiency is made up by the root of a kind of fern, called *helecho* (*Pteris aquilina*), which grows wild on the small hills in the caldera. It is mixed with flour, or even used alone for making bread, which is as black as rye bread, and is said by Von Buch to constitute the principal article of food for two-thirds of the inhabitants. The cane is still grown in the Llanos, but the cultivation is much diminished, and some years ago only 4000 arobas were annually produced, while at the Havanna one plantation produced 30,000 arobas. It appears that more silk is produced in Palma than on any other of the Canaries. The vineyards are extensive, but no wine is exported: the surplus is converted into brandy, which goes to the Spanish colonies in America. The fruit-trees which are found in the orchards are the same as those mentioned in TENERIFFE, P. C., vol. xxiv. p. 204. Few horses, mules, and asses are kept. Cattle are rather numerous, but neglected; sheep and goats are kept in great number, especially in the vicinity of the caldera. The number of hogs is small.

The population amounted in 1805 to 28,878 individuals, but MacGregor states it in 1830 to have increased to 33,000. The people are descendants of Spaniards, who settled there at the time of the conquest, and of a few Flemish families. The condition of the labouring classes is miserable. They live in straw huts, and subsist for two-thirds of the year on the black bread made of the helecho. But they are very industrious. In the Llanos there are 236 silk-looms, in which stuffs, stockings, and ribbons are made. They make also some coarse cotton and woollen cloth. In two or three places tiles and earthenware are made.

Palma is not visited by foreign vessels. Some vessels from Teneriffe and Lanzerote take away the produce of the island, consisting of sugar, almonds, fruits, deals and timber, pitch, charcoal, raw and manufactured silk, brandy, and orchilla. They import European goods, oil, grain and potatoes, salt-fish and salt.

Palma has several ports: Espindola, Santo Domingo, Tazarotc, Naos, and Santa Cruz. Only the last mentioned, which is on the eastern shores of the island, is visited hy vessels. Tho town of Santa Cruz de la Palma consists of two streets running parallel to the shores from north to sonth, and many isolated houses built on the steep declivities of the rucks. It contains one church and four convents, and a good hospital. The anchorage is good in from 10 to 15 fathoms of water. The population, including that of some hamlets in the neighbourhood, amounts to 6000 individuals.

It is uncertain when Palma was discovered. In tbe thirteenth century it appears to have been visited, like the other Canaries, by the Genoese. It was taken possession of by the Spaniards in 1492, under the command of Don Alonzo Fernandez de Lugo, and has since that time remained in their possession.

(Von Buch's *Physikalische Beschreibung der Canarischen Inseln*, and Mac Gregor's *Canarische Inseln nach ihrem gegenwärtigen Zustande.*)

PALMA'CEÆ. [PALMS, P. C.]

PALMACI'TES, a genus of fossil plants, from the coal formation. (Sternberg.)

PALMARO'LI, PIETRO, a painter and celebrated picture restorer, who was the first to transfer frescoes from the wall to canvas. The first work so transferred was the Descent from the Cross by Daniele da Volterra, in the church of Trinità do' Monti, in 1811: It is still in this church, but not in the chapel in which it was originally painted. The successful transfer of this picture caused a great sensation at Rome and in other parts of Italy, where such transfers were and still are repeatedly practised with success: the process is described in the article FRESCO, P. C. S. Palmaroli transferred and restored many celebrated works in Rome and in Dresden, and among those in tho latter city the celebrated Madonna di San Sisto by Raphael was restored by him. Palmaroli has done great service as a restorer: he freed in 1816 the celebrated fresco of the Sibyls, painted by Raphael for Agostino Chigi in the church of Santa Maria della Pace, from the destructive *restorations* in oil which were made by order of Alexander VII. Although some restorations were necessary and are evident in tbis work, the lovers of art are bighly indebted to Palmareli; for, before his undertaking, this celebrated fresco was a subject of general disappointment to the admirers of Raphael, and was indeed so dark that the objects were scarcely distinguishable. He died at Rome in 1828.

(Platner, *Beschreibung der Stadt Rom*, vol. iii. pt. 3, p. 385; *Kunstblatt*, 1837; Nagler, *Neues Allgemeines Künstler Lexicon.*)

PANAX (intended to be formed from πᾶν, all, and ἄκος, a remedy), a genus of plants belonging to the natural order Araliaceæ. The flowers are polygamous, the calyx obsolete and 5-toothed. It has 5 petals, 5 stamens inserted with the petals under the edge of the disk, and alternate with them. The fruit is succulent, compressed, orbicular, from 2 to 3 celled; the cells leathery and one-seeded. Tbe species are herbs and shrubs and trees, having the leaves and inflorescence variable.

P. quinquefolium, Five-leaved Panax, or Ginseng, has a fusiform root more or less branched, of a whitish colour, and terminating in fibres. The stem is smooth, round, and green, often with a tinge of red, divided at the top into three petioles with a flower-stalk in their centre. The petioles are round, smooth, and swelling at their base. The leaves ternate, quinate, or septenate. The berries are kidney-shaped, of a bright red colour, and contain 2 semicircular seeds. The flowers are of a yellowish colour. It is a native of Chinese Tartary and North America. In China it has been considered an invaluable drug from time immemorial. In 1709 the Emperor of China commissioned 10,000 Tartars to go in quest of as much of this root as they could find; each one was to give two pounds of the best of it to the emperor, and to sell the rest for its own weight in fine silver. The roots enter into the composition of every Chinese medicine. It is reckoned a stimulant and restorative, and both rich and poor consider it a remedy for every disease. By Europeans and Americans, however, it is comparatively disregarded, and looked upon as a mere succulent, similar in its qualities to liquorice; hence the question arises, is the Chinese plant the same as the North American? For we cannot regard all that the Chinese say and practise as merely imaginary. The common namo of the plant, Gen-seng, Jinchen, or Nindsin, signifies 'wonder of the world,' or the 'dose for immortality;' and the Chinese firmly believe that its powers are almost miraculous. [GINSENG, P. C.]

P. fruticosum is also used in China and Cochin-China as a febrifuge, and as an astringent tonic. It has a shrubby unarmed stem, pinnately decompound leaves; petiolate oval oblong leaflets coarsely and dentately serrated, the ultimate ones deeply trifid, the panicle corymbose, with the branches umbelliferous at the apex. It is a native of the islands of Ternate, Java, and Amboyna.

Tbe hardy species of this genus grow best in peat, and are propagated by dividing at the root. The other species flourish in a mixture of loam and sand, and are propagated by cuttings, which should be planted in sand with a hand-glass over them.

(Don's *Gardener's Dictionary*; Lindley's *Flora Medica*; Burnett's *Outlines of Botany.*)

PANVI'NIO, ONU'FRIO, was born at Verona in 1529. He took at an early age the habit of the order of St. Augustin, and pursued his studies at Rome, whence he was called to Florence in 1554 to fill the chair of theology in that city; but soon afterwards, at his own request, was superseded in the office, and obtained leave from his superiors to visit the chief cities of Italy in order to collect inscriptions. At Venice he became acquainted with Sigonio, who had been appointed professor of belles lettres in that city in 1552, and who was not less enthusiastically attached than Panvinio himself to the study of antiquities. The acquaintance soon ripened into a lasting friendship. At Rome he was patronised by Cardinal Cervini, who in 1555 became Pope Marcellus II., and by him Panvinio was appointed to a situation in the library of the Vatican, with a salary of six gold ducats a month. The pope however died a short time after his election; and Panvinio was then patronised by Cardinal Farnese, who gave him apartments in his palace, admitted him to his table, and treated him in other respects with the greatest liberality. Having accompanied the Cardinal in a voyage to Sicily, he was taken ill at Palermo, and died there April 7, 1568, at the age of thirty-nine.

Panvinio was a man of great learning and indefatigable industry. Niceron, in his 'Mémoires,' mentions twenty-seven of bis works which had been printed; and Maffei, in bis 'Verona Illustrata,' gives a list of his manuscripts in different libraries of Italy and Germany. The most important of his works are the following, some of which were not printed till after his death :—'Epitome Pontificum Romanorum usque ad Paulum IV.,' Venice, fol., 1557; 'Viginti-septem Pontificum Romanorum Elogia et Imagines,' Rome, fol., 1568; 'Fasti et Triumphi Romanorum à Romulo usque ad Carolum V.,' Venice, 1557, of which Mader published another edition in 1662 at Helmstadt; 'In Fastos Consulares Appendix;' 'De Ludis Secularibus et Antiquis Romanorum Nominibus,' Heidelberg, fol., 1588; 'De Baptismate, Paschali Origine, et Ritu consecrandi Agnos Dei,' Rome, 4to., 1560; 'De Sybillis et Carminibus Sybillinis,' Venice, 8vo., 1567; 'De Triumpho Commentarius,' Venice, fol., 1573, and Helmstadt, 1676, 4to., by Mader; 'De Ritu sepeliendi Mortuos apud Veteres Christianos et eorum Cœmeteriis,' Louvain, 8vo., 1572; 'De Republica Romana Libri III.,' Venice, 8vo., 1581; 'De Bibliotheca Pontificis Vaticana,' Tarragona, 4to., 1587; 'De Ludis Circensibus Libri II., et de Triumphis Liber I.,' Venice, fol., 1600; 'Amplissimi Ornatissimique Triumphi, ex Antiquissimis Lapidum Nummorum Monumentis, &c. Descriptio,' Rome, fol., 1618; 'De Antiquitate et Viris Illustribus Veronæ Libri VIII.,' Padua, fol., 1648. The following treatises are contained in the great collection of Graevius, 'Thesaurus Antiquitatum Romanarum :'—'De Civitate Romana,' 'De Imperio Romano,' in vol. i.; 'De Antiquis Romanorum Nominibus,' in vol. ii.; 'Antiquæ Urbis Imago,' in vol. iii.; 'De Ludis Circensibus,' 'De Ludis Saecularibus,' and 'De Triumpho Commentarius, in vol. ix. His great treatise 'De Cærimoniis Curiæ Romanæ,' in 11 vols. folio, is in manuscript in the royal library at Munich.

(Weiss, in *Biographie Universelle*; Tiraboschi, *Storia della Letteratura Italiana*, vol. vii.)

PAPI'LIO, a genus of Lepidopterous insects, established by Linnæus, and divided by subsequent entomologists into many groups and genera. It includes that very natural and beautiful assemblage of insects popularly known as butterflies. The first section of *Lepidoptera*, named *Rhopalocera* (clubhorned) in the arrangement of Boisduval, and *Diurna* in that of Latreille, corresponds with the Linnæan genus *Papilio*. The insects composing it have mostly thin and elongated antennae, terminated by a club. They are all day-fliers. Their larvae, which are variously shaped, have six pectoral, eight abdominal, and two anal feet. The pupae are usually angulated and, with a few exceptions, naked. The perfect insect varies in size from less than an inch across the wings when expanded, to nearly a foot in breadth. Equally variable are their colouring and outlines. They are short-lived. Their powers of flight are very great, and the mode of flight varies in the several species. The males are usually more gaily coloured than the females.

The arrangement according to natural relations of the species of butterflies has been attempted by many naturalists. Even in the time of Linnæus the number and variety of known species was such as to render it necessary to subdivide his great genus *Papilio*. He constituted five principal groups. In the first of these, named *Equites*, he included such butterflies as have the fore wings longer from the posterior angle to the apex than to the base. In the second, the *Heliconii*, the wings are narrow, entire, and often almost naked. The *Danai* had also entire wings. The *Nymphales* have dentated wings; and the group of *Plebeii* was composed of small species, whose larvae are usually short and thick.

Dr. Horsfield has proposed an arrangement of these insects into five groups or stirpes, characterised by the peculiarities of the larvae. He names the first stirps, *Vermiform*, the second *Iuliform*, the third *Scolopendriform*, the fourth *Thysanouriform*, and the fifth *Anopluriform*.

Perhaps the most valuable arrangement of the diurnal *Lepidoptera* is that proposed by M. Boisduval, who divides them into three great sections and fifteen tribes, as follows, founding his classification upon the characters of the larva:—

Section 1. Succincti.

Chrysalis attached by the tail, and also girt.

A. Six feet in both sexes: caterpillars elongated.

Tribe 1. *Papilionides.*
2. *Pierides.*

B. Six feet in both sexes: caterpillars short.

Tribe 3. *Eumenides.*
4. *Lycenides.*

C. The males with four feet, the females with six. Caterpillars short.

Tribe 5. *Erycinides.*

D. Four feet in both sexes: caterpillars elongated.

Tribe 6. *Peridromides.*

Section 2. Suspensi.

Chrysalis suspended by the tail only.

A. Ungues of tarsi simple. Four feet in both sexes.

Tribe 7. *Danaides.*
8. *Helionides.*

B. Ungues of tarsi strongly bifid. Four feet in both sexes.

Tribe 9. *Nymphalides.*
10. *Brassolides.*
11. *Morphides.*
12. *Satyrides.*
13. *Biblides.*

C. The males with four feet, the females with six. Caterpillars elongated.

Tribe 14. *Libythides.*

Section 3. Involuti.

Chrysalis enclosed in a cocoon.

Tribe 15. *Hesperides.*

See Boisduval in the *Suites à Buffon* and his other works; Wood, *Index Entomologicus;* Horsfield, *Catalogue of Lepidoptera in the Museum of the East India Company;* and Westwood's *Modern Classification of Insects*, where an enumeration of the principal treatises on butterflies may be found.

PAPI'RIUS, SEXTUS or PUBLIUS, is the collector or supposed collector of the old Leges Curiatae, or as they are sometimes called, Leges Regiae, which were enacted at Rome during the kingly period. This Papirius is said to have been Pontifex Maximus and to have lived under the last Tarquin. The few and doubtful fragments of this supposed compilation are contained in Hoffmann, *Hist. Juris*, vol. ii. p. i. The collection is mentioned under the name of Jus Papirianum, not because he added anything of his own, but because he arranged the laws in due order (Pomponius, *Dig.* 1, tit 2, s. 2, § 2); and sometimes it is called Lex Papiria. (Servius ad Virg. *Aeneid*, xii. 836.)

PAPI'RIUS, JUSTUS, a Roman jurist, who compiled twenty books of Constitutions, according to the Florentine Index. There are sixteen excerpts from this work in the Digest. In one excerpt (Dig. 2, tit. 14, s. 59) Papirius mentions a rescript of the Emperor Antoninus, addressed to Avidius Cassius. The fact of the rescript being addressed to Cassius shows that Antoninus is the Emperor Marcus Antoninus. Accordingly Papirius was living under Marcus Antoninus; and he also survived him, as appears from his speaking of the Divi Fratres.

A jurist of the name of Papirius Fronto is cited by Callistratus. (Dig. 14, tit. 3, s. 4.)

PAPIST. [Roman Catholics, P. C. S.]

PAPAW. [Carica, P. C.]

PARADOXI'DES, a genus of Trilobites, from the Silurian strata. (Brongniart.)

PARAPET, in Fortification, is generally an embankment of earth which is formed either on the natural ground or on the upper surface of the rampart of a fortress or outwork. In the latter case the parapet rests on that part of the rampart which is nearest to the exterior of the work, the terreplein, or nearly level part on the interior side, being occupied by the artillery or left free for the movements of the defenders. Parapets of brick or stone are sometimes constructed for works which are masked by others in their front, or on heights, or on the sea-coasts; but in other circumstances they would be improper, because the splinters detached from such materials by the enemy's shot are dangerous to the defenders, whereas the shot sinks into earth without doing further mischief.

The height of a parapet above the ground, or above the terreplein of a rampart which it surmounts, is about 7½ feet, in order that it may effectually cover the defenders behind it. In its mass are cut the embrasures through which the guns are fired; and a banquette, or step, about 3 feet high and 4 feet broad is formed, usually of earth, at its foot, on the interior side, in order to enable men, by standing on it, to fire over the upper surface. The form of a transverse section of a rampart, surmounted by a parapet, is represented in *fig.* 2, Bastion, P. C.; the parapet with its banquette being that which occupies, on the right hand side of the figure, rather less than the upper half of the space between the dotted lines.

The exterior face of a parapet of earth is generally formed in a plane making an angle of 45 degrees with the horizon, in order that the earth may stand unsupported; the superior surface, which varies in breadth from 3 feet to 20 feet according to the nature of the shot which it is intended to resist (from musket bullets to the balls discharged from the heaviest ordnance), has its exterior crest or edge lower than the other by about one-sixth of the breadth of that surface. It is recommended that the depression of the slope should not bear a greater proportion to the breadth, lest the upper part of the parapet should by its acuteness be weakened; but the general rule is that the plane of the superior slope should, if produced, meet the counterscarp line of the ditch in front, in order that the enemy, at the time of an assault, and when detained by the obstacles there, may be completely exposed to the fire of musketry from the parapet. The interior face of the parapet is frequently formed in a plane passing through the crest, and, at the terreplein of the banquette, or at the foot of the parapet if there is no banquette, deviating from a vertical plane passing through the same crest about one-third of the height of the slope. By this inclination the earth, when reveted with fascines or sods, and even without any revetment, will support itself for a time, while a man, by leaning a little forward, is enabled without inconvenience to fire over the parapet.

Occasionally parapets of field-works have been formed with the earth obtained by excavating the ground in the interior; and, in this case, the crest of the parapet may be only 3 or 4 feet above the exterior ground. Such a construction is admissible, however, only when the site of the work is several feet higher than the ground which the enemy may occupy, since otherwise the defenders, except when close behind the parapet, would be exposed to his fire. Again, should the ground about the spot to be fortified be higher than that spot, the crest of the parapet must have a greater height than 7½ feet, in order that the defenders may be sufficiently covered by it: but in general the parapets of field-works cannot be raised more than 14 feet above the ground; since a man can scarcely throw earth with a spade to a greater height than 7 feet, and a greater height than 14 feet would require, above ground, more than two rows of shovellers, one row 7 feet above the other, besides one row, or two rows, at an equal interval in the ditch; and it is seldom that the numerical strength of a working party is sufficient to allow such a disposition to be made.

The earth used for forming the parapets should be free from gravel, in order to avoid the accidents which might arise from the dispersion of the stones when shot or shells are fired into the mass; and the slopes, as well as the banquettes, are usually covered with turf.

PARASELENÆ (from παρὰ and σελήνη the moon). This name is given to the ill-defined and faintly luminous disks which occasionally appear in halos surrounding the moon, as the corresponding but brighter spots which are seen in halos about the sun are called parhelia. [Halo, P. C. S.] The phenomena of parhelia and paraselenæ are ascribed to a like cause; that is, a blending of the rays of light reflected from the parallel sides of small triangular plates of ice with those which are refracted through the sides containing one of the angles.

One of the earliest recorded phenomena of this kind is that which was observed by Hevelius at Danzig in 1660: a double halo surrounded the moon, with coloured segments nearly resembling those which are represented in the second figure in the article above referred to; and in the inner circle at each extremity of a horizontal diameter was a false moon: it was faintly tinged with colour and, at intervals, beams of whitish light proceeded from it towards the exterior.

Sir Edward Parry, during his voyage to Melville Island, saw several lunar halos with paraselenæ; and, once, very nearly the like phenomena occurred on two successive nights. Two false moons appeared in the halo at the opposite extremities of a horizontal diameter, and one at the upper extremity of a vertical diameter; while from the real moon proceeded vertical and horizontal brushes of whitish light like the four arms of a cross: on one of the nights a stream of light issued from the eastern moon, like part of a second halo, and at times ascending almost directly towards the zenith. At another time the moon was surrounded by a double halo, and on the circumference of the interior ring were four paraselenæ, at the opposite extremities of a vertical and a horizontal diameter.

PARENT-DUCHÂTELET, ALEXANDRE-JEAN-BAPTISTE, was born at Paris on the 29th of September, 1790. His father held an office under government which had been in the family for upwards of three centuries. At the birth of Alexandre he was possessed of considerable wealth, but the changes that occurred during the Revolution seriously affected his circumstances, and he retired to a house in the country called Châtelet, about a league from Montargis. Here Alexandre, who was the eldest of five, was brought up with little further assistance in his education than could be given by his mother, who was an amiable and accomplished woman. He was, however, fond of study, and early exhibited a taste for natural history by collecting the insects and birds of the neighbourhood.

At the age of seventeen he was sent to Paris, where he commenced the study of medicine. In 1814 he took the degree of doctor of medicine, and commenced practice in Paris. He became early dissatisfied with the practice of medicine, and directed his attention to pathology. One of the earliest works which he published was upon inflammation of the arachnoid membrane. In this work he was assisted by M. Martinet; the title is "Recherches sur l'Inflammation de l'Arachnöide cerébrale et spinale, ou Histoire théorique et pratique de l'Arachnitis,' Paris, 8vo. 1821. This work is a valuable monograph. The mind of the author was however shortly after directed, through the influence of Hallé, to the subject of public health, and from the period that he first thought on this subject to the day of his death, he devoted all the energies of his mind to it. From 1821 to 1836 he published twenty-nine memoirs and papers on various questions relating to public health. One of his first efforts on this subject was a series of researches directed to discover the cause of a disease which had occurred on board a vessel which was conveying *poudrette* across the seas. Parent examined the manufacture of this substance, which consists of animal and vegetable matters which have been collected from the drains and sewers of Paris, and, being exposed to the sun and air, are allowed to dry. In this state it is used as a manure. It was the fermentation of this substance, its conjunction with moisture, that had produced the disease, and Parent recommended that in future plaster of Paris should be mixed with it, which prevented the recurrence of such catastrophes.

His next work was upon the common sewers of Paris, entitled 'Essai sur les Cloaques ou Egouts de la Ville de Paris, envisagés sous le Rapport de l'Hygiène Publique et de la Topographie Médicale de cette Ville,' Paris, 8vo. 1824. Parent-Duchâtelet here displayed the peculiar aptitude of his mind for the investigation of subjects which others regard with natural abhorrence. He not only made inquiries into the state of the health of the workmen employed in cleansing these places, and obtained from them much important information, but he entered with them the places of their noisome occupation, and, from diligent personal inspection and experience, reported on their condition and nature. Shortly after the publication of this work, Parent was appointed on a commission to superintend the emptying of one of these common sewers (*égouts*) which had been blocked up for years, and which threatened to generate fever of the worst kind. Under his direction this place was cleansed without the loss of life to a single workman, and without any evil results.

He subsequently contributed largely to the 'Annales d'Hygiène Publique et de Médicine Légale.' In this work will be found reports and papers by him on the influence on the health of workmen and the public, of tobacco manufactories, of pyroligneous-acid factories, of employments requiring immersion of the feet in cold water; of burying the dead in cities; of putrid emanations from dead animals and vegetables, of dissecting-rooms, &c. He also published a work on the progress of cholera, and a history of its ravages in Paris. His greatest work, and that which most displays the industry and character of the man, is that on prostitution in the city of Paris. It was published after his death, edited by F. Leuret, with the title 'De la Prostitution dans la Ville de Paris considérée sous le Rapport de l'Hygiène Publique, de la Morale, et de l'Administration,' Paris, 2 vols. 8vo. 1836.

Parent-Duchâtelet died of inflammation of the lungs, on the 7th of March, 1836. Few men have led a life of greater usefulness, and his labours have assisted in laying the foundation of those systems of medical police which, when properly conducted, are undoubtedly the most important institutions of a civilized community.

(*British and Foreign Medical Review*, vol. iv.; Leuret, *Notice Historique, sur A. J. B. Parent-Duchâtelet.*

PARE'XUS, a genus of Placoid fossil fishes, from the old red-sandstone of Scotland. (Agassiz.)

PARIETA'RIA, a genus of plants belonging to the natural order Urticaceæ. It has polygamous flowers, surrounded by an involucre, a bell-shaped 4-parted perigone, 4 stamens, and a filiform style.

P. officinalis, Wall Pellitory, has ovate or oblong ovate leaves, without lateral ribs at the base, two axillary bifid cymes, the segments of the involucre ovate obtuse. The leaves are alternate, the flowers small and reddish, the fruit black and shining. It is a British plant, and is found on old walls and rubbish. It is the *P. erecta* of Koch and Reichenbach.

(Babington's *Manual of British Botany*.)

PARIS, a genus of plants belonging to the natural order Asparageæ. It has a patent horizontal perianth, 8-parted to the base, the four inner parts or corolla narrower than the others. There are 8 stamens, the anthers fixed to the middle of a subulate filament. The styles are 4 in number, the berry 4-celled, the cells with from 4 to 8 seeds.

. *P. quadrifolia*, Herb Paris, the only British species, has usually four leaves in a whorl, a stem about a foot high springing from the extremity of a long rhizoma usually with 4, occasionally from 3 to 6 leaves at its summit. The flowers are solitary and terminal, the sepals lanceolate, the petals subulate. It has no root-leaves, and is found in damp woods in England. It is considered to be a narcotico-acrid poison.

P. polyphylla, a native of Nepal, possesses similar properties.

(Babington's *Manual of British Botany*; Burnett, *Outlines of Botany*; Lindley's *Vegetable Kingdom*.)

PARMELIA. [Liverworts, P. C. S.]

PARNASSIA (from the name of Mount Parnassus), a genus of plants belonging to the natural order Droseraceæ. It has a 5-cleft deeply-cut calyx, 5 petals and 5 stamens, with 5 scales fringed with glandular setæ interposed. The stigmas are sessile and 4 in number, the capsules 1-celled with 4 valves. The species are smooth herbs. The leaves ovate, cordate, cauline ones usually clasping the stem or sessile. The flowers are all white striped with green; the tuft of the glands yellow.

P. palustris, Marsh or common Grass of Parnassus, has cordate stalked radical leaves, the stem-leaves amplexicaule, the filaments of the petaloid scales from 9 to 13; the petal has a short claw, and is white and veined; the glands of the scales yellow. It is native throughout Europe, in marshy and damp places, and in Britain in mountainous countries.

P. fimbriata is a very elegant species; the leaves are remarkably hollowed out at the base close to the lateral ribs, which are connected with one another by a common base like the divisions of a pedate leaf. It has palmate glandless appendages, obovate petals fringed at tho base. It is native of the western coast of North America.

The species of this beautiful genus grow best in a peat soil in a damp situation. They may be grown in pots, which should be placed in pans of water. They may be propagated by dividing at the root, or by seeds, which ripen in plenty. Plants must be introduced, as seeds do not vegetate after a voyage.

(Don's *Gardener's Dictionary;* Babington, *Manual of British Botany*.)

PARNY, EVARISTE DE'SIRE' DESFORGES, Chevalier and afterwards Vicomte De Parny, was born in the Isle of Bourbon, on the 6th of February, 1753. At the age of nine he was sent to France and placed at the College of Rennes; but he appears to have shown considerable indifference to the course of studies which were followed there. His imagination, which even at an early age had taken the almost entire guidance of his conduct, impressed him as he grew up with the belief that he was called upon to embrace the ecclesiastical profession, and it is said that he attempted to join the brotherhood of La Trappe. An effort of imprudent zeal, however, on the part of the confessor whom he had chosen as his spiritual guide, produced a rapid change in the mind of the young convert, and he is related to have fallen into an opposite extreme of conduct, and soon after, entering into all the dissipations of youth, finally to have enrolled himself in the military profession. He returned to his native island at the age of twenty, where he became acquainted with a young creole lady, the Eleanor of his verse, which acquaintance his fervent imagination soon converted into the most ardent attachment. Their mutual love inspired his first poetical effusions, which paint with grace and freshness, though perhaps in too vivid colours, the all-absorbing passion of his soul. The affections however of the lady were of an evanescent nature; a marriage of interest, which sho contracted at the desire of her parents, induced Parny to return to France. Distance and time were unable to efface his sad reminiscences, and he there continued to translate into the language of poetry the feelings which appear to have taken a lasting possession of his mind. In 1775 was published his first collection of elegiac poems, which have been so much admired by his countrymen that they have earned for him the titlo of the French Tibullus. On the breaking out of the French Revolution he became deprived of the property which he had inherited from his father, and he was compelled to obtain a livelihood by the cultivation of his talents. A painful and striking change now appears in his writings, which he had the weakness to adapt to the prevalent taste of a corrupt age. The rival of Tibullus became the feeble copyist of Voltaire, and his 'Paradis perdu,' 'Galanteries de la Bible,' and 'Guerre des Dieux,' by their disgusting profaneness and absence of genuine poetical feeling, will only be remembered by posterity as indications of the state of society at a period when 'everything evil was rank and luxuriant.' So strong indeed was the feeling excited against Parny even in France on account of the last mentioned of these three poems, that his name was repeatedly passed over among the candidates for the honours of the Institute. However he was admitted into it in 1803, in the place of Devaines. Most of his other poems are inferior to his early productions; his 'Goddam,' published in 1804, is a spiritless and insipid parody on the invasion of England by the Normans; his 'Isnel and Aslėga,' though possessed of more merit, is but a feeble imitation of the Scandinavian style of poetry; but among his later productions there are two small poems, one on the culture of flowers, and the other entitled 'Journée Champêtre,' which for simple beauty and delicacy of colouring are deserving of being ranked among the finest specimens of lyric poetry. His principal poem, in eighteen cantos, on the loves of the Queens of France, was destroyed by him from fear of its falling into the hands of the suspicious judges of the Revolutionary Tribunal. He died in Paris, after a painful and lingering illness, on 5th December, 1814.

His works have been published in 5 vols. 18mo. by Didot, Paris, 1808, and at Brussels, in 2 vols. 8vo. The best edition, however, is that by Mons. Boissonnade in the 'Collection de Classiques Français,' Lefevre, Paris, 1827. A volume was published in 1826 entitled les 'Poésies inédite de Parny,' with a notice on his life and writings by Mons. Tissot.

PAROCHIAL REGISTRIES. [REGISTRATION OF BIRTHS, &c., P. C. S.]

PARTHE'NIUM. [PYRETHRUM, P. C. S.]

PARTNERSHIP. In 1837 a statute was passed (7 Wm. IV. & 1 Vict. c. 73) authorizing the crown, after a reference of an application to the Board of Trade, to grant a species of incorporation to trading companies by letters patent under the great seal. The patent may limit the responsibility of partners to a certain sum per share. The company obtaining such a privilege must be constituted by deed of partnership, containing its name, its object, the place where its business is to be conducted, the names of the members, and the appointment of two officers in whose name the company may sue and be sued. These matters must also be entered, along with the additions of the members and the shares held by each, in numerical order in a return which must be made within three months after the date of the patent—in England or Ireland, to the Enrollment Office of Chancery; in Scotland, to the General Register House. Notice of transfers of shares must be sent within three months. This registration is the criterion both of benefits and responsibilities: no one is entitled to profits unless as accruing to registered shares, and no one is relieved from responsibility until his name is superseded in the register. The extent to which this statute may have been adopted in practice is not publicly known.

PARTY-WALLS. [BUILDING-ACT, P. C. S.]

PASSA'LODON, a genus of fossil Placoid fishes, from the Bagshot sand. (Buckland.)

PASSENGERS. [SHIPS, P. C.]

PA'SSERI, GIOVA'NNI BATTISTA, a distinguished painter, and author of one of the best collections of biographies of Italian artists, was born at Rome about the year 1610 or earlier. Passeri received a good education, and, according to his own account, did not take up painting until comparatively late; he was first engaged in the capacity of a painter in 1635 by Canini in the Villa Aldobrandini at Frascati, where he contracted an intimate friendship with Domenichino, then returned from Naples. When Domenichino died in Naples in 1641, Passeri was president of the Academy of St. Luke, and he read a funeral oration on him, and painted a portrait of him, which was placed in the academy with other portraits of painters, which are at present in the gallery degli Uffizj at Florence; the portraits now in the academy at Rome are copies. (Platner, *Beschreibung der Stadt Rom.*) At the close of his life Passeri entered into holy orders; and obtained in 1675 a benefice in the college of Santa Maria in Via Lata. He died in 1679.

Passeri is one of the best of the Italian historians of art; his theoretical knowledge was good and his facts are believed to be very correct. The circumstance of his book lying for nearly a century unnoticed, or rather unpublished, was owing to its unfinished state and the severity of many of his remarks, especially on Bernini. It was first published in Rome by an anonymous editor (supposed to be Bottari, editor of the *Lettere Pittoriche*) in 1772, with some omissions, under the title 'Vite de' Pittori, Scultori, ed Architetti che anno lavorato in Roma, morti dal 1641 fino al 1673, di Giambattista Passeri, Pittore e Poeta,' 4to. pp. 492 (Lives of the Painters, Sculptors, and Architects who have practised in Rome, and died between the years 1641 and 1673 inclusive); thus constituting a continuation to the work of Baglione. It contains thirty-six lives, as follow: Domenichino, Baccio Ciarpi, Pieter Laer, called Bamboccio, Guido, Il Fiammingo, Agostino Tassi, Francesco Mocchi, Lanfranco, Camassei, Giambattista Calandra, Vincenzo Armanno, Alessandro Turco, Pietro Testa, A Caroselli, Algardi, G. Rainaldi, Gio. Miele, M. Lunghi, G. U. Abatini, Luigi Gentile, Giuliano Finelli, Ag. Mitelli, Albani, M. Cerquozzi, Catterina Ginnasi, Andrea Sacchi, Romanelli, Giu. Peroni, N. Poussin, F. Baratta, Gio. Ang. Canini, Guercino, F. Boromino, P. F. Mola, Pietro da Cortona, and Salvator Rosa.

There is only one public picture by Passeri in Rome, a crucifixion between two saints, in the church of San Giovanni della Malva. They are not so rare in galleries. He painted sometimes still-life. His nephew Guiseppe Passeri was likewise an eminent painter. He died in 1714, aged sixty.

PASSIGNA'NO, DOME'NICO DA, or DOMENICO CRESTI, Cavaliere, was born at Florence about the middle of the sixteenth century. Some accounts give 1560, but this is probably too late; Baglione says he was eighty years old when he died in 1638, which would place his birth in 1557 or 1558. He was the pupil of Federigo Zucchero, and lived some time in Venice, where he acquired a great preference for the Venetian school of painting, and especially the works of Paolo Veronese. He acquired a great reputation at Rome, where he was employed by the popes Paul V. and Urban VIII.; he painted the Crucifixion of St. Peter for the Capella Clementina in the great church of St. Peter on the Vatican, for which he was created Cavaliere dell' Abito di Cristo. He spent the latter part of his life at Florence, and he was one of the most influential of those painters who contributed towards the reform of the Florentine school by improving the taste for colour and rendering the mannered anatomical school less popular. Passignano was the friend and associate of Cigoli, and is said to have been the master of Lodovico Carracci while in Florence. He died in 1638. He had many scholars, of whom Pietro Sorri of Sienna was the most distinguished.

(Baglione, *Vite de' Pittori*, &c.; Lanzi, *Storia Pittorica*.)

PASTINA'CA (from *pástinum*, the Latin name for a two-pronged fork), a genus of plants belonging to the natural order Umbelliferæ, and the tribe Peucedaneæ. It has a calyx with 5 very small or nearly obsolete teeth; round entire petals, involute, with an acute point. The fruit has a dilated flat margin. The carpels with slender ridges, 3 dorsal equidistant, two lateral distant, near the outer edge of the dilated margin. The interstices with single linear vittæ.

P. sativa, Parsnep, has an angular furrowed stem, pinnate leaves, downy beneath, ovate oblong leaflets, crenate, serrate, often with a lateral lobe at the base. The stem from 2 to 3 feet high. The flowers are yellow. The leaves generally shining above, sometimes downy beneath. It is native of Great Britain and of Europe, even to the Caucasus, on hillocks and dry banks, in a chalky soil. The root is spindle-shaped, white, aromatic, mucilaginous, and has a sweet taste. A variety of this species, *P. edulis*, is the common edible parsnep, and is much cultivated in our gardens. For cultivation and uses of this variety see article PARSNEP, P. C. Another variety, called *P. Coquaine*, has roots from three to four feet long, and upwards of six inches in circumference. It is extensively cultivated in Jersey and Guernsey as fodder for cattle. In the north of Ireland parsneps are used in the composition of a kind of beer brewed with hops. Wine and ardent spirit are likewise made from the roots.

P. Sekakul is another edible species of this genus, and is native of Syria and of Egypt. It has a grey root, a terete downy branched stem, pinnate downy leaves, pinnatifid cut leaflets, blunt and unequally toothed. It is cultivated in the Levant, under the name of Sekakul.

The species are only to be increased by seed, which should be sown in the open border early in the spring.

(Don's *Gardener's Dictionary*; Babington's *Manual of British Botany*; Burnett's *Outlines of Botany*.)

PASTURE, COMMON OF. [COMMONS, P. C.]

PATELLOI'DEA, a genus of Mollusca proposed by MM. Quoy and Gaimard for certain Gasteropoda, which have shells exactly resembling those of limpets, but whose animals are cervico-branchiate. It is synonymous with the genus *Lottia* of J. E. Gray. The *Patella testudinalis* of Otho Fabricius, a shell not uncommon on the northern coasts of Britain, is the type. Numerous species are known, inhabiting all latitudes and living in various depths of water. Their shells are gaily coloured, often tessellated and rayed with purple, orange, or pink. The animals are usually of a uniform tint of white, orange, or pale red.

PATENT. The 7 & 8 Vict. c. 69, § 2, enables a patentee, by petition to the Queen in council, to obtain an extension of the patent term for any time not exceeding fourteen years, 'subject to the same rules as the extension for a term not exceeding seven years, is now granted under the powers of the said act of his late majesty (5 & 6 Wm. IV. c. 83).' This act of Victoria contains also a provision applicable to the extension of time in cases where patentees have wholly or in part assigned their patent right. Sections 5 and 6 contain provisions as to disclaimer and memorandum under 5 & 6 Wm. IV. c. 83, in cases in which a patentee has assigned all or part of his patent right. Section 7 confirms new letters-patent which may have been granted under 5 & 6 Wm. IV. c. 83, to an assignee or assignees, and declares that such new letters-patent shall be as valid as if they had been made after the passing of this act; provided that nothing in this act contained shall give validity to any letters-patent heretofore granted to an assignee or assignees, when any action or proceeding in Scire facias or suit in equity shall have been commenced before the passing of this act, wherein the validity of such letters-patent shall have been or may be questioned.

PATENT. [PARTNERSHIP, P. C. S.]

PATERNITY. [BASTARD, P. C.]

PATERSON, WILLIAM. Of the early history of this man, who originated several celebrated projects, little is known. By some accounts he is said to have been brought up to the clerical profession, to have been sent as a missionary to the West Indies, and to have subsequently become a buccaneer. In the account however of the parish of Tinwald, Dumfries-shire, in the first volume of the old statistical account of Scotland, it is asserted that he was born at Skipmyre in that parish about the year 1660, that he was respectably connected, and that he more than once sat for Dumfries-shire in the parliament of Scotland. Whatever may be his early history, he must have had ample opportunities of making himself acquainted with the commerce and institutions of foreign countries, and he was probably an extensive traveller. His schemes regarding banking and trading projects are said to have been first offered to the mercantile communities in the Low Countries, and to have been coldly received. He subsequently laid his plans before the merchants of London, and it seems to be nowhere doubted that they were the foundation of the project of the Bank of England, incorporated in 1694. [BANK, P. C.] From the rapidity with which the scheme was brought into a working shape, it may be conjectured that very little alteration was made on the original suggestions of Paterson. It does not appear that the inventor was for any length of time practically connected with the working of the institution. It is usually said that the rich capitalists, once possessed of his ideas, quarrelled with him, set him adrift, and managed his project for their own peculiar advantage. It is probable however that Paterson, though so able a schemer, was a bad practical man of business; that his invention was perpetually on the wing, and that he could not settle down to the routine of business with much advantage either to himself or to others. His next project, if it was not conceived at the same time as that of the Bank, was the renowned Darien expedition. Scotland was at that time filled with active and enterprising spirits, who, by the two kingdoms being under one crown, had lost much of that department of foreign service which their ancestors had held in states at war with England. There was an earnest desire to rival England in commerce and manufactures, and in colonies, of which Scotland was not previously possessed. An act of the Scottish parliament was passed on 26th June, 1695, incorporating certain persons by name, of whom Paterson was one, with powers to add to their number, to be called 'The Company of Scotland trading to Africa and the Indies.' Very important privileges, both in connection with foreign trade and with the institutions of the country, were conferred on the members. The company raised a large subscription in England. Its progress roused the English jealousy of trade, and after some representations by the East India Company and other bodies, both houses of parliament presented an address to King William, in which they stated, 'that by reason of the superior advantages granted to the Scottish East India Company, and the duties imposed upon the Indian trade in England, a great part of the stock and shipping of this nation would be carried thither, by which means Scotland would be rendered a free port, and Europe from thence supplied with the products of the East much cheaper than through them, and thus a great article in the balance of foreign commerce would be lost to England, to the prejudice of the national navigation and the royal revenue.' In fact, under the guise of a company having a monopoly, Paterson's plan would have developed itself, had it come into full operation, as a nucleus of free trade; and its opponents rather *felt* how unable they would be to compete with this untrammelled community, than saw in its constitution any general principle of superiority to the restrictive commercial system with which they were connected. 'We do hereby publish and declare,' says the first proclamation of the company, 'that all manner of persons, of what nation or people soever, are and shall from henceforward be equally free, and alike capable of the said properties, privileges, protections, and immunities, and rights of government granted unto us; and the merchants and merchant-ships of all nations may freely come to and trade with us without being liable in their persons and goods to any manner of capture, confiscation, seizure, forfeiture, attachment, arrest, restraint, or prohibition, for or by reason of any embargo, breach of the peace, letter of marque, or reprisals, declaration of war with any foreign prince, potentate, or state, or upon any other account or pretence whatsoever. And we hereby not only grant, concede, and declare a general and equal freedom of government and trade to those of all nations who shall hereafter be of or concerned with us, but also a full and free liberty of conscience in matters of religion.' In contemplation of a company carried on on such principles, the two houses of the English parliament represented that 'the privileges granted their company would render their country the general storehouse for tobacco, sugar, cotton, hides, and timber; the low rates at which they would be enabled to carry on their manufactures would render it impossible for the English to compete with them." King William was induced to discountenance the undertaking, and the projectors were deprived of all aid, not only from England, but from foreign speculators. This only made the scheme a more truly national object, and all the disposable wealth of Scotland was speedily embarked in it. The main scheme of the company was to establish a colony at Darien, when Paterson believed that it would be in the middle of the highway of the world, and form the emporium where the commerce of the East would meet that of the West. With all due respect for the principles on which the commerce was to be conducted, it may be questioned if the place possessed all the peculiar advantages which he attributed to it, especially at a time when regular commercial enterprise had made so comparatively little progress over the globe. The expedition set out on the 26th July, 1698; its disastrous results may be found recorded in the ordinary histories of the period, and particularly in Sir John Dalrymple's Memoirs. Paterson was ambitious, but not mercenary, and in the palmy days of the company he had resigned the profits which those confident of its success had assigned to him. The failure of the expedition preyed deeply on his spirits, and grief and disappointment brought him, during his return home, to the borders of lunacy. He lived subsequently a life of obscurity, and the period of his death is not recorded.

PATRIARCHS. We propose to give a chronological list of the Patriarchs of Alexandria, Antioch, Constantinople, and Jerusalem, arranged systematically with the Roman Popes, for which reason we place the article under ROMISH CHURCH.

PAVONIA (in honour of Don Joseph Pavon, M.D., of Madrid, a traveller in Peru, and one of the authors of 'Flora Peruviana'), a genus of plants belonging to the natural order Malva. It has a 5-cleft persistent calyx, surrounded by an involucel from 5 to 15 leaved. The ovarium has 5, and rarely 4, 1-ovuled cells. It has 10 stigmas, 5 carpels, capsular, 2-valved, and 1-seeded.

P. diuretica has cordate acuminate serrated leaves, velvety on both sides, and full of pellucid dots. The flowers are axillary, solitary, and sulphur-coloured. It is native of Brazil, in the province of Minas Geraes. A decoction of this plant is used in Brazil as a diuretic. This is the only species of Pavonia used in medicine; many others are however worth cultivation for the beauty of their blossoms. They are free-growing plants, for the most part ripening seed in abundance, and cuttings will root freely under a hand-glass.

(Don's *Gardener's Dictionary*; Lindley's *Flora Medica*.)

PAYMENT. If a man owes several sums of money to another on different accounts, and makes a payment of any one of such sums, he may state at the time of payment on which account such sum is paid, and the payment will be considered to be legally appropriated to the debt which he has named. If at the time of payment the debtor makes no appropriation of the payment, the creditor may at the time of payment appropriate it to such debt as he pleases, provided he so appropriates the payment, as he would do, or as it may be presumed that he would do, if he were the debtor. Accordingly the creditor must appropriate the payment to such debt as is the most burdensome to the debtor. If neither party make any appropriation of the debt at the time of payment, the payment will be presumed to be made on account of the more burdensome debt; if there is no difference in the quality of the debts, the payment must be presumed to be made on account of the oldest.

These are the rules of the Roman Law (*Dig.* 46, tit. 3), which perhaps may be considered to be adopted by the English Law, though the decisions are by no means uniform in this matter. (Devaynes *v.* Noble, 1 Mer. 606.) The principles just laid down apply to distinct debts on different accounts (causae). If there are dealings between two persons which are all of one uniform and continuous nature, as for instance between a banker and his customer, there is no question of appropriation of payment. The customer pays money into the bank at different times, and draws it out by drafts at different times. All the sums paid in and all the sums paid out severally make an entire creditor and debtor account, and by striking the balance at any given time it will appear what sum is due at that time from the banker to his customer or from the customer to his banker. It is true that this supposes a kind of appropriation, but not exactly that kind which is meant by the term. It assumes that the sum first paid in is discharged by the sum first paid out, so far as it is sufficient to discharge it; and the same remark applies to all subsequent payments into the bank and sums drawn out. The account therefore must be made out in the order of time, and the balance will show how the account stands at the time when it is made out. (Devaynes *v.* Noble.)

There are various cases in the reports in which the question of appropriation of payments has been discussed. (Boddenham and Purchas, 2 B. and Ald. 39; Simpson and Ingham, 2 B. and Cr. 65; Pemberton and Oakes, 4 Russ. 154; and others.)

PEAR-GAGE. The principle of Smeaton's pear-gage, for measuring the exhaustion of a receiver, differs from that of the other gages, in that the measurement does not take place until after the air has been re-admitted into the receiver. Suppose a wire working through a collar in the top of the receiver and supporting a tube open only at the lower end. Under the tube is a cup of mercury, standing on the floor of the receiver, so that by lowering the wire the open end of the tube may be immersed in the mercury. The exhaustion being made before lowering the wire, the air in the tube will be rarefied equally with that in the rest of the receiver. If the wire be then lowered, and the air re-admitted into the receiver, the mercury will rise in the tube until the elastic force of the recompressed air in the tube, together with the column of mercury, counterbalances the pressure of the external air. A gage attached to the tube shows, by the height of the mercury, what was the original rarefaction.

Now it is plain that while the ordinary gages show the actual amount of elastic force left in the receiver, the pear-gage submits the air, or whatever else there may be, to a process of compression before the measurement is made. If there be nothing but air, all the gages agree; but if, as generally is the case, there be also vapour, the pear-gage shows a much higher degree of apparent exhaustion than the ordinary gage. For further detail see the article 'Pneumatics' in the *Encyclopædia Metropolitana.*

PECO'PTERIS, a genus of fossil Ferns, of which the species occur abundantly, both in the coal-measures and the oolitic strata. (Brongniart.)

PECULIARS, COURT OF, is one of the English ecclesiastical courts. It is the third court of the archbishop of Canterbury, the other two being the Court of Arches, or supreme court of appeal, and the Prerogative or Testamentary Court. The Court of Peculiars takes cognizance of all matters arising in certain deaneries, one of which is in the diocese of London, another in the diocese of Rochester, another in the diocese of Winchester, each comprising several parishes; and some others over which the archbishop exercises ordinary jurisdiction, and which are exempt from and independent of the jurisdiction of the several bishops within whose dioceses they are locally situated.

(*Political Dictionary*, article 'Ecclesiastical Courts.')

PEDICULA'RIS (from the Latin word *pediculus*, a louse, from its supposed quality of making sheep that feed upon it lousy), a genus of plants belonging to the natural order Scrophularineæ. It has an inflated 5-toothed calyx, a ringent corolla, with the upper lip laterally compressed, the lower plane 3-lobed. The capsules are acute, and compressed. The seeds numerous and angular. The species are usually simple herbs. The flowers sessile, disposed in dense terminal interrupted spikes.

P. palustris has a solitary erect stem, branched throughout, pinnatifid leaves, with oblong blunt lobed segments; an ovate pubescent 2-lobed calyx, the lobes incise, dentate, crisped. The upper lip of the corolla has a short truncate beak, with a triangular tooth on each side. The flower is large and crimson, varying to white. It is found in marshes and wet meadows, particularly in the north of England, and is said to be injurious and disagreeable to cattle. This is the *Pedicularis Herba* of Columella, 6. 30, and of Scribonius Largus,

P. sylvatica has a stem branched at the base, erect, the branches long, spreading, and prostrate; the leaves pinnatifid, leaflets ovate and deeply toothed. The upper lip of the corolla as in the last species, the flower large and rose-coloured. It is found on wet, heathy, and rather hilly grounds in Siberia, Europe, and Great Britain. The expressed juice of the herb, or a decoction, has been used with advantage as an injection in serous ulcers. It is injurious to the sheep that feed on it. There are 75 other species of Pedicularis enumerated, none of which are British, or applicable to any useful purpose. They are found chiefly in Europe and Northern Asia. All these herbs are very shy of cultivation. Peat soil and a moist situation suit the generality of them. All foreign species require protection during the winter, and to this end they should be grown in pots. It has been affirmed that these plants breed lice in the animals that feed on them; the truth, however, appears to be that they indicate a very poor pasture, and the want of food may produce an unhealthy state of the animal, and thus cause them to generate vermin.

(Don's *Gardener's Dictionary;* Babington's *Manual of British Botany.*)

PEDRO, DON, Emperor of Brazil and King of Portugal, was the son of John VI., king of Portugal, and was born at the castle of Queluz on the 12th Oct., 1798. From early youth he was the active witness of the long series of political troubles which distracted Portugal, and which are fully detailed in another part of this work. [PORTUGAL, P. C.] At the age of nine he accompanied his father, then regent for the Queen Maria Isabella, in their exile to Brazil. The misfortunes which had befallen his family proved an advantageous school for his political education; they became the means of developing the activity of his mind by depriving him of the hope of depending on other sources than those which should arise from his own talents and energy. He applied himself with considerable success to tho acquisition of various languages, while he devoted the hours usually spent in recreation to the cultivation of poetry and music.

At the general peace of 1815 a marriage was contracted for the young prince of Brazil, the title by which he was then known, with Maria Leopoldina, archduchess of Austria. At that period the colony of Brazil was raised to the rank of a kingdom, and, when, in 1820, John VI. was recalled to Portugal by the Cortes, Don Pedro remained as regent in that country. [BRAZIL, P. C.]

His first position in political life was, as will be seen by reference to the article BRAZIL, P. C., one of peculiar difficulty; to preserve the authority with which he had been intrusted, and to secure the peace and prosperity of the kingdom, required the exercise of diplomatic skill, and a firm resolution of no ordinary kind. The Cortes of Portugal were desirous of reducing Brazil to its antient position as a colony, and to confine its commerce to the mother country; they also designed for it a new system of government by dividing it into provincial administrations. The prince regent, sensible of the impolicy and injustice of this scheme, placed himself at the head of the popular opposition which it excited, and refused obedience to the attempted innovations. The Portugese troops stationed at Pernambuco and Rio Janeiro were sent back to Europe, while, on the other hand, the Portuguese commandant at Bahia retained possession of that town, and expelled from it the militia. Civil war was the necessary consequence of these proceedings, and on the 13th of May Don Pedro was proclaimed protector and perpetual defender of Brazil; and, finally, on the repeated refusal of the Portuguese Cortes to abandon their design, the independence of Brazil was declared; and the prince, yielding to the popular wish, was proclaimed emperor on the 12th of October, 1822, and was crowned on the 1st of December in the same year. The details of the war which followed with Portugal, the constitution which was adopted by the Brazilians, and sanctioned by the emperor, will be found elsewhere. [BRAZIL, P. C.]

Though Don Pedro appears to have satisfied the exigencies of the new state by granting it a constitution based upon liberal principles, partial outbreaks of resistance to his government continued to manifest themselves. The long anarchy which had existed in the provinces rendered the inhabitants indisposed to submit to regular rule, and the instinctive hatred of the Brazilians against the Portuguese diminished the popularity of the ruler. Insurrections broke out at Pernambuco, San Salvador, and Bahia, which were however speedily checked. In 1825 the independence of Brazil was recognised by Portugal. The following year a dispute arose between Brazil and the neighbouring republic of Buenos Ayres [PLATA, LA, P. C.] respecting the possession of a territory named the Banda Oriental, the inhabitants of which were desirous of annexing themselves to the new empire, and a war was the result, which terminated unfavourably to the interests of Brazil. To this cause of discontent another was added by the death of John VI. in March, 1826, and the consequent succession of Don Pedro to the crown of Portugal. This event excited the fears of the Brazilians lest he should prefer the kingdom which descended to him by hereditary right to the empire at whose head he had been placed by the will of the people, and thus Brazil should again become reduced to the position of a dependancy of Portugal. These fears however he endeavoured to dispel by abdicating the crown of Portugal in favour of his daughter Donna Maria da Gloria, reserving to himself the regency, with the title of king, during her minority. The succeeding years of his reign were marked by continual disturbances of a political nature throughout the country. In 1830 the French revolution gave a new impulse to the democratical party, and an affray which took place on the 6th of April, 1831, the details of which are given in the article BRAZIL, P. C., determined Don Pedro upon abdicating the throne in favour of his son, to whom, being under age, he appointed a guardian, and the following day he left the country.

The throne of Portugal, which Don Pedro had resigned in favour of Donna Maria, had been usurped by his brother Don Miguel, whom in 1827 he had appointed regent of the kingdom. [PORTUGAL, P. C.] His object was now to recover the country from the usurper, and to reinstate his daughter in the rights of which she had been deprived. The plan of the enterprise was matured during a somewhat lengthened sojourn in Paris, where ho was joined by the exiled Portuguese who had espoused his cause, at tho head of whom was General Saldanha, and a great number of foreign adventurers. For the details of the civil war which ensued we must again refer to another part of the Cyclopædia. [PORTUGAL, P. C.] On the 26th of May, 1832, Don Miguel was reduced to the necessity of signing a convention, which left the young queen in quiet possession of the throne of Portugal under the regency of Don Pedro.

The acts of his short administration were calculated to secure for him the good will of the more liberal party in his dominions; but many of them, though they may have been expedient, were certainly unjust. He strengthened the external relations of Portugal by a close alliance with England and France, and in order to give an interest to the people in the new revolution he confiscated for the use of the state tho property of the numerous monastic establishments in his kingdom. The anathemas of the Vatican were the natural result of these sweeping measures, and they were soon followed by his own excommunication. In September, 1832, the declining state of his health compelled him to resign the regency, and his daughter, having been declared of age, was placed in full possession of the royal authority. He did not long survive to assist the young queen with his counsels, and the palace where he had been born was the scene of his death on the 24th of September, 1834.

The life of Don Pedro is chiefly interesting as it is connected with the general history of the period; the difficult circumstances in which he was placed deprived him of the opportunity of putting into effect many measures of utility which he had the talent to design, and on a more quiet theatre he might have acted the part of a greater king.

PEEL (or PEELE, as the name is found in most books printed forty years ago), SIR ROBERT, the first baronet, was born 25th April, 1750, at Peel's Cross, near Lancaster, a small property belonging to his father, Mr. Robert Peel, whose third son he was. The family, though not wealthy, appears to have been of some respectability for several generations. It is said to have been lately traced back to the end of the sixteenth century, about or soon after which dato its head was a clergyman of the Established Church; but the common accounts go no higher than to the great-grandfather of the subject of the present notice. He was Robert Peel, and died in 1736. His son is described as William Peel of Oswaltwich, who married Jane, daughter of Laurence Walmesley, of Darwin, Esquire; their son Robert, of Peel's Cross, married Elizabeth, daughter of Edmund Howorth, of Backburn, Gentleman, and had a numerous family of sons.

It is understood that the Peels had been Unitarians for some generations, and that Sir Robert was brought up in that sect. When he conformed we do no know. It is said that he early gave evidence both of remarkable business talents, and of a decided ambition and determination to raise himself in the world. He and most of his brothers were brought up to different branches of the cotton-trade, now fast extending under the effect of the inventions of Arkwright, whose personal success in the acquirement of wealth and station was also of course operating as a powerful example and incentive. The mechanical processes of the trade are said to have early engaged much of Peel's attention, though they were never indebted to him for any improvement, so far as we are aware. He made his fortune by his general ingenuity and sagacity, by his unremitting activity and attention, by his comprehensive boldness of enterprise, and by his admirable conduct of business, alike in its largest scope and in its minutest details.

In 1773 Mr. Robert Peel entered into partnership with Mr. William Yates in an extensive factory at Bury, in Lancashire; and on the 8th of July, 1783, he married Ellen, daughter of Mr. Yates, who had then just completed her seventeenth year. His career from this time was one of great and uninterrupted prosperity. About the time of his marriage he purchased a considerable estate in Lancashire; and in the course of a few years he invested large additional sums of money in land in the counties of Stafford and Warwick.

It has been asserted that Mr. Peel's principles were originally favourable to the French Revolution, or at least to the class of opinions in which that movement originated; but this, we apprehend, must be a mistake. He appears to have first come forward as a politician in 1780 by the publication of a pamphlet entitled 'The National Debt productive of National Prosperity,' a title which may be taken as evidence that his views at that date were the very reverse of revolutionary or disaffected. In 1790 he was returned to parliament as one of the members for Tamworth, in and near which borough he had acquired large property; and it is indisputable that from the moment he entered the House of Commons, in which he sat for the same borough in seven successive parliaments, or to the end of the reign of George III., he was a steady and zealous supporter of the government. We do not see, therefore, to what period of his life we can with any probability assign his imputed republicanism.

In 1797 Messrs. Peel and Yates distinguished themselves by the considerable subscription of 10,000*l.* to what was called the Loyalty Loan. This fact is often stated in such a way as to make it appear that the money was a munificent gift which they made to the public. The truth is, it was merely a purchase of so much stock in the Public Funds, which promised and proved to be an excellent speculation, and was evidence of nothing except the confidence of the subscribers in the stability of the government, and their correct views of their own interest. The entire loan, amounting to 18,000,000*l.*, was all raised in a few hours, and might probably have been doubled in amount if it had been desired; for the only difficulty was to satisfy a mob of applicants whose subscriptions could not be received. The sum subscribed by Messrs. Peel and Yates was far from being the highest; the Duke of Bridgewater, for instance, subscribed 100,000*l.* For each 100*l.* the subscribers received a capital of 112*l.* 10*s.*, bearing an interest of five per cent., with a right to have their stock two years after the conclusion of a peace converted into three per cents. at the rate of 133*l.* 6*s.* 8*d.* for 100*l.* capital.

In 1798 Mr. Peel further showed his loyalty and public spirit by the part which he took in encouraging the volunteer system. Besides assisting in the formation of the Lancashire Fencibles, and the Tamworth Armed Association, he raised, chiefly from among his own workmen, six companies of what were called the Bury Loyal Volunteers, and got himself commissioned as their lieutenant-colonel. On the 14th of February, 1799, he made a speech in the House of Commons in favour of the Union with Ireland, which was soon after printed and extensively circulated in that country. On the 29th of November, 1800, he was created a baronet.

Sir Robert Peel, the number of persons employed by whom is said to have amounted in 1803 to fifteen thousand, lived for ten years after his retirement from parliament in 1820, dying at his seat of Drayton Park, in Staffordshire, on the 3rd of May, 1830. On the 18th of October, 1805, he had married a second wife, Susannah, sister of the Rev. Sir William Henry Clarke, Bart., Rector of the parish of Bury, who was then in her fifty-third year, and who died on the 19th of September, 1824. By his first wife, who died on the 28th of December, 1803, he had six sons and five daughters; the eldest of the former being the present Right Hon. Sir Robert Peel. It may be remarked that, with the exception of two daughters who died in infancy, he saw all his children married before his death. Besides his large landed property, which he entailed upon his eldest son, together with, it is supposed, near half a million in money, he left about 150,000*l.* to each of his younger sons, and above 50,000*l.* to each of his daughters. He had also previously advanced to or settled upon his several children above 240,000*l.*, besides an income of 9000*l.* per annum secured to his eldest son.

(*Gentleman's Magazine* for June, 1830; *Parliamentary History*, and other records of the time.)

PEELE, GEORGE, is supposed to have been a native of Devonshire, and to have been born not later than 1552 or 1553. In 1564 he was a member of Broadgates Hall, now Pembroke College, in Oxford: he took his degree of Bachelor of Arts in 1577, and was made Master of Arts in 1579. In no long time afterwards he appears to have removed to London, and thrown himself upon the world as a literary adventurer. In that age the precariousness always incident to the profession of authorship was so distressingly great, that the pursuit, if entered on by a poor man, was barely compatible with the preservation of personal respectability: and, though the particulars of Peele's career are but very imperfectly known, there is evidence enough to show that it was not only unfortunate but disreputable. His conduct is represented as having been even more irregular than that of Marlowe and Greene, who were his intimate associates and his coadjutors in the improvement of the early English drama. It had been conjectured that he was professionally an actor, and his having been so is now made certain by a document discovered by Mr. Collier. A tract, frequently reprinted, entitled 'The Merrie Conceited Jests of George Peele,' represents him as nothing short of a common swindler. Some of the exploits which it relates are doubtless exaggerated, and others may have been erroneously fathered upon him; but it cannot be doubted that he suffered many pecuniary distresses, and was no way scrupulous in the shifts by which he sought relief. There is extant a begging letter, which, in 1595, labouring under poverty and sickness, he addressed to Lord Burleigh; and it is a characteristic trait of the man, that, relying perhaps on the Lord Treasurer's ignorance of the current literature, he sent with his petition a copy of a poem which, although he evidently wished it to be regarded as new, he had actually published six years before. He was dead in 1598, when Meres, in the second part of his 'Palladis Tamia,' described his death as having been caused by his debaucheries. In the 'Jests' he is spoken of as a married man; and his letter to Lord Burleigh describes the bearer as his eldest daughter.

The earliest of Peele's compositions that is known is a copy of verses prefixed to Watson's 'Εκατομπαθία, which was published in 1581; and his earliest known drama was printed in 1584. In 1828 Mr. Dyce published an excellent edition of 'The Works of George Peele, with some account of his Life and Writings,' 2 vols. post 8vo. A reprint of this edition, with improvements and additions, appeared in 1829; and in 1839 the same editor published a third volume, which probably makes the collection as nearly complete as it will ever be possible to render it. The non-dramatic poems, except a few short miscellaneous pieces and a long piece on the War of Troy, are speeches for pageants (such as 'The Device of the Pageant borne before Woolstone Dixie, Lord Mayor of London, 1585'), or celebrations of public occasions, like the 'Polyhymnia,' which describes a tilting-match held in the queen's presence in 1589, and 'The Honour of the Garter displayed,' which commemorates the installation of the unfortunate Earl of Northumberland in 1593. The dramas in Mr. Dyce's collection are six in number:—1, 'The Arraignment of Paris,' published anonymously in 1584, and assigned to Peele on the authority of his friend Nash; 2, 'The Famous Chronicle of King Edward the First,' printed in 1593 and 1599, and inserted in vol. xi. of the last edition of 'Dodsley's Old Plays,' as also in vol. iv. of the small collection called 'The Old English Drama,' 1830, 12mo.; 3, 'The Old Wives' Tale, a pleasant conceited Comedie,' printed in 1595, and chiefly remarkable as treating, in a coarse and prosaic fashion, a story closely resembling that of Milton's 'Comus;' 4, 'The Love of King David and Fair Bethsabe, with the tragedie of Absolon,' printed in 1599, and reprinted in the second volume of Hawkins's 'Origin of the English Drama,' 1773; 5, 'The Battle of Alcazar,' printed in 1594; 6, 'The Historie of the two valiant Knights, Sir Clyomon and Sir Clamydes,' printed in 1599, with no author's name, but attributed to Peele by Mr. Dyce, on the faith of a MS. marking in a very old hand on the title-page of a copy, to which not a little corroboration is afforded by the play itself. Thomas Campbell, in his 'Specimens,' has spoken of Peele more favourably than any other critic. There is more of justice in the cool estimate of his merits formed by Mr. Dyce and others. 'Those of his dramatic works which have come down to us,' says Mr. Knight, 'afford evidence that he possessed great flexibility and rhetorical power, without much invention, with very little discrimination of character, and with that tendency to extravagance in the management of his incidents, which exhibits small acquaintance with the higher principles of the dramatic art.' His inferiority to Marlowe is great and unquestioned; and perhaps it is only his musical though monotonous versification that entitles him to be compared even with Greene.

PELLERIN, JOSEPH, was born at Marli-le-Roi, near Versailles, April 27, 1684. He studied at Paris, and, besides the Latin and Greek languages, made himself master of the Italian, Spanish, and English. After completing his college studies, he learned Hebrew, Syriac, and Arabic. His knowledge of the three modern languages procured him, in 1706, a situation in the navy-office (bureau de la marine), where he was employed in making translations and extracts in those languages from the foreign correspondence of the minister. Several letters written in cipher having been seized on board a Spanish frigate on her voyage from Barcelona to Genoa, in 1709, Pellerin in a few days deciphered them without the keys. They were found to be important communications, some in French for the court of Turin, and some in Italian for the court of Naples. Torcy, then minister for foreign affairs, had an interview with Pellerin, who was soon afterwards appointed private secretary (sécrétaire de cabinet) to the secretary of state for the navy; and he held the situation when, on the death of Louis XIV., the business of the office was transacted by a council. The Comte de Thoulouse, grand admiral of France, made Pellerin a commissioner of the navy (commissaire de la marine) in 1718, and sent him on service to the great harbours of France, and in 1723 he was destined to make a general inspection of all the harbours, but a change of ministry took place, the council of the navy was suppressed, and other measures were decided on. Pellerin however still continued attached to the department of the minister for the navy, by whom he was appointed commissioner-general, and afterwards was made first clerk of the navy (premier commis de la marine), in which office his activity, probity, and firmness, combined with the suavity of his manners, met with universal approbation. In 1745 bodily infirmities compelled him to retire from the public service. His son, who had served in the navy and in the naval department of the government, succeeded him in his office.

Pellerin, during his long service of about forty years, had used the opportunities which his situations afforded him in the collection of a considerable number of coins and medals, at first from curiosity, but afterwards from a taste for them as monuments of antiquity. To occupy his leisure and alleviate his sufferings, after his retirement, he began to read, explain, classify, and arrange them. His early studies in the oriental languages, as well as in Latin and Greek, were renewed, and became a source of much gratification to him. Such was the origin of that magnificent collection of coins and medals which he formed in the course of the subsequent forty years of his life. He died at Paris, August 30, 1782, in his ninety-ninth year.

In the arrangement and classification of his medals Pellerin adopted a system different from that of any previous collector. Instead of distributing them in drawers according to difference of metals, and arranging them alphabetically without reference to the countries to which they belonged, he placed them according to certain great geographical divisions, preserving however an alphabetical arrangement of the medals of kings, nations, and towns included in each of those divisions. His descriptions of the medals, with his comments and remarks, formed a large Catalogue Raisonné, which he published under the title of 'Recueil de Médailles de Rois, Peuples, et Villes,' &c., 10 vols. 4to., Paris, 1762 to 1778. His delight in his favourite study was such that when upwards of ninety years of age and blind, he composed and wrote with his own hand, by means of an ingenious contrivance, the last volume of the work, which is entitled 'Additions,' &c. A system of arrangement and classification similar to that of Pellerin was adopted by Eckhel, in his 'Doctrina Numorum Veterum.' [ECKHEL, P. C.] Pellerin and Eckhel were probably the two greatest numismatists who have ever lived. Pellerin's collection, which consisted of 32,500 medals, was bought by the King of France, in 1776, for 300,000 francs. The king afterwards allowed Pellerin, as long as he lived, the use of the whole of the royal collection, which then amounted to about 44,000. The most important additions which have since been made to numismatics relate to the coins of the kings of Bactria. [PRINSEP, JAMES, P. C.; AFGHANISTAN, P. C. S.]

(Allier-d'Hauteroche, in *Biographie Universelle.*)

PELLISSON-FONTANIER, PAUL, was born at Béziers in 1624. He was deprived of his father at an early age, and was educated by his mother in the principles of the Reformed church. His family had for a long time been distinguished in the profession of the law, and to that profession he was also destined. He studied successively at Castres, Montauban, and Toulouse, and acquired an intimate knowledge of the best classical writers, and of French, Spanish, and Italian literature. To the study of civil law and jurisprudence he especially devoted himself; the fruits of which shortly afterwards appeared in a paraphrase of the Institutes of Justinian, which was published at Paris in 1645. He commenced his legal career with considerable success at Castres, but it was soon interrupted by a most severe attack of small-pox, which permanently affected his sight and so disfigured him that Mad. de Scuderi, though sincerely attached to him (*Menagiana*, vol. ii. p. 331, Paris, 1715), could not refrain from making him the object of her wit, by remarking that he abused the permission of being ugly.

Compelled by his infirmities to abandon the practice of his profession, he retired into the country and devoted himself to general literature. In 1652 he settled in Paris, where his writings had already made him advantageously known. The French Academy, in acknowledgment of the services he had rendered it by writing its history (the work perhaps by which he is best known), decreed that he should be appointed a member of it on the first vacancy that should occur, and that in the meantime he should be permitted to attend their sittings; to enhance the honour, they further decided that a a similar privilege should on no consideration be granted in future to any man of letters. The same year Pellisson purchased the office of secretary to the king, and the assiduous attention which he applied to the performance of his duties acquired for him a reputation for the management of public affairs. In 1657 he was appointed first clerk to the intendant of finances, Fouquet, of unfortunate celebrity. In an employment where vast sums of money passed through his hands he maintained his reputation for integrity, while his increased means enabled him to render pecuniary services to the distressed men of letters in the capital. Several traits of his generosity are recorded and their value is increased by the delicate concealment which accompanied them. (*Menagiana*, vol. ii. p. 16.) His services were rewarded by Fouquet with the appointment, in 1660, to the office of state counsellor. The following year he partook of the disgrace of his patron, and, as being the principal sharer in his fortunes and the supposed confidant of his secrets, was imprisoned in the Bastille. He remained upwards of four years in captivity, and constantly resisted every attempt which was made to induce him to divulge anything prejudicial to the interests of his benefactor. During this imprisonment he composed three Memoirs in behalf of Fouquet, which have been reckoned the finest models of that species of writing in the French language; the author of 'Le Siècle de Louis XIV.' considers them the nearest approach to the Ciceronian style that French literature possesses; they are indeed alike honourable to his talents as a writer and his feelings as a friend. They became however the plea for additional severity towards Pellisson. In order to increase the rigour of his confinement he was deprived of the use of ink and paper, the want of which compelled him to have recourse to divers ingenious expedients, such as writing on the margin of his books with the lead of the casements. He found some alleviation to his sufferings in the grateful sympathy of his friends, one of whom, Tannegui le Fevre, did not fear to incur the risk of royal displeasure by dedicating to the imprisoned advocate of a persecuted minister his edition of Lucretius and a translation of Plutarch's Treatise on Superstition. The persevering influence of his friends was at length successful in restoring him to liberty; and he was even received into favour by a king whose characteristic was seldom to forgive any opposition to his despotic will. The sufferings he had undergone at the Bastille were compensated for by a pension and the appointment of historiographer to the king. In 1670 he abjured Protestantism for the Roman Catholic faith. This change, followed soon after by his entrance into holy orders, enabled Louis XIV. to bestow upon him the abbacy of Gimont and the priory of St. Orens, a benefice of considerable value in the diocese of Auch. However, he is favourably distinguished from most proselytes by the lenient and tolerant disposition which he evinced towards those who disagreed with him in opinion, and, when high in royal favour, he publicly disapproved and opposed by his influence and writings the violent measures which were employed by the king's command [Nantes, P. C.] to bring his Protestant subjects within the pale of the Roman church. In 1671, on the occasion of the reception of the archbishop of Paris as member of the Academy, he delivered a panegyric on Louis XIV., which was translated into the Latin, English, Spanish, Portuguese, Italian, and even Arabic languages. In 1673, having incurred the displeasure of Madame de Montespan, he was deprived of his office of royal historiographer, but, at the special request of Louis, he continued to write the Life of the King, and for that purpose accompanied him in several of his campaigns. Nearly every succeeding year of Pellisson's life was marked by some instance of royal favour. His death took place at Versailles, in February, 1693. The fact of his not receiving the Sacrament in his last moments has been explained by the Roman Catholic writers to be owing to the suddenness of his death, by Protestants to his unwillingness to sanction a conversion, which they allege to be insincere, by a solemn act of hypocrisy. The arguments on both sides will be found impartially stated by Bayle (art. 'Pellisson').

The principal works of this writer, who enjoyed a greater reputation in his life-time than has been accorded to him since his death, are—1, 'Histoire de l'Académie Française,' which was first published at Paris, in 1653; the best edition is that by l'Abbé d'Olivet, by whom it has been continued, Paris, 1730. The fault of this work is generally considered to be its diffuseness; the style however is commended by Bishop Sprat, in his 'Hist. of the Royal Society of London' (part i., sect. 19). 2, 'Histoire de Louis XIV.,' which extends from the death of Mazarin, in 1661, to the peace of Nimeguen in 1678; this history has the faults to be expected in the work of a professed courtier; the best edition is that of Paris, 3 vols. in 12mo., 1749. 3, 'Abrégé de la Vie d'Anne d'Autriche,' 1666, in 4to.; a panegyric rather than a history. 4, 'Histoire de la Conquête de la Franche Comté,' in the 5th vol. of 'Les Mémoires du Père Desmolets;' this work has been greatly praised by Voltaire. 5, 'Lettres Historiques et Œuvres diverses,' 3 vols. in 12mo., 1749; the letters, 273 in number, are a journal of the king's journeys and encampments in the above-mentioned campaign. 6, 'Recueil des Pièces Galantes,' 5 vols., 1695, being a correspondence in prose and verse between him and the Comtesse de la Suze; his verse partakes of the elegance of his style in prose, but it is deficient in imagination. 7, 'Réflexions sur les Différends de la Religion,' 4 vols. 12mo., an answer to the arguments of Jurieu on religious toleration; on this treatise Bayle has made several valuable remarks in his notes on the article 'Pellisson.' 8, 'Traité de l'Eucharistie,' a work he left unfinished. The Prologue in verse of the comedy 'Les Facheux' of Molière is stated in the 'Menagiana' (vol. i. p. 90) to be by Pellisson. An edition of his select works has been published by Desessarts, Paris, 1805, 2 vols. 12mo.

(Bayle, *Dict. Historique; Biographie Universelle Classique;* Baillet, *Jugemens des Savans*, vol. ii.; *Menagiana*, vol. ii., p. 16, 89, 207, 331; vol. iii. p. 131.)

PENSTOCK, a kind of small sluice or floodgate, employed to retain or let go at pleasure the water of a mill or other pond. A cut of a simple form of penstock sluice is given under Irrigation, P. C., p. 42. See also Sluice, P. C., p. 142.

PENTZ, PENCZ, or PENS, GEORG, a celebrated German painter and engraver, was born at Nürnberg about 1500. He was first the pupil of Albrecht Dürer, and he afterwards studied the works of Raphael at Rome, probably after the death of Raphael, but before his school was dispersed in 1527. If however Pentz were born in 1510, as some accounts give, it must have been after the dispersion of the school of Raphael that he was in Rome. He died, according to Doppelmayr, in 1550, at Breslau.

Pentz was one of the most correct in design of the early German masters, perhaps the most correct. His prints are numerous, but his pictures are scarce; there are some at Nürnberg, and a few in the galleries of Berlin, Munich, and Schleissheim. Bartsch enumerates and describes 126 engravings by Pentz, of which the best are seven of the history of Tobias. He was the pupil of Marcantonio, and assisted him in some of his prints after Raphael.

(Sandrart, *Deutsche Academie*, &c.; Doppelmayr, *Historische Nachricht von den Nürnbergischen Künstlern*, &c. Bartsch, *Peintre-Graveur*.)

PEPPER-CORN RENT. [Rent, P. C.]

PERAMBULATION. A perambulation is a walking through or over ground for the purpose of settling boundaries. A perambulation of a forest is a walking over the boundaries of a forest by justices or others to fix and preserve its bounds. A perambulation of a parish is made by the minister, churchwardens, and parishioners once a year, in or about Ascension-week, for the purpose of preserving the boundaries. Usage will justify the parishioners in following the boundary over any man's land. Manors and lordships also are or may be perambulated: and there is a writ De Perambulation facienda, which ought to be sued with the assent of both parties when they are in doubt about the bounds of their lordships or manors. The writ is addressed to the sheriff, who is to execute it and make his return to the justices at Westminster on a certain day; or to the justices of assize, under his seal and the seals of those who make the perambulation with him. The king may direct the writ to other persons to make the perambulation, as well as to the sheriff. This perambulation made by assent binds the parties and their heirs. But unless both parties who assent to the perambulation are tenants in fee-simple, it seems that the perambulation shall not bind him who is in reversion.

Questions of boundaries are now generally determined by actions of trespass or ejectment.

It was an old Roman practice at the time of the Terminalia, in the month of February, to perambulate the boundaries of a district or community. The old original boundaries of the territory of Rome, which extended six miles from the city, were perambulated at the Terminalia; the boundaries between private properties were also perambulated at the Terminalia, and the usual religious offerings were made. This antient and simple mode of preserving boundaries probably fell into disuse as the land-surveyors became more skilful, and the records of boundaries were better kept. It is stated that the practice fell into disuse with the establishment of Christianity. But this is not probable. The religious ceremonies might be changed or dropped: but the fact of perambulations being still kept up in this country in the case of parishes, leads to the conjecture that the practice extended from Rome to other countries which the Romans occupied, and was retained in some form among the Christianized people in the provinces.

(Fitz-Herbert, *The New Natura Brevium*, p. 296; Rudorff, in the *Zeitschrift für Geschicht. Rechtswiss.* x. 436.)

PERCIER, CHARLES, an architect of celebrity, whose name is so intimately associated with that of his friend and professional colleague, Pierre François Louis Fontaine, that the reputation of the one is inseparable from that of the other, for both their buildings and their publications were the productions of their joint talent. Percier, whose father was a colonel of dragoons, was born at Paris, August 22, 1764; and had for his first instructor in art one Poirson, who was no more than a mere water-colour draftsman. In 1783 he entered the school of Peyre, and afterwards studied under the elder Gisors, another architect of considerable repute; and having obtained the prize for a project for a Jardin des Plantes, in 1786, he went to Rome, where he was at first quite overwhelmed and perplexed by the multiplicity of buildings and other objects of art that all at once solicited his study. It was at Rome that his friendship and connexion with Fontaine commenced, and there he also became acquainted with Flaxman, Canova, and other artists, who afterwards rose to eminence. During their residence in that city, Percier and Fontaine made the drawings which form the subjects of their first publication, viz. 'Palais, Maisons, et autres Édifices modernes, dessinés à Rome,' Paris, 1798, a folio with 100 plates, beautifully delineated and engraved in outline. In the interim, and for a while after their return, they had to contend with necessities and difficulties for a subsistence: the agitated state of public affairs was most unpropitious to their profession, more especially to beginners in it; they were therefore fain to provide for their actual subsistence by making designs for various articles of ornamental manufacture and furniture. The careful study and superior taste displayed by them, rescued them from the obscurity to which they seemed doomed, by bringing their talents in some degree before the public. Various decorations, executed by them at Malmaison for the First Consul and Madame Bonaparte, secured for them the powerful patronage of the Emperor Napoleon; and almost immediately after the commencement of his reign they were employed to restore, complete, and embellish the two palaces of the Tuileries and the Louvre, of which latter more especially the very extensive, numerous, and complicated works fully occupied them for a series of years extending to some time after the restoration of the Bourbons. This accounts for their having, with all their high reputation, been employed on so few buildings; and flattering and favourable as it was, it was not wholly without drawback, because they could not lay claim to those edifices as their own architectural creations, and their fame in them merged in the renown of their original authors. One distinct work of theirs is the arch (1806) in the Place du Carrousel, before the east front of the Tuileries; and such also are the ground staircase and other separate portions of the interior of the Louvre. The chief other monument by them is the Chapelle Expiatoire erected after the Restoration, in memory of Louis XVI. The line of houses called the Rue Rivoli adds nothing to their professional fame, it being no more than a handsome and regular piece of street architecture.

For the general celebrity attached to their names, Percier and his colleague are perhaps, after all, mainly indebted to their publications, and not least of all to that entitled 'Recueil de Decorations Interieures, contenant tout ce qui a rapport à l'Ameublement,' folio, Paris, 1812, a collection of designs for rooms and various articles of furniture in the ultra-classic style of embellishment that was affected in France at the beginning of the century, but which was so entirely matter of mere fashion, that Percier lived to see it pass away. Another publication brought out by them about the some time, was the 'Choix des plus belles Maisons de Plaisance de Rome et ses Environs,' a series not of strictly architectural studies, but pictorial views of Roman villas and their gardens. To these may be added two magnificent graphic works, one of them recording the ceremonies and pomps at Napoleon's coronation; the other, those which took place on his marriage with Marie Louise. Besides these, there is another work attributed to Percier, but which does not appear to have got into public circulation, 'Parallèle entre plusieurs Residences de Souverains de France, d'Allemagne, de Suède, do Russie, et d'Italie,' Paris, 1833, with thirty-eight plates.

Percier died September 5th, 1838.

PERCOIDEÆ (or *Percidæ*), a family of Acanthopterygious osseous fishes, of which the perch is the type. The *Percoideæ* have bodies covered with rough scales, ciliated at the margin. The edge of the opercle or preopercle is denticulated or spiny. The vomer, both jaws, and usually the palatine bones, are armed with teeth. *Perca*, *Trachinus*, and *Mullus* are British genera of this family. *Beryx* is an intertropical percoid genus, containing two or three species remarkable for bright-red colours, tinged with golden hues. *Holocentrum* is an allied genus, including very beautiful fishes, mostly tropical species. *Myripristis* differs from *Holocentrum* in the absence of opercular spines. *Trachichthys* is also a genus of this family.

PERIDI'NIUM, a genus of infusorial fossils, which occurs in flint. (Ehrenberg.)

PERIECHO'CRINUS, a genus of fossil Crinoid echinodermata, found in the Silurian strata. (Austin.)

PERI'ODUS, a fossil fish from Sheppey. (Agassiz.)

PERRY, JAMES, was born in Aberdeenshire on the 30th of October, 1756. He received the rudiments of his education at the rural parish school of Chapel of Garioch, studied Latin at the grammar-school of Aberdeen, and in the year 1771 was entered a student of Marischal College. He seems to have been destined for the profession of the law, and was for some time employed in the office of one of the attorneys, or, as they are by local usage termed, advocates, of Aberdeen. There are some local traditions of his having been found an inefficient clerk, and having stolen so much time from the unscientific details of the country practitioner's office, to be devoted to higher studies, that his master losing all patience dismissed him as incorrigible, and blighted all his prospects of becoming a prosperous country attorney. Perry was master of that ordinary Scottish education which fits its owner for many of the progressive and less-established departments of business or literature. He first proceeded to Edinburgh, where he in vain attempted to procure the means of livelihood. He went afterwards to Manchester, and was rather more fortunate, obtaining employment as clerk to a manufacturer. He had all along occupied his hours of involuntary leisure in cultivating his mind, and fitting himself for those higher walks of industry which he felt an innate capacity to occupy. He had shown intelligence and ability as a member of a debating society in Manchester, and went thence in 1771 with introductions to people of some influence in London. Among the friends who had made him general promises of assistance in procuring a situation was Mr. Urquhart the bookseller. Perry had in the mean time dropped some anonymous contributions into the letter-box of the 'General Advertiser,' which duly appeared in its columns. In one of his unsuccessful visits to Urquhart, that gentleman, who had been highly pleased with the last subject of his reading, pointed to an article in the Advertiser, and told Perry that if he could write *like that* he would at once procure an engagement. The delighted aspirant claimed the article as his own, and produced from his pocket the next contribution, which he was about to drop into the letter-box. He was immediately engaged as a stipendiary contributor, both to the 'General Advertiser' and the 'Evening Post.' During the trials of Keppel and Palliser, he surprised the London world by the rapidity and completeness of the reports of the proceedings. Becoming subsequently editor of the 'Gazetteer,' he systematised the method of rapid reporting, by establishing the employment of relays of reporters, which has made so marked a change in the nature of the daily press. He became afterwards joint proprietor and editor of the 'Morning Chronicle,' to which he communicated a decided Whig spirit, which it has ever since retained. From his marked position he was the first selected to be the victim of Sir Vicary Gibbs's attempt to crush the independent press. On the 24th February, 1810, his case came on for trial before Lord Elleuborough and a special jury, on an *ex officio* information for libel. The substance of the charge was a reprint in the Chronicle of a paper in the 'Examiner' descriptive of the blessings which might be anticipated from a new reign commencing with a change of system. This was interpreted as an insinuation that the existence of George III. was a barrier to improvement. Perry defended himself, maintaining his right to inculcate the necessity of improvement, and to look with hopeful anticipations towards any quarter whence it might come. He said that the doctrine maintained in the paragraph—the necessity of a change—had not been said in one solitary instance, but was the doctrine he had ever promulgated since he had risen to manhood. The jury pronounced a verdict of Not guilty, and the other official informations were dropped. Mr. Perry died at Brighton on the 6th December, 1821. He was the author of some pamphlets and poetical pieces, the reputation of which was temporary.

PERSPIRATION. [SKIN, P. C.]

PESNE or PENE, JEAN, a French painter and engraver, distinguished chiefly for his excellent prints after N. Poussin. He was born at Rouen in 1623, and died at Paris in 1700. The chief merit of his prints after Poussin is the preservation of the peculiar style of that painter: they are generally of a large size, and are valued by collectors. He engraved also many prints, chiefly landscapes, after Annibal Carracci.

(Watelet et Levesque, *Dictionnaire des Beaux Acts*; Huber, *Manuel des Amateurs*, &c.)

PETASITES. [TUSSILAGO, P. C.]

PETECHIAL FEVER. [PETECHIÆ, P. C.]

PETIT SERJEANTY. [SERJEANT, P. C.]

PETIVE'RIA (in honour of Mr. James Petiver of London) a genus of plants belonging to the natural order Petiveriaceæ. It has 6, 7, or 8 stamens; 4 permanent styles, at length becoming spiny and reflexed; the point is armed with spines at the apex. The species are West Indian herbs, and in pastures are troublesome weeds, giving an unpleasant flavour to the milk of cows which feed upon them.

P. alliacea, Guinea-hen Weed, is a small bush with a disagreeable odour. It bears an erect downy stem, not branched, and of a deep green colour. The leaves are oblong-obovate or oblong-lanceolate, acute and scabrous at the edge, glandular near the petiole, which is both glandular and downy; the stipules are small and spiny. The spikes are long, slender, and drooping at the upper end. The flowers are white, and placed close to the rachis, which is angular; the calyx 4-parted with linear spreading segments, which afterwards become erect, leafy, and cover the fruit. The juices of this plant are excessively acrid, and if a small portion of it be chewed it will render the tongue as dry, rough, and black as in cases of malignant fever.

The negroes consider it a sudorific, and say that fumigations or vapour-baths of it will restore motion to paralysed limbs. The roots are used in the West Indies as a cure for toothache; the negresses also employ it to procure abortion. The plant is rejected by most animals as food. Pintados alone seem fond of it; hence its common name *Guinea-hen weed*.

Martius says *P. tetandra*, another species, is employed in Brazil, under the name of *Raiy de Pipi*, in warm baths and lotions for defective contractility of the muscles or in paralysis of the limbs.

(Lindley's *Flora Medica;* Burnett's *Outlines of Botany.*)

PETROSELI'NUM (πετροσέλινον, which means 'rock parsley,' rock being the habitat of the species,) a genus of the plants belonging to the natural order Umbelliferae. It has an obsolete calyx; roundish entire incurved petals, scarcely emarginate, contracted into an inflexed lobe. Tho disk is short and somewhat annulate. The fruit ovate and contracted at the side. The species are smooth-hranched herbs. The leaves decompound, with wedge-shaped segments. The involucels many-leaved; the flowers are white or greenish, uniform; those of the disk often sterile. The stamens longer than the corolla.

P. sativum, common Parsley, is described under PARSLEY, P. C.

P. segetum, Corn Honewort, has pinnate lower leaves: nearly sessile leaflets, ovate and serrated, the upper leaves entire or trifid. The umbels are very irregular, the general involucre having from 1 to 2 leaves. The flowers are whitish, the stem erect, roundish, nearly leafless above from a foot and a half high. It is found on damp fields in a calcareous soil in Great Britain, France, and Switzerland. Goodyer has given an accurate account of this herb, and says that the origin of its name was from the fact of its having cured a swelling in the cheek called a hone.

The species are easily cultivated and can be raised only from seed.

(Don's *Gardener's Dictionary;* Babington's *Man. of Brit. Bot.;* Lindley's *Flora Medica;* Burnett's *Outlines of Botany.*)

PEUCE, a fossil Coniferous tree, of which the species occur in the oolitic strata. (Witham.)

PEUCE'DANUM (the πευκέδανον of Theophrastus and Dioscorides, from πεύκη a pine, on account of the resinous smell of the plant), a genus of plants belonging to the natural order Umbelliferæ and the tribe Peucedaneæ. It has a calyx of 5 teeth, obovate petals, contracted into an inflexed segment, emarginate or nearly entire. The fruit has a dilated thin flat margin, the carpels with equidistant ridges, 3 dorsal filaments, 2 lateral close to the base of the dilated margin obsolete. The interstices have single linear vittæ. The species are perennials, generally smooth. The leavea are pinnated, more or less compound. The flowers are white, yellow, or yellowish green.

P. officinale, Sulphur-wort, or Hog's-fennel, is a smooth herb 3 or 4 feet high, with a resinous juice and a strong sulphureous smell. The leaves are four or even five times ternate, with linear lanceolate acuminate flaccid segments. The involucre 3-leaved and deciduous; the pedicels much shorter than the fruit. The fruit of a pale brown colour, the vittæ of a deep chocolate; the primary ridges much depressed and paler. The commissure a light fawn-colour with two crimson vittæ very evident upon it. It is native in marshy and shady places throughout Europe and in Great Britain. The juice of the root of this plant is resinous and has a peculiarly strong smell. Many stimulating qualities have been attributed to it, and it is reputed anti-spasmodic and diuretic, but it seems to be rather a dangerous internal remedy.

P. oreoselinum has a taper striated stem. Triternate leaves with tho petioles hroken back, the leaflets remote, ovate, deeply pinnatifid and shining. The fruit is roundish oval. The flowers white with a tinge of blue. The leaves and stem are bitter and aromatic, as is the fruit in a higher degree. They were formerly used as stimulants, and are still esteemed in some countries.

P. montanum is a native of the north and middle of Europe, and has a tapering simple root with many long fibres. The stem is erect from 4 to 5 feet high, hollow, deeply furrowed, smooth branched, and corymbose at the top, and of a bright purple colour at the base. There are about 5 or 6 leaves on a stem, which are alternate, remote, and with hipinnate divisions; the leaflets are opposite, deeply pinnatifid, dark green and smooth; the petioles striated, smooth, with a reddish membranous margin. The flowers are white and numerous; the fruit a very light straw-colour, shining and obovate. The root is said to supply the place of ginger in Russia. The whole plant abounds in a white bitter fetid juice which soon hardens into a hrown acrid resin. It is a famous remedy in Courland in epilepsy.

P. palustre has 3-pinnate leaves pinnatifid with linear lanceolate acuminate segments, the general involucre of many persistent lanceolate deflexed leaves. The stem is furrowed and from 3 to 5 feet high. The flowers are white. It is found in Great Britain, but rarely. Any common garden soil will suit the species of Peucedanum, and they are easily raised from seed.

(Don's *Gardener's Dictionary;* Babington's *Man. of Brit Bot.;* Lindley's *Flora Medica;* Burnett's *Outlines of Botany;* Lindley's *Vegetable Kingdom.*)

PEVENSEY. [SUSSEX, P. C.]

PEZI'ZA. [HYMENOMYCETES, P. C. S.]

PHACOPS, a genus of Trilobites, found in the Silurian strata. (Emmerich.)

PHALÆNA, one of the three Linnæan genera of Lepidopterous insects. It corresponded to the division *Nocturna* in the arrangement of Latreille. It included the Night-moths. The *Phalænæ* are now distributed among many genera, all of which form part of the division *Heterocera* in M. Boisduval's arrangement of *Lepidoptera.*

PHALLUS. [GASTEROMYCETES, P. C. S.]

PHANEROTI'NUS, a genus of fossil Gasteropoda, from the mountain-limestone of England and Ireland. (Sowerby.)

PHANTASMAGO'RIA. [MAGIC LANTERN, P. C. S.]

PHARBI'TIS, a genus of plants belonging to the natural order Convolvulaceæ. It has 5 sepals, a campanulate funnel-shaped corolla, one style, a capitate granular stigma, a 3-celled rarely 4-celled ovary, and 2-seeded cells. The species of this genus are easily distinguished from others of the same order: they are mostly climbing American herbs, usually beset with retrograde hairs.

P. Nil has twining annual round hairy branches and stem stalked, 3-lobed, downy leaves, axillary peduncles from 2- to 3-flowered, the flowers large, of a beautiful light bright blue colour. The capsulo is much shorter than the calyx, smooth, 3-celled, with two seeds in each cell. The seeds are sold in apothecaries' shops of Calcutta under the name of 'Kala dana' and are said to act as a purgative and an effectual speedy cathartic. They are roasted like coffee, powdered, and administered in doses of from 30 to 40 grains. It is native of the tropics in every part, and in tho South Sea Islands.

There are about fifteen species of this genus, but the one described is the only one of use in medicine. They are however showy plants, and should be reared in a hotbed and then planted out in a warm sheltered situation. A light rich soil or a mixture of loam and decayed leaves suits them best.

(Don's *Gardener's Dictionary;* Lindley's *Flora Medica.*)

PHASCOCHŒRUS. [SUIDÆ, P. C.]

PHILLIPS, THOMAS, R.A., one of the most distinguished English portrait painters, was born at Dudley, in Warwickshire, October 18, 1770. He was placed very early with Mr. Edgington at Birmingham to learn to paint on glass; and he came to London in 1790 with a letter of introduction to West, who employed him at Windsor on the glass paintings in St. George's Chapel. In 1792 Phillips exhibited a view of Windsor Castle from the north-east; and in the following year he exhibited two historical pictures—the Death of Talbot, earl of Shrewsbury, at the Battle of Cassillon, and Ruth and her Mother-in-law. He exhibited likewise two pictures of similar classes in 1794—Cupid disarmed by Euphrosyne, and Elijah returning the recovered Child to the Widow. He seems in the year 1796 to have already turned his attention to portrait painting, for from that year he appears chiefly in the Exhibition notices as a portrait painter, though he occasionally painted some historical pieces. It is as a portrait painter however that he acquired his reputation, and as such he will be known; for nearly half a century he was a favourite exhibitor, and for a great portion of the timo the encouragement he met with was not limited to applause, as is often the case, but he was substantially patronised, and fully occupied, notwithstanding the rivalry of Hoppner, Owen, Jackson, Lawrence, and others of nearly equal reputation; few however of the nobility sat to him.

In 1804 he removed into No. 8, George-street, Hanover-square, where he remained until his death. In 1808 he was made a member of the Royal Academy, to which he presented a picture of Venus and Adonis as his diploma piece: there is a large picture of this subject hy him in Stafford House. In 1824 he succeeded Fuseli in the professorship of painting, an office which he held until 1832; and he delivered in all ten lectures, which he published together in one volume 8vo. in 1833, dedicated to the Earl of Egremont, under the title 'Lectures on the History and Principles of Painting:' the first four lectures are on the History of Painting; the fifth is on Invention; the sixth on Design; the seventh on Composition; the eighth on Colouring; the ninth on Chiaroscuro; and the tenth on the Application of the Principles of Painting. These lectures are clear and simple in their style, and instructive in substance and arrangement, especially in some of the author's expositions of his views of the principles of art. The author made a tour in Italy in company with Hilton, in 1824, after his appointment to the professorship, and before the delivery of any lectures, in order to be able to discharge the duties of his office more efficiently. He died April 20, 1845. He was one of the trustees of the Royal Academy. The following are some of Phillips' principal portraits:—A portrait of Lord Thurlow, painted in 1802; one of Napoleon, of the same year, but which was painted chiefly from memory, Napoleon did not sit to Phillips; the Prince of Wales, in 1806; Blake the painter, in 1807; Sir Joseph Banks as president of the Royal Society, in 1809; two of Lord Byron, in 1814, one in an Albanian dress; Hetman Count Platoff, the Cossack general, on his charger, in 1816, the horse was painted by J. Ward, R.A.; Sir F. Chantrey, in 1818; the poet Crabbe, for Mr. Murray, in 1819; Earl Grey and Lord Brougham, in 1820; the Duke of York, for the town-hall of Liverpool, in 1823; Major Denham, the African traveller, the best of his portraits according to Lawrence, in 1826; Lord Stowell, Sir E. Parry, and Sir J. Brunell, in 1827; Wilkie, in 1829; Mrs. Somerville and Sir Francis Burdett, in 1834; Mr. Justice Littledale and Lord Lyndhurst, in 1836; W. Currie, Esq., first mayor of Liverpool under the Municipal Reform Bill, painted for the town-hall of Liverpool, and Lord William Bentinck, in 1838; Rev. Dr. Arnold, and the late Earl of Egremont, a posthumous portrait, in 1839; the Duke of Sussex in the chair of the Royal Society, and Sir Nicholas C. Tindal, late Lord Chief Justice of the Common Pleas, in 1840; Dr. Shuttleworth, late Bishop of Chichester, and George Green, Esq., for the town-hall, Poplar, in 1842; and others in 1843 and 1844. He painted also portraits of Lord Byron and some other poets and writers for the late Mr. Murray, of Albemarle-street, comprising those of Sir Walter Scott, Camphell, Southey, Coleridge, Crabbe, and others. He painted very few pictures besides portraits after the establishment of his name as a portrait-painter. He exhibited a piece called Field Sports in 1832; Rebecca, in 1833; a Nymph Reposing, in 1837; and in 1839 a picture of Flora MacIvor having received the letter sent to her by her brother Fergus on the morning of his execution at Carlisle. His last picture of this class is said to be the Expulsion from Paradise, at Petworth. He was the author of several articles on painting in Rees's 'Cyclopædia.'

(*Athenæum*, 1845; *Catalogues of the Exhibitions of the Royal Academy;* and the Artist's *Lectures*.)

PHILLIPSIA, a genus of Trilobites, found in the mountain-limestone strata of England and Ireland. (Portlock.)

PHILOSOPHY OF THE HUMAN MIND. [METAPHYSICS, P. C.]

PHILOSOPHY, POSITIVE. The distinction of philosophy as positive and negative, is chiefly to be found in the German school. Thus Kant's 'Kritik der Reinen Vernunft,' his 'Prolegomena zu einer jeden Künftigen Metaphysik,' and his 'Kritik der Urtheilskraft,' are regarded as forming a sort of Prima Philosophia, preparatory to a positive or formal and detailed system of metaphysics. For though the philosophies which have successively arisen in Germany since Kant's day, such as the Scientific-doctrine of Fichte, the Transcendental Idealism of Schelling, the Phenomenology and Logic of Hegel, or the Metaphysic of Herbart, are all genealogically descended from Kant's Critical review (the review which reason was made by him to engage in, of the faculties of the soul), yet Kant himself, in his Kritik, did not profess to do more than pave the way for a system or dogmatik of speculative philosophy. Hence Rixner observes:—'Billig haben alle die sein Lehrgebäude nicht selbst für ächte Philosophie im positiven Sinne, sondern nur für Philosophie im negativen Sinne, d. h. für universalen Protestantismus gegen alle philosophische Anmassungen des seine eigne Grenzen misskennenden Verstandes erkannt und gehalten. Denn überall verfährt Kant nur kritisirend, nicht construirend' (*Geschichte der Philosoph.* Bd. iii. § 129). 'Those are right who have regarded Kant's doctrine not as genuine philosophy in the *positive* sense, but as philosophy in the *negative* sense—that is, as a universal protest against all the philosophical pretensions of an understanding which does not know its own limits. For Kant proceeds throughout, only in the way of criticism, not constructing a system.' We have quoted the words of Rixner to exemplify the use of the term *positive*, as distinguished from that of the term negative, in this school of philosophy. Kant's main question proposed for solution in the criticism of reason was, 'are metaphysics possible?' or, are synthetic judgments *à priori* possible?—judgments, or propositions, that is—the truth of which is not learned from experience, and which also are not merely analytical, or judgments in which the predicate barely unfolds the subject. Thus 'all body is extended,' is an analytical judgment: 'all men are mortal,' is synthetical indeed, but then it is *à posteriori*, being founded on experience: but, 'every change must have a cause,' is synthetical *à priori*, being universal and necessary, and founded in nothing but 'pure understanding and reason.' Now all such axioms, conceptions, and principles as are *à priori*, being enumerated, are regarded by those who make a distinction between positive and negative philosophy, as forming a negative philosophy, or as drawing the ground for a positive constructive system. Kant held out the expectation of such a system, as a superstructure to be erected by himself on the basis of the 'Kritik:' such a system of pure speculative reason I hope 'to furnish myself, under the title, Metaphysic of Nature; which shall have far richer matter than this Kritik, though the latter was necessary, first, to exhibit the sources and conditions of its possibility, and to cleanse and level a soil altogether overgrown with weeds' (*Kritik: Vorrede*). Such a system would have been, in the German phrase, a positive philosophy: but the Transcendental Criticism professes only to examine and secure the foundation on which, the author says, 'every future metaphysic' must be built, and is, relatively to such supposed system, merely negative.

PHLEBO'PTERIS, a genus of fossil Ferns, from the oolite of Yorkshire. (Brongniart.)

PHLIA'SIA was a small territory bounded by Sicyonia and Corinthia on the north and Arcadia on the west. The chief town, Phlius, is mentioned in Homer under the name of Aræthyrea. The old Phliasians were Argeii, but the population became Dorian in consequence of the invasion of the Heraclidae (Pausanias, ii. 12) and the settlement of some Dorians in the territory. This little state sent a contingent of 200 men to oppose the Persians at Thermopylae, B.C. 480, and in the following year it sent 1000 men to oppose them at Plataea. (Herod. vii. 202; ix. 28.) In the Peloponnesian war the Phliasians were on the side of the Spartans, as was natural, inasmuch as they were a Dorian state. Its position and comparative feebleness exposed it to hostile invasions from the Athenians, when they were leagued with Sparta, and from Sparta when a cause of quarrel arose with that more powerful state. When Phlius was reduced by Agesilaus, B.C. 379, it had above 5000 citizens. (Xenophon, *Hellen.* v. 3, 11.) At the time of the formation of the Achæan league, Phlius was under a tyrant, Cleonymus, who abdicated his power and induced the people to join the confederation.

Phlius is placed by Pausanias at the distance of 40 stadia from Titane, and he adds that the road to Phlius from Sicyon was straight. The site of the old town is supposed to be at Agios Giorgios (St. George), and there are said to be traces of several temples on the height above the river Asopus. Pausanias mentions two temples on the acropolis, a temple of Aesculapius on the right below the fort of the acropolis, and a theatre near it. Celeae, a small place, was four stadia from Phlius.

(Pausanias, ii. 12, &c.; Strabo, p. 382, ed. Casaubon; Cramer's *Greece*, iii. 288.)

PHLIUS. [PHLIASIA.]

PHOLIDO'PHORUS, a genus of fossil fishes, from the lias of England. (Agassiz.)

PHOSPHORESCENCE IN PLANTS AND ANIMALS. Organic bodies under certain circumstances become luminous, and upon the supposition that this appearance depends on the combustion of phosphorus at a low temperature, the phenomenon has been called phosphorescence. This luminosity is very constantly developed under the same circumstances in both animals and plants. It is observed both during the decomposition of the bodies of plants and animals as well as whilst they are still living. The oldest observations on this subject were made on the wood of trees whilst in a state of decay. This however takes place only under peculiar circumstances. It generally occurs when the wood of trees is buried in the earth whilst they are in a green state, and does not take place when wood is allowed to decompose in the usual way and in free contact with the air. It is also found that the phosphorescence does not take place when the wood is allowed to decompose in a damp place. Wood exhibiting this property will retain it for a long period when kept in a dry place. Albrecht observed luminosity in a tree during the night at a spot where one of its branches had been torn off. Decaying fungi have been often observed to emit this light. Travellers in tropical climates have observed that when plants containing a milky juice are wounded, the juice frequently becomes luminous, whilst it is descending the sides of the tree. The cause of this phenomenon in decaying plants is probably owing to a slow decomposition of the tissues attended with a union of oxygen gas, but what determines the development of light under these more than other circumstances is still unknown.

In living plants luminosity has been frequently observed. It is most constant amongst some forms of fungi, especially of the genus Rhizomorphæ. In the coal-mines in the vicinity of Dresden the species of Rhizomorphæ are so numerous as to 'dazzle the eye by the brilliant light they afford.' [BYSSACEÆ, P. C. S.] The light from decaying wood, as also from the living Rhizomorphæ, continues although they are immersed in irrespirable gases, linseed oil, phosphoric acid gas, oxygen, &c. The phenomenon in both the living and the dead plants is probably due to the same cause.

Another class of plants in which light has been observed is the Mosses. Several species of the genus Schistostega, which grow in caverns and other damp places, have been observed to give out light. Mr. Babington and other botanists have observed it in this country in the *S. pennata*; whilst Funk, Brandenburg, Nees von Esenbeck, Hornschuche, Struve, Unger, Bridel-Briderei and Agardh, have observed it on the continent of Europe. The two latter attributed this light to a small alga, which Bridel-Briderei called Catoptridium smaragdinum, and Agardh called Protococcus smaragdinus, which they supposed was parasitic on the moss. Unger however has examined the moss accurately, and finds that at certain seasons the utricles of this moss assume a globular form, and being partly transparent, the light is refracted and reflected in such a way as to present a luminosity on the surface of the vesicles.

Another class of these phenomena is that which is exhibited by the flowers of some plants. The first observation on this subject was recorded by Linnæus, and made by his daughter Christina Linnè. She was walking in the garden one hot summer's evening, when she observed the flowers of Tropæolum majus to give forth a stream of light. This was attributed by many to an optical illusion, but the fact has since been repeatedly observed on this as well as other plants. We are not perhaps in a position to say this was not an optical illusion; but if it was, one would expect that it should be more constant. It has also been seen by several observers at the same time in different positions, and when one has seen it, the others have seen it also. A correspondent of the 'Gardener's Chronicle,' October, 1843, says 'I have frequently observed the luminous appearance of garden plants, and have looked for it in each succeeding summer on the double marygold, and more especially on the Papaver pilosum, the hairy red poppy, in my garden at Worcestershire. In the evening after a hot dry day, the flashes of light have afforded much amusement to myself and others.' It is to this phenomenon that Coleridge alludes in the following lines:—

'Tis said on summer's evening hour
Flashes the golden-colour'd flower
A fair electric flame.

Decaying animal bodies frequently emit a luminous appearance, which has generally been attributed to the presence of phosphate of lime in their skeletons, which become decomposed and yield phosphorus when exposed to the action of organic compounds in a state of decomposition. It is to this cause that the luminosity of putrefying fish is attributed. Light has also been observed on the bodies of those dying of spontaneous combustion. [COMBUSTION, SPONTANEOUS, P. C. S.] But the emission of light is a very constant phenomenon of many of the invertebrate animals under peculiar circumstances. Thus during warm weather, when a vessel passes through the ocean, the waves frequently exhibit a diffused lustre with here and there streaks and stars of a brighter light. This occurs in our own climate, but the phosphorescence is much more brilliant in tropical seas. Poeppig, in his 'Reise in Chili, Peru, und auf dem Amazonstrome,' describes this phenomenon in an equatorial sea. 'Whilst one side of the vessel is still illuminated by the last fading rays of the evening sun and the opposite side darkened by the shade of the sails, the sea in this direction already becomes brilliant. One spot after another begins to be illuminated, indistinct stripes of light commence glimmering from greater depths, till at last, with the approach of night, a new creation seems to be called into existence. These illuminated beings move in various directions, sometimes appearing like sparks, sometimes like a radiating ball of fire, at others darting through the dark surface of the water like a rapid flash of lightning. A great number of these beings are undoubtedly true night animals which conceal themselves during daylight in the dark depths of the ocean.'

These lights in the sea are principally produced by various species of the family Acalephæ, or jelly-fishes. The light emitted by these animals seems to be due to the secretions on the surface of their bodies, for when this secretion is removed it retains for some hours its luminous character, and will even impart it to milk or water. But this property is not confined to the Acalephæ; many species of Polypifera, some of the Echinodermata, and the lower forms of Mollusca, also exhibit this appearance. Some few of the Crustacea and even fishes have been observed to possess the same property.

Amongst insects this phenomenon is not uncommon. Those which possess the greatest luminous power belong to the Coleoptera, the beetle tribe, and of these the two families represented by the fire-fly—the Elateridæ, and the glow-worm—the Lampyridæ, are the most distinguished. [ELATERIDÆ, P. C.; LAMPYRIDÆ, P. C.] Some of the species of the tribes of Myriapoda and Annelida give out light occasionally, as the centipede and the common earth-worm.

(Meyen, *Pflanzen-Physiologie*, Band ii.; Carpenter, *Animal Physiology*; Lankester, *Gardener's Chronicle*, 1843.)

PHOSPHORUS, BOLOGNIAN, is one of the most powerful of the solar phosphoric substances, and was the accidental discovery of Vincenzio Cascariolo, a shoemaker of Bologna, who about the year 1630, being engaged in some alchemical experiments, had occasion to calcine a quantity of native sulphate of barytes, found near Bologna, at Monte Paterno. He observed that whenever this mineral had been sufficiently heated, it acquired the property of shining in the dark after having been exposed to the sun's rays, and that it would even continue thus to emit light for some hours.

The best mode of preparing this phosphorus became a subject of no small pecuniary importance, and a family of the name of Zagoni appear to have been the most successful preparers of it; their process however is not exactly known; but if sulphate of barytes, obtained from any source, be powdered, made into cakes with gum tragacanth, and calcined carefully, they will be found to answer the purpose.

PHOTOGRAPHY. In the brief notice of this art given under PHOTOGENIC DRAWINGS, P. C., p. 113, very slight reference is made to any other processes than that of M. Daguerre, in which the images produced by the action of light in a camera-obscura are, by chemical agency, permanently impressed upon prepared metallic plates; although it is intimated that similar effects had been, though less perfectly, produced upon paper. Since the date of that article (1840), many curious facts have been discovered respecting the chemical action of light, and the various means of rendering the results of such action both permanent and visible to the eye in a pictorial form, although even yet the art of photography, or light-drawing, remains in an experimental state. We shall therefore merely notice a few general points, referring the more curious to the scientific journals of the last few years, and especially to the numerous papers published in the 'Athenæum' and the 'Art-Union,' for further information as to the processes employed, the discoveries made, and the theories proposed, by the numerous individuals, in this and other countries, whose ingenuity has been called into exercise by this new and curious art. One of these individuals, Mr. Robert Hunt, secretary to the Royal Cornwall Geological Society, published in 1844, in an octavo volume, a valuable contribution to the history of photography, under the title of 'Researches on Light,' professing to contain 'an examination of all the phenomena connected with the chemical and molecular changes produced by the influence of the solar rays; embracing all the known photographic processes, and new discoveries in the art.'

Though not absolutely the earliest as regards the date of its discovery, the Daguerréotype claims notice before any other branch of the art of photography, from the circumstance of its having been the first to attract general attention, and being also that which appears to have made the nearest approach to practical perfection. The peculiarities of Daguerréotype pictures being already described under PHOTOGENIC DRAWINGS, P. C., it is only necessary here to refer to some of the more important recent improvements, in consequence of which the practice of the art is steadily gaining ground, it being already extensively employed for the production of miniature-portraits, views of buildings, &c. A pretty full account, illustrated with engravings of the apparatus employed, of the Daguerréotype process, both as originally practised in this country under Daguerre's patent, and as modified by the subsequent patents of Mr. Richard Beard and M. A. J. F. Claudet (both of whom had purchased licences of M. Daguerre), is given in the 'Supplement' to Dr. Ure's 'Dictionary of Arts,' &c., art. 'Daguerrotype;' and in the fifty-fifth volume of the 'Transactions' of the Society of Arts (pp. 89-110), is a paper presented to the Society, in December, 1843, by M. Claudet, on 'The Progress and present State of the Daguerréotype Art,' in which much valuable information is conveyed. In addition to such improvements as could only be satisfactorily explained in connection with a minute account of the process, these sources of information show that much has been done in rendering Daguerréotype portraits more correct and more pleasing by the improved management of light, and by placing behind the sitters painted screens, to relieve the head, and to form artificial backgrounds. One of the greatest difficulties in the original process arose from the circumstance, that, as the image produced in the camera-obscura was totally invisible until brought out by a subsequent exposure to the vapour of mercury, it was impossible to tell precisely at what moment the action of the light should be stopped, to avoid, on the one hand, an image imperfectly developed, and, on the other, the misty, indefinite appearance occasioned by the unavoidable motion of the object to be copied (whenever it is an animate object), and the discoloured or burnt appearance of an image which has been exposed too long to the chemical action of light. This inconvenience is remedied by M. Claudet's method of applying the mercurial vapour in the camera-obscura simultaneously with the action of light, and providing means to enable the operator to watch the progressive development of the image. One important class of improvements has reference to the means of fixing and securing from injury by the subsequent action of light or other means, the Daguerréotype image. M. Claudet, in the paper above referred to, after alluding to some inventions for this purpose, observes, that 'it was left to Mr. Fizeau to discover what has proved one of the greatest improvements in the Daguerréotype process, and which consists in fixing the delicate image by means of a transparent coating of gold, applied by boiling upon the plate a solution of chloride of gold, which not only renders the image more durable, but has the advantage of increasing the tint, so that a picture fixed by Mr. Fizeau's process is rendered more forcible, and the mirror-like effect is almost destroyed. In the 'Athenæum' for 1843, pp. 92, 93, is an account of experiments, by M. Ulex, of Hamburg, to test the durability of Daguerréotype impressions, from which it would appear that they may be rendered insensible to the action of light, and of some more trying chemical agencies; and that even when rubbed away with leather and rotten-stone, they may be reproduced by the action of heat. On p. 292 of the same volume is an announcement of a method of Daguerréotyping in colours, by Professor Böttiger, of Frankfort-on-the-Main, by which, however, it is observed that 'as yet he has only succeeded in bringing out three colours, of which the flesh-colour is the most perfect.' In the absence, however, of any further and fuller account of this invention, we are led, from the results obtained by other experimentalists, to suspect that in this, as in the other cases about to be mentioned, the colouring was not simply the result of the action of variously coloured rays. In the ordinary coloured Daguerréotypes, some of which make a tolerably near approach to the effect which might be expected if colours could be fixed in the camera-obscura, the tinting is produced by the application of finely-powdered colours to the surface of the photographic impression, which is previously coated with an alcoholic solution of copal, and nearly dried; so that the colouring, which is so delicately performed as not to impair the distinctness of the impression, is not in any degree the result of the action of light. Since this mode of colouring photographic drawings has been in use, a new and ingenious process has been invented by C. G. Page, professor of chemistry in Columbia College, U. S., for producing a similar effect by forming coloured oxides of copper upon the surface of the Daguerréotype plates, in lieu of the deposit of gold invented by Fizeau. An account of this process, reprinted from 'Silliman's Journal,' appeared in the 'Athenæum' for 1845, p. 277. Mr. Fizeau, the inventor of the mode of fixing Daguerréotypes by a golden deposit, has also devised a process, of which an account was presented by Mr. Goadby to tho British Association in 1846, for *etching* or biting in the photographic impression by the aid of an acid menstruum; by which means the Daguerréotype is converted into a perfect, though very faintly-engraved, plate, capable of yielding impressions. Though too delicate for use under ordinary circumstances, such plates may be finished by an engraver, and it is anticipated that the process may be advantageously applied to minute anatomical illustrations, and similar purposes in which the utmost fidelity and delicacy are required. M. Claudet, in the paper above quoted, mentions the names of M. Donné, of Paris, Dr. Berrès, of Vienna, and Professor Grove, in England, as having, concurrently with Mr. Fizeau, attempted to accomplish this object. Before turning to other branches of the art of photography we may quote from the conclusion of M. Claudet's paper the remark that, notwithstanding the very recent origin of the Daguerréotype, it already ranks as one of the most prominent inventions of the present day, leaving scarcely anything to look for in the way of improvement. 'It is true,' he adds, 'that it remains to find the means of reproducing the natural colours of objects; but, although there seems no dream too marvellous in the progress of discovery, still the idea of fixing the colours of the object in the camera-obscura is so little in accordance with the present state of science, and with the properties of the known elements, that we must be satisfied with the process as it is.'

The process invented by Mr. H. Fox Talbot, and known most commonly by the name of *Calotype*, but recently called, in commemoration of its inventor, *Talbotype*, is a photographic process widely different from that of M. Daguerre, and one which, though not brought to so great perfection as regards the representation of minute details, claims some important advantages in point of cheapness and convenience. Mr. Talbot's experiments were suggested by an unsatisfactory attempt to use the camera-lucida for the purpose of sketching, in October, 1833; but although his photographic researches date from that time, his invention of the Calotype process was not completed until September, 1840, since which time some minor improvements have been made. Both the original invention and its subsequent modifications are secured by patent. In a description of the process communicated shortly after its invention to the Royal Society, and published in the 'Athenæum' for 1841, pp. 540, 541, Mr. Talbot gives directions, from which the following are abridged, for the preparation of the photographic paper which, in this branch of photography, is used instead of the silvered plate, of M. Daguerre.

The paper, which should be of the best kind of writing paper, smooth, of a close and even texture, and without water-marks, is in the first instance to be washed on one side with a solution of 100 grains of crystallized nitrate of silver in six ounces of distilled water; the solution being applied with a soft brush, and the surface either dried cautiously at a distant fire, or spontaneously in a dark room. In performing this operation the prepared side should be marked, as the paper is not visibly changed by it. When dry, or nearly so, it is dipped in a solution consisting of 500 grains of iodide of potassium dissolved in a pint of water, and left in that solution for two or three minutes, after which it is dipped into pure water, partially dried with blotting-paper, and then finished drying either spontaneously or by a fire, which will not now injure it. These processes, which it is best to perform by candle-light, produce what Mr. Talbot calls *iodized paper*, which is coated with a pale yellow iodide of silver. Though not very sensitive to light, it should be kept shut up in a portfolio or drawer until wanted for use; and if so protected from the light, it may be kept for any length of time. When required for use, but not until then, the iodized paper is to be washed with a solution which the inventor calls gallo-nitrate of silver, which is thus prepared:—In one vessel dissolve 100 grains of crystallized nitrate of silver in two ounces of distilled water, and add to the solution one-sixth of its volume of strong acetic acid. In another vessel make a saturated solution of crystallized gallic acid (of which very little will dissolve) in cold distilled water. Keep these two solutions separate, but mix them in equal volumes as required, and wash the prepared or marked side of the paper with the mixture, applied with a soft brush, observing that the operation must be performed by candle-light. After a pause of half a minute the paper should be dipped into pure water, then blotted dry, and finally dried at a considerable distance from a fire. It is then ready for use, and if kept in a press, secluded from light, it will sometimes remain good for three months; but as this is not to be depended upon, Mr. Talbot recommends the final preparation of the paper only a few hours before using it. It is so sensitive, that a momentary exposure to light, even on a clouded winter day, is sufficient to produce an impression; but the impression so produced is latent and invisible. In this state the paper is subjected to the action of light in a camera-obscura, after which the image is brought out by washing it again with the gallo-nitrate of silver, and warming it before a fire. In some cases, however, a strong impression will become visible in a minute or two after applying the gallo-nitrate of silver, without the aid of heat. The image thus brought out is subsequently fixed or rendered permanent by washing with water, lightly drying with blotting-paper, and then washing with a solution of bromide of potassium containing 100 grains to eight or ten ounces of water. A minute or two after the application of this solution the paper is again dipped in water, and finally dried. The picture thus produced is what is termed a *negative* one, in which all the light parts of tho object represented are shown of a dark colour, and *vice versâ*, and the representation is also the reverse of the original in position. It is, however, according to Mr. Talbot's second patent, rendered transparent by the application of wax, and by laying it face downwards upon another sheet of photographic paper, and exposing both to the light, a copy is produced in which the objects are brought into their true position, and the right effect of light and shade is obtained; the copy, or secondary impression thus produced, having very much the appearance of a sepia drawing. By this arrangement one original negative Calotype may be employed to produce a great number of secondary positive copies; and although it sometimes grows faint after frequent repetition of the process, its strength may be renewed by washing by candle-light with gallo-nitrate of silver, and subsequent warming. The positive Calotypes, it should be observed, may be taken upon paper prepared as above described for the negative or original impressions; but Mr. Talbot prefers using for them a paper prepared by washing first with a weak solution of common salt, and then with a solution of nitrate of silver; as such paper, though requiring more time for the perfect action of the light, affords an image with tints more harmonious and pleasing to the eye than the more sensitive paper above described. In obtaining the secondary impressions the original and the sheet of photographic paper are laid upon a board and covered with a piece of glass, which is pressed down to keep them in close contact with each other. The images are subsequently fixed in the same way as the original. The sharpness and delicacy of Calotype, or Talbotype, pictures is somewhat impaired by the mode of production; so faithful is the action of the light that even the texture of the paper on which the negative picture is taken is imitated in the positive Calotype, by which circumstance a certain objectionable woolliness of texture is given. Notwithstanding these defects, which will doubtless be greatly reduced, if not entirely dono away with, some very pleasing representations of buildings and other objects have been produced by the Talbotype process, many of which are published by Mr. Talbot in a work appropriately called 'The Pencil of Nature,' the illustrations of which are not prints, but actual photographic or sun pictures. By this process, also, a perfect fac-simile of the recent Chinese treaty has been obtained, which copy is deposited among the State Papers.

The Daguerréotype and Talbotype processes, though they may be regarded as the types of two great branches of the photographic art, are but two out of many processes which have been devised for producing pictures or images by the agency of light. On this point we cannot do better than quote the following observations from the 'Athenæum' for 1845, p. 203, premising that in the pages of that journal may be found pretty full details respecting all the processes referred to, and of some others also. 'It is a startling fact,' observes the writer of the article quoted, 'that all substances, from the delicately sensitive film which is formed on the silver plate in the Daguerréotype process, to all the salts of the metals, and even to the metals themselves, or plates of glass or stone, have been found capable of receiving light-impressed pictures. A shadow cannot fall upon any solid body without leaving evidence behind it, in the disturbed and undisturbed condition of its molecular arrangement in the parts in light and shade.' 'It is evident, then,' he proceeds, 'that all bodies are capable of photographic disturbance, and might be used for the production of pictures, did we know of easy methods by which the pictures might be developed; and we are not without hope that these means may be discovered. It must be remembered that in all the best photographic processes, the images are invisible at first. In the Calotype they are developed by the agency of gallic acid. In the Daguerréotype, the picture is brought out by mercurial vapour. In the Chromatype, nitrate of silver is the active material for the same purpose; and it may be used to bring out pictures formed on paper with any of the salts of copper. In the Chrysotype, a beautiful process discovered by Sir John Herschel, a dormant picture is brought into view as a powerful negative one, by washing tho paper with chloride of gold. In the Cyanotype, the same phenomenon is seen under the influence of the ferro-prussiate of potash. The Amphitype, and some other processes, the result of the researches of the same investigator, Sir J. Herschel, are of a remarkable character – the pictures remaining dormant as long as the paper is kept dry, whilst the simple process of breathing over it discloses the hidden picture with wonderful intensity. Lastly, the Energiatype, or, as the discoverer now names the process, the Ferrotype, enables us to keep the pictures invisible on the paper for any length of time, yet bring them out in full force in an instant, by washing with a solution of an iron salt. These are but a few of the curious phenomena which have resulted from the discoveries of Niepce, Daguerre, and Talbot. Arago said, with prophetic truth, when speaking on the subject of Daguerre's pension, 'In this instance, it is upon the unforeseen that we are especially to reckon.'

That we are as yet only beginning to understand this curious and important subject is evident from the uncertainty which yet prevails as to the precise nature of the agency by which photographic impressions are produced. Several phenomena have been observed which lead to the supposition that the remarkable chemical changes by which such impressions are produced are not due to the simple action of light itself, but of 'some power associated with it, which,' according to the writer from whom we have just quoted, 'does not affect the eye or produce colour.' 'It would appear,' he adds, 'from experiments described by Mr. Hunt, that we can separate, to a certain extent, these influences one from the other by coloured media.' 'We are therefore,' he subsequently observes, 'led to inquire, Is this a new element, distinct from light, heat, and electricity, or is it a modification of one of these?' Further researches only can settle this point. Sir John Herschel proposed the epithet of *Actino-Chemistry* for this new branch of physico-chemical science, and it has been suggested that *Actinism* would be an appropriate term to distinguish this chemical power from the light and heat with which it is associated. As having some connection with this subject we may refer to the circumstance mentioned by M. Claudet in his paper already referred to, that the operation of the Daguerréotype has been found to be much slower, with the same brilliancy of light, in an alpine region than elsewhere; and to the evidently different effects produced in the Talbotype process by different coloured rays, a circumstance which renders the foliage of some landscapes thus produced very defective. In a review of 'The Pencil of Nature,' in the 'Athenæum' for 1845, p. 593, it is observed that perhaps this defect might be remedied by some alteration in the paper, and we are informed that paper prepared with bromide of silver, if exposed to the prismatic spectrum, will be found to be equally sensitive to all the rays. In this paper is an important correction of an erroneous notion which appears to have been commonly received, that the light of the moon would not act photographically, it being supposed that the chemical principle, or *actinism*, of the rays of solar light was absorbed by the moon's surface. In answer to this we are informed that photographic impressions have been obtained by moon-light both upon Daguerréotype plates and upon paper; thereby showing that the moon's beams are of the same character as, though of less intensity than, the rays received direct from the sun. Both kinds of photography have also been performed by the artificial light emitted from lime ignited by the oxyhydrogen flame.

Of an art so new it would be premature to attempt to enumerate the advantages. Among the more obvious may be mentioned the procuring of accurate representations of the most complicated scenery, to be used in aid of an artist's memoranda for the production of landscapes, architectural representations, and even, under certain circumstances, pictures of great historical interest. On one such occasion, at least, the Daguerréotype has been employed to depict an illustrious assemblage at the opening of a continental railway; a momentary quiescence being produced, by signal, for the purpose. For producing faithful transcripts, upon a reduced scale, of works of art, and for obtaining accurate representations of machinery, for the use of the engraver, it may be rendered available; and it will doubtless be extensively employed as a means of transferring to pattern-books indisputable representations of various articles of manufacture. Still, as Arago well observed, 'it is upon the unforeseen that we are especially to reckon' in forming an estimate of the future value of photography as a handmaid to art and science.

PHY'LLODOCE, a genus of plants belonging to the natural order Ericaceae. It has a 5-parted calyx, an ovate corolla with a contracted 5-toothed mouth, 10 stamens enclosed, slender glabrous filaments longer than the anthers, short truncate cells opening by pores at the apex. The seeds are compressed and shining. The species are small evergreen shrubs, natives of the north of Europe, Asia, and North America.

P. coerulea has linear leaves with denticulated margins, glandular hairy peduncles; calycine lanceolate-acute segments; anthers three times shorter than the glabrous filaments. The stem is from 4 to 5 inches high, determinately branched, naked below, densely hairy above. The flower is large, pale bluish red; the peduncles terminal, aggregate, and simple. The plant is native of Perthshire and the north of England. There are three other species of *Phyllodoce*, which are natives of North America. They thrive only in a peat soil, and are propagated by layers. They are a genus of elegant, small, heathlike plants.

(Don, *Gardener's Dictionary*; Babington, *Manual of British Botany*.)

PHY'LLODUS, a genus of fossil fishes from Sheppey. (Agassiz.)

PHY'SALIS (from φῦσα, a bladder, in reference to the inflated calyx), a genus of plants belonging to the natural order Solanaceae. It has a 5-toothed calyx, a campanulate rotate 5-lobed corolla, converging anthers opening longitudinally, a capitate stigma, smooth 2-celled berry, covered with the angular membranous inflated calyx. The species are annual or perennial herbs, rarely shrubs.

P. somnifera has several shrubby branched stems, round and downy. The leaves are in lateral pairs, short stalked, ovate, downy, and from 2 to 4 inches long. The flowers are axillary, subsessile, small, crowded, and of a greenish yellow or white. The berry is red and smooth, and about the size of a pea. This plant is the στρύχνος ὑπνωτικός of Theophrastus, *Hist. Plant.*, 9, 12; and the στρύχνον ἁλικάκαβον of Dioscorides, 4, 72. It is a native of rocky places in the south of Europe and the East Indies. It is reputed to be narcotic, diuretic, and alexipharmic. The leaves steeped in oil are in India applied to inflammatory tumours, and they are used in a similar way in Egypt. Kunth recognised this plant in Egyptian mummies.

P. Alkekengi, the Winter Cherry, is an herbaceous downy plant, with a perennial creeping root; ovate deltoid leaves; spotless flowers, ovate coloured calyx, and subulate segments. It is a native of Europe on exposed hills, and of Japan. The corolla is a dirty white; the calyx reddish yellow, enclosing a red berry. The fruit of this plant was well known to the antients, and is described by Dioscorides. In this country, however, the fruit is seldom eaten, and the plant is cultivated chiefly on account of its appearance. In Arabia and Armenia, Spain and Germany, however, the berries frequently supply the place of other eatable fruits. They have a subacrid and not unpleasant flavour, but the persistent calyx with which they are invested is very bitter. Ray speaks of these berries as a preventive of gout, and others have extolled them as diuretics, and recommended them in the treatment of dropsy.

P. pubescens, Downy Winter Cherry, is a native of North America and the East Indies. The whole plant is densely clothed with down. The corolla is yellow, marked with five roundish brownish violet spots at the throat. The berries are yellowish when ripe; they are called gooseberries, and are used as a substitute for them in many parts, and when preserved with sugar make an excellent sweetmeat. It is the *Camara* of Brazil. All the species of Physalis thrive best in a light rich soil, and are easily propagated by seed, and cuttings will take root under a hand-glass.

(Don, *Gardener's Dictionary*; Lindley, *Flora Medica*, Burnett, *Outlines of Botany*; Fraas, *Synopsis Plantarum Floræ Classicæ*.)

PHYSONE'MUS, a genus of fossil fishes from the mountain-limestone of Ireland. (Agassiz.)

PHYSOSPERMUM (from φῦσα, a bladder, and σπέρμα, a seed, in reference to the tegument not adhering to the seed when young), a genus of plants belonging to the natural order Umbelliferæ. It has a 5-toothed calyx, obovate petals, with an inflexed point; the fruit laterally compressed; the carpels reniform, globose, didymous, with five filiform slender equal ridges, the lateral within the margin. The interstices with single vitæ. The species are perennial herbs, the flowers white.

P. Cornubiense has triternate radical leaves, wedge-shaped leaflets deeply toothed, the stem-leaves ternate, lanceolate, and entire; the stem from one to three feet high, erect, round, striated, minutely scabrous, bearing a few small ternate leaves with linear lanceolate segments; the umbels are terminal; the carpels longer than broad; the coat loose. It is native only of Cornwall, in bushes and hedges; in great plenty in the neighbourhood of Bodmin. Cattle are so fond of this plant that they will eat it down to the ground. The root contains a yellow resinous juice. There are but few species of this genus. Any common soil will suit them, and they may be divided at the root or raised from seed.

(Don's *Gardener's Dictionary*; Babington's *Manual of British Botany*.)

PHYTE'LEPHAS. [Vegetable Ivory, P. C.]

PHYTEUMA (a name adopted by Dioscorides), a genus of plants belonging to the natural order Campanulaceae; it has a 5-parted calyx, a rotate corolla with 5 long linear segments; free anthers, and filaments dilated at the base.

P. orbiculare, Round-headed Rampion, has the heads of its flowers globose, those of the fruit oblong, the leaves crenate-serrate, the lower ones cordate-ovate, stalked, the upper ones linear, lanceolate, sessile. It is native of the mountains of Europe and of England in chalky soil. The flowers are of a deep blue colour.

P. spicatum, Spiked Rampion, is distinguished by having the heads of its flowers oblong, those of the fruit elongated, cylindrical; the lower leaves cordate-ovate, the upper ones linear lanceolate, sessile; the flowers are white, cream-coloured, or blue. It is native of the temperate parts of Europe, and in Sussex, in England. All the species are hardy and well fitted for garden borders or rockwork. They will grow in any common garden soil, and may be divided or raised from seed. *Campanula Rapunculus* is likewise known as the *Rampion*. [Rampion, P. C.]

(Don's *Gardener's Dictionary*; Babington's *Manual of British Botany*.)

PIAZZE'TTA, GIOVA'NNI BATTISTA, one of the most celebrated of the later Venetian painters, was born at Venice in 1682 or 1683, and was first instructed in design by his father, Jacopo Piazzetta, a carver in wood. He was taught painting by Molinari, but he acquired his style in Bologna from the works of Spagnoletto and Guercino. Piazzetta is one of the *Naturalist* school of painting, and he is one of the darkest of those who are sometimes called *Tenebrosi*: they generally painted on dark grounds. He died at Venice in 1754.

Piazzetta's pictures are doubtless much darkened through time: they are distinguished by their strong contrasts of light and shade. His masterpiece is considered the Beheading of John the Baptist, at Padua. He excelled in caricature. Many of his works have been engraved.

(Zanetti, *Della Pittura Veneziana*, &c.; Lanzi, *Storia Pittorica*, &c.)

PICART, ETIENNE (called Le Romain, the Roman), a celebrated French engraver, was born at Paris in 1631, and died at Amsterdam in 1721. His prints, chiefly portraits and history, are very numerous: they are firmly executed, but want harmony. He worked with the graver and the etching-needle, much in the style of Poilly. He is supposed to have been called Le Romain from his long sojourn in Rome, or he assumed the name that he might not be confounded with another engraver of the name of Picart. He was engraver to the king, and a member of the French Academy of Painting, &c.

Bernard Picart, the son of Etienne Picart, born at Paris in 1663, was a designer and also a distinguished engraver, and superior to his father. He was the pupil of Le Clerc; his best works are those executed in France; in Amsterdam, to which place he accompanied his father in 1710, he worked exclusively for the booksellers, and became mannered, metallic, and merely ornamental. A great many of his prints are from his own designs, in which he imitated the style of composition of Antoine Coypel. He had a facility in imitating the styles of other earlier engravers, and he published many prints of this class which are said to have deceived collectors; Picart used to call them *Impostures innocentes*, and they were published under this title, to the number of 78, with a list of his works, at Amsterdam, in 1738, after his death. His prints altogether amount to about 1300; and one of the best of them is a Slaughter of the Innocents, after a design of his own: there are various impressions of it. Darius opening the Tomb of Nitocris, after Le Sueur, is also one of his best prints; it is much in the style of Girard Andran. He died at Amsterdam in 1733.

(Watelet et Levesque, *Dictionnaire des Arts*, &c.; Huber, *Manuel des Amateurs*, &c.)

PICO is one of the Azores, or Western Islands, so called from the remarkable volcano which it contains, and which is called 'the Peak' (Pico). This island lies between 28° 3′ and 28° 42′ W. long., and between 38° 15 and 38° 33′ N. lat. It extends from west-north-west to east-south-east about forty-five miles, and is about eight wide towards its western extremity, where it is widest, whence it gradually grows narrower as it proceeds farther east, until it terminates in a forked rock hardly a mile in width. The average width is about five miles. This gives an area of 225 square miles; which is about equal to the Isle of Man.

The coast-line is bordered by rugged rocks, which form no port nor allow an anchorage; at Lagens, on the south coast, is a small cove, in which small craft find shelter. The western districts present the most rocky surface. The country rises from the shores towards the peak, which occupies the centre of this part of the island, and is more than 8000 feet above the sea. The soil is composed of lava, which in many places is entirely naked, and in others covered with a thin layer of earth, formed by the decomposition of volcanic matter. The country round the volcano and even the lower parts of its sides are richly cultivated, principally with vineyards; there are also gardens and orange-groves wherever there is any soil. From the cultivated grounds to within a third of the distance from the summit, it is thickly covered with splendid cedars, the myrica faya, the white yew, immense junipers, myrtles, and tree-ferns, beyond which point vegetation begins to decline, and on approaching the top of the peak nothing is seen but moss and lichens. From the eastern base of the volcano a high ground runs eastward to Cape Calhagrossa, the eastern extremity of the island. It occupies the middle of the island, and descends with a very broken surface towards the northern and southern shores. Though this part of the island also consists of lava-rocks, it contains a much larger portion of cultivable land, but is not so well cultivated as the country round the volcano. The southern declivities are much better cultivated than those which slope towards the northern shores, which are less covered with soil.

The chief article of produce is wine. Until lately there were annually exported nearly 25,000 casks. It is considered better than any kind grown in the Azores, and goes by the name of Fayal wine, because it is brought to foreign countries from Horta, the capital of the island of Fayal. Great quantities of fruit are also sent to Fayal. Grain and pulse are grown sufficient for the consumption of the population; the onions of Pico are much valued, and large quantities of them are disposed of to the Americans and other traders who frequent Fayal. Among the forest-trees, the cedar and white yew are greatly prized for furniture, nearly as much as mahogany. Pasture-grounds abound on the higher part of the ridge, where a large number of sheep are bred for the wool, which is worked by the natives into clothing for home consumption; goats are still more numerous. Cattle abound, and are of a fine breed. In many places orchilla is collected.

The climate is mild, neither the cold of the winter nor the heat of the summer being intense, but it is very irregular. No decidedly settled weather can be calculated on except between the summer solstice and the autumnal equinox. Showers of rain are frequent throughout the year, and in the winter so violent as to cause constant changes in the face of the country, washing away enormous masses of pumice from the mountains, throwing down projections of soft volcanic materials, and leaving the surface of the rocks and heights in many places destitute of soil. This island, like the other Azores, is subject to incessant gales, which render the approach to it dangerous to vessels. Earthquakes are frequent, and four eruptions of the volcano are on record. Three of them occurred in the sixteenth century, and the last in 1718, which burst from the western side of the peak and overwhelmed a large portion of the best vineyards.

The population, which is stated at 30,000, consists of the descendants of the Portuguese who settled in the Azores in the fifteenth century. They are an industrious race, and are settled on the shores of the island, where they live in neat white cottages, with bright, cane-reed thatched, conical roofs.

The capital is Lagens, a small place built round a small cove. In the strait which divides Pico from Fayal, but at a short distance from Pico, are two immense masses of red volcanic rock, called the Isles of Magdelena, and between them and Pico is an anchorage in six to eight fathoms. Opposite to them is the town of Magdelena Criaçaovelha, whence the produce of Pico (wine, brandy, fruits) is shipped to Fayal, and where the rich inhabitants of Horta have villas.

It is not ascertained when Pico was first settled, but probably many years after 1466, when Fayal was occupied by a colony of Flemings, who were soon afterwards followed by the Portuguese. It was not till the best portion of this island had been settled, that the inhabitants passed over to Pico, which is so difficult of access. It has always remained in the hands of the Portuguese.

(Ashe's *History of the Azores*; Boid's *Description of the Azores*; Von Buch's *Physikalische Beschreibung der Canarischen Inseln*.)

PICRIS, a genus of plants belonging to the natural order Compositae, and the suborder Cichoraceae. It has an involucre of one row of equal scales, with unequal linear, often spreading, scales at the base; the receptacle is dotted; the fruit terete, transversely striated, constricted, or slightly beaked above; the pappus in two rows, feathery, external row subpilose. *P. hieracioides*, the only British species, has rough leaves, with forked and hooked bristles, lanceolate leaves, dentate or sinuated, the upper leaves somewhat clasping, the head solitary, terminating the stem and branches, the outer involucral scales lax, oblong, bristly on the keel, glabrous on the margin. The fruit constricted just below the pappus. The flowers are a bright yellow colour. This species is found on dry banks in Great Britain.

(Babington's *Manual of British Botany*.)

PIERMARI'NI, GIUSEPPE, an architect who occupies a foremost place among those of Italy during the latter half of the eighteenth and at the beginning of the present century, was born at Foligno, July 18th, 1734. His father (Pietro) was a merchant, and intended that Giuseppe should apply himself also to business, where he had only to pursue the course opened and prepared for him, in order to prosper. Nor does he seem to have at all rebelled against paternal wishes, except that his bent of mind led him to give his attention more willingly to mechanics and scientific pursuits. Having constructed for himself a geographical globe, 20 Roman palms (about 14½ English feet) in diameter, it attracted many visitors, and among others the celebrated mathematician Boscovich, who recommended, or rather, enjoined his father to send him to Rome to pursue his studies systematically under proper instructors.

He was nearly twenty years of age when he went to Rome, and, eager to make up for lost time, he applied himself with ardour to mathematics and architecture, which last he studied first under Poggi, and next under Vanvitelli [VANVITELLI, P. C.], who conceived a particular regard for him. The master was sincerely desirous of bringing his pupil forward, and afforded him every opportunity of gaining practical instruction, the means for which were abundantly supplied by Vanvitelli's numerous engagements. On Vanvitelli's going to Naples to erect the palace of Caserta, he took Piermarini with him as his principal assistant in that extensive work. Again, when Vanvitelli was afterwards invited to Milan, by the Austrian government, for the purpose of altering and embellishing the palace there, or that now called the Palazzo Imperiale, for the Archduke Ferdinand, Piermarini accompanied him; and for Piermarini this proved a singularly important event. Meeting with obstacles and having other engagements that demanded his attention, Vanvitelli contented himself with making some general designs and explaining his ideas, and recommended his pupil as fully competent to supply his place. The work was accordingly transferred to Piermarini (1769), who thus unexpectedly found himself established at Milan, the city destined to become the chief theatre of his professional labours, with the title of architect to the archduke, and inspector-general of buildings. Afterwards on the Academy of Fine Arts at the Brera being established, he was appointed to the professorship of architecture. For thirty years Piermarini was constantly employed at Milan, which is indebted to him not only for most of the principal structures erected at that period, but also for the more correct taste which he introduced both by his example and his precepts. Had he executed nothing of any note besides the theatre *Della Scala* [THEATRE, (Table), P. C., vol. xxiv. p. 298], that edifice alone would have secured his professional fame; but he erected, or else altered and improved, so many buildings as greatly to enhance the architectural character of the city. Among the private palaces or mansions by him are the palazzi Greppi, Moriggia, Lasnedi, Sannazari, Litta, Cusani, and the magnificent and extensive façado of the Palazzo Belgiöioso; also one of the fronts of the archbishop's palace. Among his public buildings are the Monte di Pietà, the Monte Napoleone, the Luoghi Pii, the Teatro della Canobbiana, and the Porta Orientale, his designs for which were adopted in preference to Cagnola's. [CAGNOLA, P. C. S.] He likewise conducted many general public improvements, such as several new streets, the Piazza del Tagliamento, and almost the whole of the new quarter called the Contrada di S. Redegonda; to which may be added the Public Gardens and their buildings. Nor were his labours confined to Milan itself, for he was the architect of the elegant imperial villa at Monza; also of the Villa d'Adda in Casano, and of the Villa Cusani at Desio, at which last place he improved and completed the church.

Some years before his death, political changes and the state of public affairs induced him to withdraw altogether from Milan, and retire to his native town Foligno, where he occupied himself with his favourite studies, and formed a valuable collection of books, especially rich in works upon art. There he died, February 18th, 1808. The Academy of the Brera, at Milan, honoured his memory with a monument in the portico of their building.

(P. E. Visconti, in Tipaldo, *Biografia*, &c.)

PIG. [HOG, P. C.; SUIDÆ, P. C.]

PIG-NUT. [BUNIUM, P. C. S.]

PIGALLE, JEAN BAPTISTE, a celebrated French sculptor, was the son of a carpenter, and was born at Paris in 1714. He was the pupil of Robert le Lorrain and the elder Lemoyne, and studied three years in Rome. On his return to Paris he attracted great notice and obtained a permanent reputation for a statue of Mercury. The king (Louis XV.) purchased the statue, and the Royal Academy of Painting and Sculpture elected Pigalle a member. Louis XV. ordered the sculptor to make a Venus as a companion to this Mercury, which, however, was considered unequal to it, and the king presented them both to Frederick the Great of Prussia: they are still at Sans Souci. Another celebrated work by Pigalle is the statue of Louis XV. at Rheims; but his masterpiece is the great allegorical monument of the Maréchal de Saxe, or Moritz von Sachsen, who commanded the French at Fontenoy, in the church of St. Thomas at Strassburg, commenced, by the order of Louis XV., in 1765, and finished in 1776. It is a group of five figures against a pyramid, which proclaims the glories of the marshal: the idea is singular—the marshal is represented in his own costume, and crowned with laurel, entering a tomb; on one side is Death, as a skeleton; on the other, Hercules mourning; an impersonation of France is endeavouring to restrain the marshal and avert death; a weeping Genius is also in attendance, with an inverted torch: many military trophies are introduced as accessaries. The marshal is most elaborately modelled. It has been several times engraved.

Pigalle was much employed by Madame Pompadour, and his great success is said to be originally owing to her patronage. There is no great work by Pigalle in Paris: the tomb of the Comte d'Harcourt, in Notre Dame, is the principal. Among his smaller works, a figure of a child holding a cage from which a bird has escaped, obtained him great applause. He is considered one of the best sculptors of the eighteenth century, though his taste cannot be called classical. He died in 1785, as Chancellor of the antient Academy of Painting and Sculpture. The bronze equestrian statue of Louis XV., by Bouchardon, which was in the Place Louis XV., and was destroyed by the populace in 1792, was finished and put up by Pigalle.

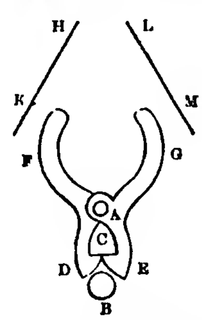
(D'Argenville, *Vies des fameux Architectes et Sculpteurs*; W. Füssli, *Kunstwerke am Rhein*.)

PILE-ENGINE is a machine by which a heavy mass of iron is raised to a considerable height in the air; the mass being then allowed to fall by gravity on the head of a pile, the momentum acquired by the descent forces the pile into the ground.

Such an engine is employed in driving piles for the support of the sleepers or horizontal timbers on which are built the piers of bridges, the revetments of the ramparts of fortresses, or any other heavy mass of brick or stone work when the soil is not sufficiently firm to carry the structure. Piles are also thus driven in order to form coffer-dams in rivers, preparatory to the construction of piers or the faces of quays, basins, &c.

A pile-engine generally consists of two pieces of timber, from 20 to 30 feet long, which are braced together and retained in upright positions by means of props; at their lower extremities they are inserted in a horizontal frame constructed with four pieces of timber crossing one another at right angles and resting immediately on the ground, or upon the sides of a barge when the piles are to be driven into the bed of a river. The two nearest sides of the upright timbers are covered with sheet-iron in order that while the *ram*, or driving mass of iron (two of whose opposite sides are grooved or cut to fit the sides of the timbers), may move freely up and down, the shock arising from its impact on the head of the pile may not force it out of its place.

The ram is raised up by means of a rope or chain attached at one end to the barrel of a *crab* whose supports are bolted to the horizontal frame constituting the base of the machine: the rope or chain passes from thence over a pulley at the top of the two upright timbers; and, descending between them, it is made fast to an apparatus called a *monkey*, which, by means of forceps or tongs, remains in connection with the ram during the ascent of the latter. The monkey is a block of wood having two opposite sides grooved like those of the ram, so that it may slide freely between the two upright timbers without quitting them; and in front of it is a frame carrying the forceps, whose form is indicated in the figure: the two curved arms F D, G E, of which it consists, turn freely on a strong pin at A, and, in the descent, their lower



extremities D, E, coming in contact with the top B of a staple which is fixed in the top of the ram, open by pressure, far enough to allow that top to enter into the space C; when the weight of the upper parts F, G, cause D, E, to close together under B. Thus, on turning the barrel of the crab, the monkey and the forceps are raised and the ram is drawn up with them.

At the top of the machine are formed two inclined planes, between the surfaces of which, at K H and L M, enter the arms F, G, of the forceps; these closing up in the contracted space near H and L, the extremities D and E open and allow the top B of the staple to escape, by which means the ram, being no longer retained, falls directly on the head of the pile. The weight of the monkey and forceps is sufficient to cause them afterwards to descend, the men ceasing to act at the winch of the crab; and the lower part of the forceps falling on the staple of the ram, the latter becomes engaged with the monkey, when it may be raised up and, subsequently, suffered to fall as before.

In order that the pile may penetrate more easily into the ground, or the bed of the river, its lower part is pointed and shod with iron; and, to prevent the top from splitting by the action of the ram, it is surrounded by an iron hoop. The weight of the ram employed, in large engines, is generally about half a ton.

An ingenious machine for driving piles was invented by M. Vauloue, and is described by Desaguliers. The power of horses was employed to give motion to a horizontal cylinder, about which was wound the rope for raising the weight; and, while the weight was being raised, the cylinder was

PISA'NO is the surname of several distinguished artists of Pisa in the thirteenth century, namely, Giunta, Niccola, Giovanni, and Andrea Pisano. Of two of these artists, Niccola and Giovanni, some account is given in the Penny Cyclopædia, but chiefly as architects. [NICCOLA DI PISA.] Vasari commences his 'Lives of Artists' with Cimabue, but there were several Tuscan artists anterior to Cimabue, especially at Siena and Pisa. [TUSCAN SCHOOL OF PAINTING, P. C.]

GIUNTA PISANO was one of the principal of these artists, and is the earliest known Tuscan painter; Niccola was a sculptor, and Giunta appears to have preceded him for a time, though he was eventually much surpassed by him in design: and as they were contemporaries, the name of Niccola accordingly takes the lead in the list of celebrated Tuscan artists. Giunta may have been born about 1180 or 1190. He is said to have learned painting about 1210, from some Greek artists, who were then engaged probably at Pisa, a tradition which is disputed by some Italian historians of art, who suppose that Pisa had at that period its native artists. The arts were very active at Pisa, owing to the construction of the cathedral there, which was commenced in 1063. The notice of Giunta in question occurs in an old history of the Basilica of Assisi, by Pater Angioll, who says, 'Juncta Pisanus ruditer a Graecis instructus primus ex Italis artem apprehendit circa an. sal. 1210.'

Giunta appears to have attained considerable reputation, for Frat' Elia of Cortona, general of the Minorites, invited him about 1235, or sooner, to Assisi, to execute some works there in the upper church of San Francesco. There are still some remains of the paintings of Giunta in this church, around the window behind the altar. He painted also a Crucifixion in 1236, in which he introduced the portrait of Frat' Elia. The painters of this time were acquainted with some excellent water-colour medium, for another Crucifixion at Assisi, with other figures, painted upon a wooden cross in the church of Santa Maria degli Angeli, by Giunta, is remarkably solid in impasto and unaffected by water; it was painted probably about 1236, and has the following inscription upon it, according to the restoration suggested by Lanzi:—'*Junta* Pisanus *Juntini* me *fecit*.' Lanzi assumes Giunta di Giustino to be the name, from the occurrence of this name in an old MS. mentioned by Morrona in his 'Pisa Illustrata.' Other existing works ascribed to Giunta are—a Crucifixion in San Ranieri at Pisa, a picture (a panel) of Saints in the chapel of the Campo Santo, and a Martyrdom of St. Peter in the church of San Francesco at Assisi (it is engraved by Lasinio in the 'Etruria Pittri' of Lastrici). The Campo Santo was built or commenced by Giovanni Pisano in 1278. (*Archæologica*, vol. xxiii. pt. 1.) Giunta was contemporary with Guido of Siena and Bonaventura Berlingieri of Lucca; and all belong to the Byzantine school in style—brown carnations, positive colour in the draperies, emaciated faces, drawn in coarse outlines with hatchings for the shadows, and elongated extremities, even with occasional short thick figures; but their forms are generally attenuated and emaciated. This meagreness of form however, often had an historical and illustrative signification; as sorrow, resignation, or bodily suffering are almost exclusively the sentiments expressed in early paintings; as we also generally find to be the case in MSS. These peculiarities of style were not much improved until the time of Giotto, and not wholly corrected until Masaccio, two centuries later than Giunta. They were, says Lanzi, faults of the times rather than of the men. Mr. W. Y. Ottley possessed an old Italian distemper picture of the Crucifixion, which he supposed was a work by Giunta. Vasari has omitted the Life of this painter. There is no notice of him later than 1236, but he may have lived some time beyond this date.

ANDREA PISANO was another early artist of Pisa, but nearly a century later than Giunta and Niccola Pisani. He was born in 1280, was distinguished as architect and sculptor, and particularly as a metal-founder, in which art he was the first of his age. He is said by Vasari to have imitated the design of Giotto in the Campo Santo. He was invited early to Florence, where he executed several celebrated works. The first were statues of Pope Boniface VIII. and St. Peter and St. Paul, from designs by Giotto, for the façade of Santa Maria del Fiore; they are now, with other works by Andrea, in the Stiozzi garden al Valfonda; the pope is engraved in Cicognara's *Storia della Scultura*. Vasari attributes to Andrea the colossal Madonna and Child, and the two accompanying angels, in marble, in the chapel della Misericordia of the Piazza San Giovanni at Florence, but this was the work of Alberto di Arnoldo in 1364; the error was detected by Vincenzio Follini: the documents are given by Cicognara and Rumohr. The half-figure of the Madonna above a side door of the Misericordia, on the wall of the Cialdonai, is the work of Andrea, and was a celebrated work, because, says Vasari, contrary to his usual custom, he imitated the antique. Andrea's great work in sculpture, however, was the bronze gate for the Baptistery of St. John, which he undertook to make from a design by Giotto, who was in the time of Clement residing at Avignon. He had a few years previously sent Pope Clement V. (1305-1314), through Giotto, a bronze crucifix as a present, and the excellence of this work led to the important commission to model and cast two of the bronze gates of the Baptistery, which, after the lapse of twenty-two years, says Vasari (Baldinucci says eight years), in 1339, with the assistance of his son Nino, he successfully accomplished; not that he was all this time exclusively occupied on this work, for he executed many others in the meanwhile. The sculptures are from the life of John the Baptist, and were gilded, and the gates were fixed up in the central entrance to the Baptistery; but upon the completion of the much more excellent gates of Ghiberti, they were removed to one of the side entrances, and those of Ghiberti were put in their place. The year 1339 in Vasari appears to be a misprint; for, according to most good authorities, the gates bear the following inscription: Andreas Ugolini Nini de Pisis me fecit anno dominin. MCCCXXX. (Cicognara, *Storia della Scultura*, iii. 396; and Lasinio, *Le tre Porte del Battisterio di Firenze*, Florence, 1823, in which all the gates (six) are well engraved.) But this date, according to Giovanni Villani, one of the superintendents of the work, is the year in which they were commenced; if therefore they occupied twenty-two years from this time, they were not finished until 1352, seven years after Andrea's death, and accordingly by Nino, Andrea's son; but this is impossible, as Villani, who died in 1348, saw the completion of the work—the date therefore, 1330, is apparently the year of the commencement of the casting in metal, which was done by Venetian artists, the model only being finished in that year; they may therefore have occupied twenty-two years from the commencement of the model to the completion of the cast. Twenty-two years from 1339 give 1317, one year after Giotto's return from Avignon, as the date of the commencement of the work, which is quite probable. As an architect, Andrea designed the Castello di Scarperia in Mugello at the foot of the Alps; and Vasari says, according to report, the Arsenal of Venice, where he spent a year; he raised part of the walls of Florence eight ells in 1316; he designed the church of San Giovanni at Pistoja, commenced in 1337, and he executed many works for Gualtieri, duke of Athens and tyrant of Florence, until the duke was expelled from Florence in 1343.

Andrea was made a citizen of Florence, and had other honours conferred upon him. He died in 1345, and was buried in Santa Maria del Fiore, where his son Nino raised a monument and placed the following inscription to his memory:—

Ingenti Andrea jacet hic Pisanus in urna,
Marmore qui potuit spirantes ducere vultus,
Et simulacra Deum mediis imponere templis
Ex aere, ex auro candenti et pulchro elephanto.

Nino completed the unfinished works of his father, and executed many original works of merit. Tommaso Pisano, another pupil of Andrea, is supposed also to have been his son.

(Vasari, *Vite de' Pittori*, &c., and the notes to the German translation by Schorn; Lanzi, *Storia Pittorica*, &c.; Cicognara, *Storia della Scultura*; Köhler, *Kunstblatt*, 1827; Rumohr, in the *Kunstblatt*, 1821, and *Italienische Forschungen* D'Agincourt, *Histoire de l'Art par les Monumens*.)

PISCARY. [FISHERIES, P. C.]

PISCI'DIA (from piscis, a fish, and cædo, to kill or destroy), a genus of plants belonging to the natural order Leguminosæ. It has a campanulate 5-cleft calyx, an obtuse keel, and a papilionaceous corolla. The stamens are monadelphous, with the tenth one free at the base. The style is filiform and smooth, the legume pedicellate linear, furnished with four membranous wings, the seeds separated by a spongy substance. The species are West Indian trees, with broad unequally pinnate leaves and terminal panicles of white and red flowers mixed.

P. erythrina (Dogwood) is a tree about twenty feet high. The leaflets are in pairs, from 3 to 4 together; they are oblong or obovate, rounded at the base, downy on both sides when young, but smooth when old. The racemes are compound, axillary, staminal. The flowers whitish tinged with purple. This plant possesses the peculiar property of intoxicating fish; the bark of the root is the part used. Dr. Hamilton, in a paper read before the Medico-Botanical Society of London, gives a lengthened account of this process and of the properties and uses of this plant. He says that a preparation of the root is infused into the water containing the fish, which soon rise to the top. They float perfectly insensible along, and are easily taken by the hand; they recover on being thrown into pure sea-water, and neither their flavour nor wholesomeness is in any degree impaired. The same gentleman made a series of experiments on himself as to the effect of a tincture of this plant. Labouring under an attack of severe toothache, he took a powerful dose of the tincture, which was succeeded by a profound sleep and entire relief from pain on awakening. As a topical application to carious teeth he found it equally successful, and came to the conclusion that the tincture of the dogwood is more powerful than that of opium. The root-juice is used to poison the arrows with which birds are shot in the Antilles. It is said to be an effectual remedy for mange in dogs: it is also reputed to possess tanning qualities. It is one of the best timber-trees in Jamaica; the wood is coarse, heavy, resinous, and almost imperishable, lasting equally well in or out of water; hence it makes excellent piles for docks and wharfs.

P. Carthaginensis is a native of Jamaica, Guadaloupe, and Carthagena, on the mountains. It closely resembles the former species, and is scarcely distinguishable from it. These trees grow best in sandy loam; cuttings of them may be rooted in sand under a hand-glass in heat.

(Don, *Gardener's Dictionary;* Lindley, *Flora Medica;* Burnett, *Outlines of Botany.*)

PI'SODUS, a genus of fossil fishes from Sheppey. (Owen.)

PISTIL. [STIGMA, P. C.]

PISTON. [STEAM-ENGINE, P. C.]

PISUM. [PEAS, P. C.; VICIEÆ, P. C.]

PITCHER-PLANTS. [LEAF, P. C.]

PITUS, a genus of fossil plants from the Carboniferous strata of Tweeddale. (Witham.)

PLANE, PLANING MACHINERY. Of the planes commonly used by carpenters and cabinet-makers for levelling and smoothing the surface of wood, an account is given under JOINERY, P. C. S., p. 123, where the use of what is termed a *double-iron* is briefly alluded to. This improvement, which has been in common use for many years, is not found sufficient, in all cases, to meet the difficulties which arise in planing hard and coarse woods. To remedy this defect Mr. C. W. Williamson contrived, and submitted to the Society of Arts in 1825, what he terms a double-bevelled plane, in which a single iron is used, but it is made thicker than those of ordinary planes, and its edge is produced by two bevels instead of one. By this arrangement is produced a cutting edge which is 'much stronger, will retain its keenness much longer, and will cut much smoother' than any other plane known to its inventor. This modification of form has the further advantage of allowing the use of the finest cast-steel for making the plane-iron; whereas the comparative weakness of plane-irons of the ordinary make had presented serious difficulties in the way of applying that material, although it is known to be preferable to any other for cutting-instruments. A fuller account of this invention, coupled with a testimony as to the superiority of the improved plane for use in smoothing box-wood for the use of engravers, is given in the Society's 'Transactions,' vol. xlviii., pp. 86-88. In the preceding volume of the same work (pp. 83-85) is a description of an ingenious contrivance rewarded by the Society in 1824, 'to make one plane answer the purposes of the jack-plane, the pannel-plane, the smoothing-plane, and the moulding-plane,' by having the bottom, or *sole*, of the plane moveable, and attached to the body of the stock by means of a dove-tailed groove. By this contrivance a workman may have several different irons or blades, and any number of different soles, made either flat like those of an ordinary plane, convex or concave in different degrees, either longitudinally or transversely, for planing curved surfaces, or adapted to the form of an ogee or other moulding, all fitted to one stock, thereby effecting a great saving both in expense and portability. This contrivance is the invention of Mr. G. Gladwell, who, like the author of the double-bevelled plane, is described as a working carpenter.

The first attempt to economize labour by means of planing-machinery was made, according to Nicholson's 'Architectural Dictionary,' by General Bentham, who obtained a patent in 1791 for a contrivance by which large planes, wide enough to take the whole width of a plank at one stroke, and supplied with apparatus for directing their course, regulating the depth to which they could cut, and, generally speaking, for superseding the necessity of skill and judgment on the part of the operator, might be worked either by mechanical power or by manual labour. The machine was used for a time, worked by hand, but did not succeed well. A patent was obtained in 1803, by a person named Bevans, for a similar apparatus for planing, or, to use a technical term, *sticking*, mouldings, rebates, grooves, &c. The improved principle, now generally adopted, of moving the wood to the tool, instead of, or in combination with, the moving of the tool to the wood, was introduced in Bramah's patent of 1802. In a beautiful machine of this character constructed by Bramah for the Woolwich Arsenal the wood is placed upon a carriage and drawn, by hydraulic power, under the lower surface of a rapidly revolving disk or wheel, to the face of which a series of planes or cutting instruments are attached, which, acting upon the wood in quick succession, bring it to a very smooth and even surface. A remarkable feature in this machine is that the vertical spindle which carries the revolving wheel or cutter-frame is supported, by hydrostatic pressure, upon a column of oil, its lower end forming, as it were, the piston of a hydrostatic press in which oil, instead of water, is the fluid employed. This arrangement not only saves much friction and wear, but also affords the means of adjusting and varying at pleasure, with the greatest accuracy, the height of the spindle, and consequently the level of the cutter-frame carried by it. Of both this and General Bentham's machinery very full details are given by Nicholson, and also in Barlow's 'Treatise on Machinery and Manufactures,' in the 'Encyclopedia Metropolitana.' Machines for planing flooring-boards are mentioned under HOUSE, P. C. S., p. 54; and under SAW-MILL, P. C., p. 479, is noticed a contrivance for partially planing the surface of boards as they are cut in a saw-mill.

Immense saving of labour, accompanied with a corresponding improvement in accuracy, has been effected by the application of planing-machinery to the levelling of iron and other metals, in lieu of the cold chisel and the file, worked by hand. In some instances this has been done on the principle of Bramah's machine, above referred to; but more generally the planing of iron is effected by a stationary cutter, the iron being brought under it by a rectilinear motion. For this purpose it is not usual to employ wide cutting-instruments, as for wood; but a narrow tool, cutting a mere line of the surface at once, is brought into contact with all parts of the surface to be levelled in succession; the action of the machine being more like that of a lathe and slide-rest than that of wood-planing machinery, and still more widely different from the action of a hand-plane, in which the accuracy of the surface is in a great measure dependent upon the width and extended face of the stock. In some machines the cutter is raised a little during the return of the carriage after a stroke; but others are so contrived that at the end of each stroke the cutter is turned round and again applied to the iron, so as to cut in both directions. A minute account, illustrated with plates, of the admirable metal-planing machinery of Mr. Joseph Clement, of Newington Butts, is given in the forty-ninth volume of the 'Transactions' of the Society of Arts, part i., pp. 157—185.

PLANTA'GO, a genus of plants, the type of the natural order Plantagineæ. It has a 4-cleft calyx, a corolla with an ovate tube and a 4-parted reflexed limb. The capsules burst transversely; they are from 2 to 4 celled and have from 2 to 4 seeds.

P. Coronopus, Buck's-horn Plantain, has linear pinnatifid leaves, with a slender spike; the bracts are subulate from an ovate base, erect; the midrib of the lateral sepals with a ciliated membranous wing; the placenta 4-winged, with one seed in each sell. This species is found in gravelly and sandy places, both near the sea and inland. It is native of Great Britain. It has been eaten as a salad, but it is too bitter and astringent to be palatable, and these qualities have given it some reputation as an expectorant and vulnerary. Strange accounts are given of its efficacy in medicine, and some very improbable cures attributed to its use.

P. maritima has linear grooved fleshy leaves, convex on the back; the sepals not winged, the capsules 2-seeded, the tube of the corolla pubescent, the spike cylindrical, the bracts ovate acuminate. It is found on the sea-coast and on high mountains in Great Britain.

P. lanceolata is distinguished by its leaves being lanceolate, attenuated at both ends, and 5-nerved; the scape furrowed, the spike ovate or oblong; cylindrical bracts, ovate-acute or cuspidate; the capsules 2-celled, the cells 1-seeded, the tube of the corolla glabrous. The root produces long fibres; the neck is clothed with dense wool, and the scape and leaves with silky hairs. This species was once cultivated as an agricultural plant, but was found to be unprofitable, and has long ceased to be sown.

P. media is known by its ovate leaves, with short broad pubescent stalks; the sepals are not keeled; the capsules 2-celled, and each cell contains one seed. It is found in meadows and pastures in England. The leaves and root have been used in decoction as an astringent lotion.

P. major, Great Plantain, has broadly ovate leaves on a long channelled stalk, terete scapes, an elongated spike, ovate obtuse keeled bracts, the sepals with a prominent dorsal nerve, the capsules 2-celled, each cell containing many seeds. It is found in Great Britain, and has been called 'Way-bred,' from its prevalence on the way side. This plant has a peculiar tendency to grow in the neighbourhood of the abodes of men, and seems as though it followed the migrations of the human species. Thus, although not intentionally conveyed, it has accompanied our colonists to every part of the world, and is known in some of our settlements to the natives under the name of 'The Englishman's foot;' for with a strange certainty, wherever our countrymen have trod, there it is to be found. Small birds are almost universally fond of the seeds of these plants, which are covered with mucus. According to De Candolle the seeds of *Plantago arenaria* are exported in considerable quantities from Nismes and Montpellier to the north of Europe, and are supposed to be consumed in the completion of the manufacture of muslins. The seeds of *P. Ispaghula* are of a very cooling nature, and with boiling water form a rich mucilage, which is much used in India in catarrh, gonorrhœa, and nephritic affections. Soda is obtained in Egypt from the ashes of *P. squarrosa*.

(Babington, *Manual of British Botany*; Lindley, *Vegetable Kingdom*; Lindley, *Flora Medica*; Burnett, *Outlines of Botany*.)

PLANTAIN. [PLANTAGINACEÆ, P. C.; PLANTAGO, P. C. S.]

PLANTIN, CHRISTOPHE, was born in 1514, at Mont-Louis, in the French province of Touraine, of poor parents. He went to Paris in his youth, and worked there some time in a bookbinder's shop, but afterwards went to Caen, in Normandy, where he learned the art of printing. After working in several of the printing-offices of France, and especially at Lyon, he returned to Paris, but the religious disturbances, which commenced about that time, induced him to remove to Flanders, and he is known to have been a master printer at Antwerp in 1555. The beauty as well as the correctness of the works which issued from his presses, extended his reputation rapidly, and he soon acquired a considerable fortune. He employed as correctors of the press several men distinguished for their learning, among whom were Corneille Kilian, who was fifty years in his establishment, Pulman (Poelmann), Giselin, and Raphelengius (Ravlenghien). Plantin's house was resorted to by learned men from all countries. He died July 1, 1589, and was buried in the cathedral at Antwerp. Besides his printing-establishment at Antwerp, he had one at Paris, and another at Leyden. Plantin had three daughters. The eldest was married to Raphelengius, and he inherited the printing-office at Leydon; the second daughter was married to Jean Moretus, and he carried on the business at Antwerp, in conjunction with his mother-in-law: the youngest daughter was married to Gilles Béys, who succeeded to the printing-office at Paris.

The work which has given most celebrity to Plantin's printing establishment at Antwerp, is the edition which he printed of the great Polyglott Bible, which had previously been printed at Alcala, in Spain, under the direction of Cardinal Ximenes. [CISNEROS, P. C.] Plantin was engaged to perform the work by Philip II. of Spain, who sent Arius Montanus to superintend it, and he was employed four years (1568 to 1572) in this occupation. [ARIUS MONTANUS, P. C.] Guillaume Lebé was sent for from Paris to engrave the punches and superintend the casting of the type. The work, in addition to the contents of the Alcala Polyglott, gave a Chaldaic paraphrase and a Syriac version of the New Testament in Hebrew and Syriac characters. The proofs of the Antwerp Polyglott were all revised by Raphelengius, and the work was published in 8 large folio volumes, 1568 to 1572. Plantin was not so learned as the Aldi of Venice or the Estiennes of Paris, but his Latin prefaces to several of the works which he printed seem sufficiently to establish that he had acquired considerable scholarship.

(Weiss, in *Biographie Universelle*; Maittaire, *Annales Typographici*.)

PLANTS, FOSSIL. The progress of knowledge concerning the vegetation which in antient geological periods covered the surface of our planet has been, until within a few years, neither rapid nor sure. No small amount of time and patience was required to establish the conviction that organization, not crystallization, was indicated by the wood, leaves, and fruits which abound in the stratification of Europe. Much profound investigation of the *natural orders* of plants was an indispensable preliminary to the reference of even perfect specimens of fossil plants to their living congeners, and microscopic scrutiny of the minutest tissues could alone determine in fragments of petrified wood the essential characters of primæval trees.

These investigations have been so far advanced by eminent living botanists, that a very great proportion of fossil plants has been satisfactorily referred to the proper classes and great natural orders, and in some instances to the true families and genera. On this basis, furnished by physiological botany, geologists have erected very important inferences and very remarkable speculations—inferences concerning the succession of vegetable life, and the varying distribution of land and sea; and speculations concerning the antient temperature of the surface of the globe, and the antient chemical constitution of the atmosphere.

Passing over, but not without approbation, the earlier labours of Steinhauer, Parkinson, and Artis, in England; of Schlottheim, Sternberg, Rhode, and Martius, in Germany; of Nilson and Agardh, in Sweden, we may safely attribute to M. Adolphe Brongniart the advanced position among the natural sciences which is conceded to fossil botany. Guided by views of botanical classification at once profound and practically applicable to the subject before him, this zealous naturalist, by personal observations over great part of Europe (1825 and following years) and by communications from many distant parts of the world, gathered and methodised that body of information which is the basis of his two great works, viz.: the 'Prodrome d'une Histoire des Végétaux Fossiles,' 1828; and the 'Histoire des Vegetaux Fossiles,' which occupied many subsequent years.

A somewhat parallel but less extensive inquiry has since been undertaken in England by Dr. Lindley and Mr. Hutton (*Fossil Flora of Great Britain*, 1831-36); Göppert (*Systema Filicum Fossilium*, 1836), has revised the numerous tribes of fossil ferns; Mr. Bowerbank has collected extensive information concerning the fossil fruits of the London clay, and we are indebted to Dr. Brown, Mr. Witham, Mr. Bowman, Mr. King, and some other writers for a variety of notices on particular tribes of fossil plants. Mr. Morris has combined in his catalogue a summary of the results for the British Islands.

Previous to the year 1828 there can hardly be said to have been specifically known so many as one hundred fossil plants. In the Prodrome of M. Brongniart appeared (p. 219) 501 fossil plants, while the recent tribes were estimated at 50,350. In 1845 Mr. Göppert estimated the known fossil plants at 1792, and the recent species at 80,000. (*Reports of the British Association.*) Following the classification of M. Brongniart, we find his 501 plants thus divided and compared with living tribes:—

	Fossil.	Recent.
Agamia	27	7,000
Cryptogamia cellulosa	2	1,500
Cryptogamia vasculosa	266	1,700
Phanerogamia gymnospermia	67	150
Phanerogamia monocotyledonea	49	8,000
Phanerogamia dicotyledonea	100	32,000

It thus appears that the vascular Cryptogamia numerically constituted above half the fossil flora known in 1828, while among living plants they count only as 1 in 30; and the dicotyledonous group, which includes more than half the recent plants, is represented in the stratification of the globe by one-fifth. These results, though modified by later discoveries, are still firmly established. Are we to conclude from this statement, that the vegetation of the antient world was entirely different in the numerical *proportions* of its constituent classes from the actual flora? Do the plants which we collect in the strata truly represent the entirety of the antient flora; or only such part of it as remained after decay and the transforming agencies of nature had destroyed another and perhaps larger proportion? M. Brongniart (though not without some limiting expressions and corrections) generally assumes the fossil flora preserved in the strata as proportionate to the flora that was in existence before those strata were deposited; and arranging the 501 species of fossil plants in periods of geological succession, as well as in groups of natural affinity, arrives at results which appear in the following table. (We have altered the *form* of the original, and added the general terms Palæozoic, Mesozoic, &c., in conformity with the views advocated in this work.)

	Agamia.	Cryptog. cellulosa.	Cryptog. vasculosa.	Phanerog. gymnosper.	Phanerog. monocotyled.	Phanerog. dicotyled.	
Actual period	7000	1500	1700	150	8000	32,000	Cainozoic
Fourth period	13*	2	7	17	25*	100*	
Third period	3	0	31	35*	3	0	Mesozoic
Second period	7	0	8	5	5	0	
First period	4	0	220*	0	16	0	Palæozoic

Hence it would appear that vascular Cryptogamia had their greatest predominance in the first (Palæozoic) period: that gymnospermous Phanerogamia acquired their greatest development in the third (Mesozoic) period, while true Monocotyledonous and Dicotyledonous plants became most numerous in the fourth (Cainozoic) period, and in it approximated to the proportions now actually observed between them in living nature.

But it is thought by Dr. Lindley (*Fossil Flora*, vol. iii. p. 3) that the proportions among the several classes and families of plants preserved in the strata may be very different from those which obtained between the plants when living, because only part of the whole living creation of plants could be expected to resist long immersion in water and the many destructive agencies which are at work on vegetable substances, so as to be preserved in the earth. And this view is to a certain extent confirmed by experiments made by Dr. Lindley, for the purpose of ascertaining the relative conservability of plants belonging to different natural families.

For this purpose, on the 21st of March, 1833, he immersed in a large iron tank full of water, 177 specimens of various plants, belonging to all the more remarkable natural orders, taking care, in particular, to include representatives of all those which are either constantly present in the coal-measures or as universally absent. The vessel was left uncovered in the open air, and filled with water as it evaporated, till the 22nd April, 1835. The result of the experiment was then registered in respect of each plant: of the 177 tried, 56 only remained recognizable in the water; 121 were not to be traced. The numbers were thus proportioned in several natural groups:—

	Tried.	Recognizable.	Lost.
Acotyledones	22	10	12
Dicotyledones apetalæ	38	26	12
Dicotyledones polypetalæ	45	2	43
Dicotyledones monopetalæ . . .	41	6	35
Monocotyledones	31	12	19

Among the Acotyledones the recognizable families were mostly Filices, and Lycopodiaceæ, these being frequent in a fossil state. Among the Dicotyledones apetalæ the recognizable plants were numerous, especially in the Coniferæ, and these abound in a fossil state. 'With these exceptions, the Dicotyledonous plants tried were, in general, unable to remain for two years in water without being totally decomposed.' 'The Monocotyledonous plants were found more capable of resisting the action of water, especially Palms and Scitamineous plants, which occur as fossils; ferns exhibited a great power of resisting water, if gathered in a green state, but immersion in water caused their fructification to rot away.'

If we were completely assured by observation that the circumstances under which the fossil plants were buried in the sediments now hardened around them, were similar to those under which the above-narrated experiments were made, the inferences from the experiments might be relied on for modifying and perfecting a general view of the antient vegetation of the globe. But this is not the case; we have no such assurance. On the contrary, in very many cases there is little room for doubt that the plants were speedily enveloped in mud, and not for a long time scattered in water. They appear in fact to be a fair sample of the vegetation which actually prevailed on or near to the spots where they are found buried, and were subject to be drifted for that distance by water transporting mud and sand. Sometimes drifted in a fresh state, sometimes in a decomposed state, according to the degree in which they had withstood *atmospheric* rather than *watery* agencies, these plants should perhaps rather be compared to the weeds which cover the surface of some rivers in flood, than to the rotten vegetation at the bottom of stagnant pools. This comparison has, we believe, not yet been made under favourable circumstances, but certainly the flood-transported plants on English rivers are by no means to be taken as a sample of our upland flora, if even they do tolerably represent the vegetation of the river-banks.

Another important question affecting the general inferences to be derived from the study of fossil plants remains to be asked. Did these plants grow in or near to the situations where now they remain buried? The answer must be affirmative in some cases, doubtful in many, and negative in the remainder. It must be affirmative in respect of many cases of Stigmaria, if we admit the stems of this plant, with their articulated leaf-like processes, to be really the roots of trees analogous to Stigmaria and Lepidodendron; and to this, now a prevalent opinion, M. Adolphe Brongniart has assented. It must be affirmative in respect of the Cycadeoid plants of the Isle of Purbeck, which remain yet rooted as in their period of life, with the bed of soil in which they grew.

In the case of the great proportion of fern-leaves, and scattered branches and fragments of stems of Lepidodendra, which abound in the roof of many coal-beds, we cannot doubt that these have been subject to drifting, though it is not easy to determine from what distance or in what direction; as however the leaves retain almost universally their figure, expansion, and veins, and are represented by so much of a carbonaceous pellicle as may correspond to their whole mass, and have sometimes preserved their fructification, we need not suppose them to have been drifted from far, nor to have been long immersed in water.

Many other cases of fossil plants occur, which require us to admit at least the possibility of their having been drifted from great distances. The large broken stem of coniferous wood found in the sandstone of Craigleith, and described by Mr. Witham, may be taken as an example. It suggests, concerning many other cases of coniferous fossil wood found in the lias, oolites, Wealden and London clay, the idea of a great muddy river flowing through a woody region, and depositing in marshy plains, in æstuaries, or in the bed of the open sea, the spoils collected in its course. In this latter case we frequently observe the wood to be perforated by Teredines (London clay).

From the above observations we collect that the *large accumulations* of fossil plants which belong to certain stratified deposits, represent approximately, though not completely nor exactly, the flora of the period of their deposition at and near the places where they are found; but that single plants or scattered small collections of them may have been derived from remote situations.

Can we, from the catalogues of fossil plants, determine what was the climate in which they flourished during primæval periods? Confining our attention to the British Isles, we remark three great accumulations of fossil plants, in three successive periods. The land vegetation of Palæozoic periods is well represented by the plants of our coal-measures; that of the Mesozoic periods by the plants of the oolitic shales of the Yorkshire coast; and that of Cainozoic ages is known to us in some particulars by the deposits of Sheppey, rich in seed-vessels.

The most numerous group of fossil plants, in the two former great periods, is certainly the tribe of Ferns, which, with the other vascular Cryptogamia, are known to be most numerous, in comparison of the other races of plants, in countries where the climate is warm and the atmosphere damp. Some of these are Tree-ferns, which remarkably characterize warm though not necessarily very hot climates. With these are associated in great abundance large stems, like Cacteaceæ; others like gigantic Equisetaceæ; others like monstrous hybrids of Lycopodiaceæ and Coniferæ, and a few Palms; all confirming, by their structural analogies, the conclusion that the climate of the carboniferous period in the northern zones of Great Britain was warm. Now this conclusion applies with equal force to the whole of the European and North

American coal-fields; and thus we find reason to admit a prevalent warm climate in the northern zones of the globe. With these conclusions from the examination of the carboniferous flora, the inferences from the oolitic flora agree sufficiently. Substituting cycadeoid plants, which abound in these, for the lycopodioid and cactoid forms in those, we have a parallel series of results. And warmth of climate appears still to be indicated by the seed-vessels of Piperaceæ, &c., which occur in the London clay. In harmony with the data which are here generalized, into the inference of a warm climate prevailing in the northern zones of the world, even into the Cainozoic periods, is a parallel series of data and inferences derived from the contemplation of the perished races of animals.

Granted, then, a certain high probability that the great masses of fossil plants—those of the coal-formation in particular—grew in an atmosphere warm and damp, in a climate analogous to the shores and islands of the tropics, we shall not wonder if these vegetable accumulations are of *considerable* extent. But they are of *enormous* extent; for coal, itself nothing else than plants accumulated, compressed, and transmuted, is of such thickness, even in some of many workable beds, as to have absorbed the growth of plants on an equal area for hundreds of centuries, if that growth was after the rate now to be witnessed in temperate or even the most favourable tropical regions. In every natural effect time and force are reciprocally involved: if we suppose the antient growth of plants to have been more rapid than the modern, the *time* above alluded to may be conceived to be reduced. M. Brongniart does so suppose the force of vegetation to have varied and to have diminished towards our days, and he speculates on a cause for this, viz. a change of the constitution of the atmosphere by the gradual diminution of the proportion of its contained carbonic acid. That such a diminution of the carbonic acid of the air may have happened, nothing in physical science forbids: that it is not improbable, the late development of air-breathing animals (in the succession of life on the globe), seems to indicate; and, finally, that it really did happen to some extent at least, after the great period of carboniferous vegetation, may be maintained in a very simple argument. Calculate the quantity of carbonic-acid gas proportioned to the carbon in a given weight of coal: that quantity of the gas, *at least*, existed in the atmosphere before the fixation of the carbon in the plants which yielded that coal. The whole quantity of coal actually buried in the earth is of course not known, but *that which is known*, submitted to this calculation, is enough to leave no doubt that previous to the Carboniferous period the atmosphere must have been *loaded with* carbonic-acid gas, unless compensating processes, of which we have now no example, were contemporaneously in action. The compensating process now in action is chiefly animal respiration; but we have little or no evidence of the existence of air-breathing terrestrial animals previous to the carboniferous æra.

In Morris's Catalogue of British Fossils (published in 1843), occur the names of 524 species of fossil plants, distributed in 107 genera or families. We propose to enumerate these genera and show their geological distribution so far as relates to the British Islands, according to the classification developed in the Cyclopædia [PALÆOZOIC SERIES, P. C.; SALIFEROUS SYSTEM, P. C.] and exemplified in the article on FISHES, FOSSIL, P. C. S.

General Distribution of Fossil Plants.

Tab. I. In British Strata:—

	Total.
Cainozoic strata	121
Mesozoic strata	125
Palæozoic strata	279
	525

For comparison we add M. Göppert's statement of the numbers of plants in corresponding strata obtained from all parts of the globe:—

Cainozoic strata	454
Mesozoic strata	398
Palæozoic strata	929

In both estimates the Palæozoic Plants are more than equal in number to those of all the other strata. They are chiefly obtained from the coal-measures.

Selecting particular groups for consideration, we find some characteristic circumstances of distribution (as in Tab. II.).

Tab. II. Geological distribution of Ferns, Cycadeæ, Coniferæ, and Fucoids in British Strata:—

	Ferns.	Cycadeæ.	Coniferæ.	Fucoids.
Cainozoic	0	0	Few.	2
Mesozoic	51	27	12	6
Palæozoic	105	0	10	0

Tab. III. Geological distribution of certain genera of plants:—

	Pecopteris.	Neuropteris.	Sphenopteris.	Sigillaria.	Lepidodendron.	Leguminosites.
Cainozoic	0	0	0	0	0	18
Mesozoic	13	0	11	0	0	[illegible]
Palæozoic	21	22	31	19	20	[illegible]

General series of the genera of British fossil plants:—

Cainozoic Strata.

Names of Plants.	Number of Species.	Names of Plants.	Number of Species.
Amentaceæ	1	Leguminosites	18
Carpolithes	2	Lycopodites	1
Ceratophyllum	1	Mimosites	1
Chara	6	Nipadites	13
Cucumites	1	Petrophiloides	7
Cupanoïdes	8	Pinites	1
Cupressinites	13	Strobilites	1
Faboidea	25	Tricarpellites	7
Fucoides	1	Witherellia	1
Hightea	10	Xuliosprionites	2
Lauraceæ	1		

Mesozoic Strata.

Abies	2	Pecopteris	13
Alethopteris	2	Peuce	3
Araucarites	1	Phlebopteris	2
Brachyphyllum	1	Pinites	2
Bucklandia	1	Podocarya	1
Carpolithes	5	Polypodites	2
Chondrites	1	Polystichites	1
Clathraria	1	Pterophyllum	6
Confervites	2	Rhodea	2
Cycadites	1	Sagenopteris	2
Cyclopteris	3	Schizopteris	1
Dictyophyllum	2	Solenites	2
Dracæna	1	Sphæreda	1
Echinostachys	1	Sphenopteris	11
Endogenites	1	Sphærococcites	2
Equisetites	3	Strobilites	2
Fucoides	2	Taxites	1
Halymenites	1	Tæniopteris	5
Lonchopteris	2	Thuytes	4
Lycopodites	1	Tympanophora	2
Otopteris	4	Walchia	1
Pachypteris	2	Zamites	11
Palæozamia	8		

Palæozoic Strata.

Alothopteris	11	Crepidopteris	1
Anabathra	1	Cyclocladia	1
Annularia	2	Cyclopteris	8
Antholithes	2	Cyperites	1
Aphlebia	1	Endogenites	1
Artisia	3	Equisetites	1
Aspidiaria	5	Favularia	2
Asterophyllites	5	Flabellaria	1
Bechera	2	Halonia	5
Bornia	1	Hippurites	4
Bruckmannia	5	Hydatica	2
Calamites	18	Knorria	3
Cardiocarpon	1	Lepidodendron	20
Carpolithes	5	Lepidophyllum	4
Caulopteris	3	Lepidostrobus	4
Chondrites	1	Lychnophorites	1

Lycopodites	3	Poacites	2
Megaphyton	3	Protopteris	1
Musocarpum	1	Rhodea	3
Myriophyllites	1	Sagenaria	6
Neuropteris	22	Selaginites	1
Noegerrathia	2	Sigillaria	19
Odontopteris	4	Sphenophyllum	4
Palmacites	1	Sphenopteris	31
Pecopteris	21	Stigmaria	4
Picea	1	Trigonocarpum	6
Pinites	6	Ulodendron	7
Pinnularia	1	Voltzia	1
Pinus	2	Walchia	1

PLASTERING is the art of applying plastic adhesive compositions or cements to walls, ceilings, and such other parts of a building as may require a smooth and even surface, to conceal the roughness of brickwork or masonry, or the timber framing of partitions, floors, roofs, and staircases, in such a manner as to admit of colouring, painting, and other modes of decoration. The business of the plasterer also embraces the formation and fixing of ornamental cornices, centre-pieces, and other ceiling and similar ornaments. 'No art in the economy of building,' observes Mr. Hosking, in his treatise on 'Building,' in the seventh edition of the 'Encyclopædia Britannica,' 'contributes more to produce internal neatness and elegance, and no one is less absolutely important, as far as the use and stability of a structure are concerned, than that of the plasterer;' and he further remarks that its general application is of comparatively late date, 'for wainscoted walls, and boarded or boarded and canvassed ceilings, or naked joists alone, are frequently found in houses of less than a century old, both in this country and on the Continent.'

In the application of plaster or stucco [STUCCO, P. C., p. 166] to a brick wall, the first thing to be observed is to secure a rough and porous surface to which the composition may adhere readily. If the walls be new, and built with the intention of receiving stucco or plaster, the joints are, as mentioned under BUILDING, P. C. S, p. 248, left rough and prominent, instead of being *drawn* with the trowel, as is done for exposed brickwork; but if they be old, and have had the joints drawn, the mortar must be removed to a small depth, as for repointing, and the surface of the brickwork must be *stabbed* or picked over to make it rough, and to expose portions of new and porous surface. In applying the plaster, the surface must first be brushed free from dust, then wetted with water, and covered with a first coat of fluid stucco, applied with a coarse bristle-brush, after which, before it is quite dry, the first coat of coarse mortar-like composition is applied. In plastering upon quarter-partitions [CARPENTRY, P. C. S., p. 292], or upon the under surface of timber floors [HOUSE, P. C. S., p. 52], to form ceilings, a very different process is adopted. In both of these cases a surface is formed to receive the first coat of plaster by nailing to the timber quarterings, or to the joists in the case of a floor, narrow slips of wood called *laths*. These slips of wood, which are generally of fir, though oak is occasionally used, are about an inch wide, from three to five feet long, and either one quarter, three-eighths, or half an inch thick; these several thicknesses being designated respectively single, lath and a half, or double. They are, to ensure greater strength and elasticity, formed by splitting, or *rending*, so that they are not perfectly straight, and their surfaces are comparatively rough. They are laid transversely across the joists or other timbers to which they are applied, and nailed to them, frequently with cast-iron nails, in such a manner as to leave a narrow slit or opening between every two adjacent laths. As explained under HOUSE, P. C. S., it is frequently necessary to level the under surface of the joists or floor-timbers, by attaching slips of wood, technically called *furrings* or *firrings*, before nailing on the laths, in order that a perfect level may be obtained for the laths; and a similar precaution is sometimes required in timber or quarter partitions. In lathing it is important, especially in ceilings, to select laths of uniform thickness, and also to break or vary the joints produced by the abutting ends of two laths, which must be made to meet upon a joist or quartering, as much as possible. This done, the first coat of plaster, consisting of what is called *coarse stuff*, which is a mortar of lime and sand mixed with ox or horse hair, to give it consistency, is applied with a peculiar kind of trowel, in such a way as to force the mortar through the narrow openings between the laths, behind which, in consequence of its soft and wet state, it swells in such a way that, as it sets or hardens, it becomes firmly *keyed* to the laths, so that it could only be broken away in little bits, and by the application of considerable violence. As the security of the plaster depends upon this keying between and over or behind the laths, and not upon simple adhesion to their surface, it is evident that the hold must be in some degree interrupted wherever the laths lie in close contact with the joists, quarterings, or battens to which they are nailed, and hence the importance, alluded to under HOUSE, P. C. S., of keeping these timbers narrow, or, where that cannot be conveniently done, of producing a similar effect by interposing narrow fillets between them and the laths. Projections and pannelled compartments in a plastered surface are provided for by bracketing or cradling down the laths to as nearly as may be the required form.

The first coat of plaster being thus laid, the subsequent operations vary considerably according to the nature of the work, and the number of coats it is intended to apply. If it be intended to use only two coats, which, when upon laths, is technically called *laid and set*, the first coat, or the laying, is levelled with the trowel, and when sufficiently dry, its surface is scratched up or roughed with a birch-broom, and a thin coat, or *set*, of finer plaster is laid on and smoothed with the trowel, assisted by a wet bristle-brush to moisten such parts as are inclined to dry too suddenly. In applying this second coat, the first will occasionally need sprinkling with water to facilitate their perfect union. In better work, where three coats are used, the first coat is laid very roughly, and, while moist, scored over with lines about three or four inches apart, as deeply and roughly as can be done without laying the laths bare in any place, to make the second coat adhere the better. This first coat may project a quarter or three-eighths of an inch from the laths, and it is, in this case, called the *pricking-up*. When it is so far dry as to be thoroughly firm, ledges or margins of plaster, called *screeds*, are formed at the angles, and at intervals of a few feet across the surface, these being very carefully adjusted to nearly the degree of projection or level which the finished surface should have, in order that they may form gauges for the rest of the work. When these screeds, which are about six or eight inches wide, are set, the intervening spaces or bays are filled up flush with them, the plaster being very carefully adjusted to the required surface, by means of flat wooden instruments called *floats*, made with one or two handles (the latter being called *Derby floats*), and *straight-edges*, or long pieces of wood, carefully planed to a perfectly straight edge, which are moved backwards and forwards over the work in various directions, to test its accuracy. When this second coat is nearly dry, it is swept over, and a third very thin coat of fine stuff, or superior plaster made with very fine white lime, is applied as above described, the hand-float being sometimes employed to perfectly flatten and condense it, and, by the aid of occasional sprinkling with water, to rub or grind it to a smooth hard surface. In performing the like operations upon a brick or stone wall there are some trifling variations, and the first rough coat is called *rendering* instead of *laying*. For minute details in this and other departments of the art of plastering we must, however, refer the reader to the articles on the subject in Nicholson's 'Architectural Dictionary,' and to that department of the article 'Building' in the 'Encyclopædia Britannica' which treats on the duties of the plasterer. Ceilings or fine surfaces that have to be whitened or coloured are finished with putty, which is a fine plaster made of the finest powdered lime, macerated so completely as to be held in solution by the water, and forming a delicate paste, which is allowed to evaporate until of the proper consistency for working; but surfaces which are to be papered are finished with a somewhat less delicate variety of fine stuff, with the admixture of a little hair. Surfaces intended for painting are finished, or *set*, with *bastard stucco*, which is composed of two-thirds ordinary fine stuff, without hair, and one-third very fine clean sand, and these are finished with the trowel, without the use of the float upon the last coat.

The various modes of finishing stuccoed or cemented surfaces on the exterior of buildings may be passed over with the remark that they are often spoiled by the presence of muddy earth, and decayed animal and vegetable matter, in the sand which is mixed with the lime and cement, to which causes of failure may be added the occasional presence of argillaceous matter with the lime, and defects in the cements themselves. 'These things might,' Mr. Hosking observes, 'remain quiescent for a long time, if the work were well protected from access of moisture, which is the grand exciting cause.' 'The paint, or distemper wash on the surface,' he adds, 'is generally sufficient to prevent tho rain which may beat against a vertical face from penetrating, especially if the work have been well hand-floated and trowelled, to make it close and compact; but the evil arises from exposure above, and from the numberless horizontal unfloated surfaces which are constantly presented,' which receive and detain the water until the work becomes saturated, when either frost seizes and bursts it, or warmth calls the vegetative power of its impurities into action, so that it becomes covered with minute vegetation. Hence he insists on the importance of excluding road-drift, (unless it be thoroughly cleansed from animal and vegetable matter), and all mud and clay, from the composition of both plastering mortars and mortars for building, although such materials are often used in mixing what the plasterer terms coarse stuff, under the impression that, so long as it is unctuous and tenacious, its composition is unimportant. He also recommends that care be takon to guard against the effects of wet, not only by providing sufficient shelter, and by frequent painting or distempering, but also by carefully hand-floating and trowelling the upper horizontal surfaces of all projections. *Rough-cast* is a cheap mode of stuccoing adopted in inferior buildings, when there are good projecting eaves to keep the walls dry, consisting of two coats of coarse lime and hair, covered, as soon as a piece of two or three yards is completed, with a semi-fluid mixture of fine clear gravel and strong lime, and washed immediately with an ochreous colour.

Mouldings and cornices are formed upon a core or foundation, either of brackets and laths, or in some cases in external work, of projecting bricks and tiles. Very trifling projections may sometimes be supported sufficiently hy a few projecting nails. If large, a layer of comparatively coarse stuff is applied to the foundation, and to this, when dry, is applied the finer composition of which the moulding is to be formed, as nearly as possible in tho required shape. The precise form is then given by *running* or sliding along the cornice, with the aid of guides attached to the wall or ceiling, or both, a mould formed of a thin board, one edge of which is cut so as to be a perfect counterpart of the profile of the moulding. The quirks or small angles, and in some cases the whole of the acting edges of these moulds, are formed of metal. The composition used for in-door cornices and mouldings is called *gauge-stuff*, and consists of three-fourths of the *putty* used in setting ceilings, to one-fourth of calcined gypsum, or plaster of Paris. As the addition of the gypsum causes it to set very quickly, only a small quantity of gauge-stuff must be mixed at once, and the moulding must be frequently sprinkled to keep its surface soft until the shape of the mould is perfectly transferred to it. The mixture of plaster of Paris with stucco for external mouldings should not be permitted, as it will not bear exposure to the weather, although it enables the workman to produce a sharper and better looking moulding. Such ornaments as cannot be formed by *running* are cast separately in plaster of Paris, being run in moulds in the ordinary way, and are secured in their places in the ceiling or cornice, either with plaster or some other cement, or when too heavy for such a mode of fixing, by screwing them to wooden cradling fixed to receive them. Mouldings and cornices are nsually formed before the final or setting coat is given to the walls aud ceilings. Ornaments of papier-maché and some other substances, both lighter and less liable to injury than plaster or any plaster-like composition, have been extensively introduced of late years fo internal decoration, and especially for ceilings.

Plasterer's work is measured in feet and inches, and charged by the superficial yard of nine square feet, under separate heads according to the description of the work; with special charges, according to certain established rules, for arrises or external angles, quirks, mouldings, and other enrichments, and curved work.

Plaster being, in a great measnre, incombustible, it is to be regretted that its use is not generally so modified as to render it a more important protection to buildings against fire than it commonly is. Under FIRE-PROOF BUILDINGS, P. C. S., p. 577, is a notice of one of several attempts that have been made for the attainment of this desirable object.

PLATFORM, for guns, mortars, &c., is a floor of timber or a pavement of stone of a rectangular form which is laid on the ground for the support of a piece of ordnance, and to prevent the wheels of its carriage from sinking.

A gun platform has one of its extremities at the foot of the interior slope of the parapet; it is generally 14 or 15 feet long and 10½ or 11 feet broad, and is laid either in a horizontal position, or with a slope of about 6 inches, from the rear down towards the parapet, in order to diminish the recoil of the gun. It consists of five joists or sleepers, each 6 inches square, which are sunk in the ground, and covered with planks each one foot broad and two inches thick; the planks are sometimes fastened to the sleepers hy nails or screws; but in siege batteries, they are kept in their places by means of a ribband or piece of timber lying across their ends on each side of the platform, and confined to them by short ropes called rack-lashings, each of which passed under a sleeper and over a ribband. By this contrivance the platform may be laid, even in the dark, quickly, and without noise; and the timbers not being injured by nails or screws, may be removed and re-laid elsewhere as often as it may be necessary to change the position of the battery. Four men accustomed to the service can take up a platform in three minutes, and lay one in an hour.

A mortar platform is 7½ feet long and 6½ feet wide; the planks are three inches thick and rest on sleepers. This platform is placed at such a distance from the foot of the parapet towards the rear of the battery, that the shell, when discharged at the required elevation, may pass above the crest.

Along the head of every gun-plstform is laid a piece of timber called *heurtoir* or *hurter*, which, in general, serves to prevent the wheels of the gun-carriage from damaging the interior of the parapet. When the line of aim is oblique to the capital of the embrazure the hurter, which is in contact with the wheels of the carriage, in their front, serves to keep the gun in its position.

When a gun is directed against a particular object, as in breaching, the platform sometimes consists merely of four planks each six feet long, ten inches broad, and three inches thick; two of these serve as sleepers, and the other two, being placed across them, serve to support the wheels of the carriage; all the planks are kept in their places by pickets driven in the ground.

PLATING; PLATED MANUFACTURES. [SILVER, P. C., p. 25; GILDING, P. C., p. 218; ELECTRO-METALLURGY, P. C. S., p. 518; CHASING OF METALS, P. C. S., p. 332; SPOON, P. C., p. 377; SOLDERING, P. C., p. 202.]

PLECTRANTHUS (from πλῆκτρον, a cock's spur, and ἄνθος, a flower, in reference to the corolla being spurred or gibbous above the base), a genus of plants belonging to the natural order Labiatæ. It has a campanulate 5-toothed calyx in the floriferous state; the teeth equal or the upper one largest. The corolla with an exserted tube; the upper lip from 3- to 4-cleft, the lower one entire, usually longer and concave. Thero are 4 stamens, declinate, didynamous, the lower ones longest; free toothless filaments, ovate uniform anthers. The species are herbs, subshrubs, and shrubs. There are 45 species of this genus described, which are of easy culture and propagation. Any light rich soil will suit them. The shrubby and perennial species are increased by cuttings. The seeds of the annuals should be raised on a hot-bed before planting in the open ground. *P. crassifolius* is esteemed in India both as a perfume and a spice, being equally valued in the toilet and the kitchen. The Patchouly, so inimical to vermin and so efficacious in preserving clothes from moths, is said to be the leaves of P. *graveolens*, which have a very powerful odour, but the comminuted state in which it is imported renders this uncertain.

(Don, *Gardener's Dictionary*; Burnett, *Outlines of Botany*.)

PLENARTY. [QUARE IMPEDIT, P. C.]

PLINUS. [SERRICORNES, P. C. S.]

PLOOS VAN AMSTEL, CORNELIS, a celebrated Dutch amateur engraver and designer, was born at Amsterdam, in 1726. He is chiefly distinguished for his imitations of the drawings of old masters, of which he possessed one of the best collections known, amounting to 5000 drawings by celebrated Italian, German, French, Flemish, and Dutch masters, from Giotto to his own time. Born of a good and wealthy family, he had every opportunity suitable for improving his taste and advancing his pursuits: he is said to have had a mature judgment in matters of art in his fourteenth year; and being acquainted with all the principal collectors of Amsterdam, he commenced making his own valuable collection at a very early age. He had likewise a very valuable collection of prints and etchings, especially of the works of Lucas van Leyden, Albert Dürer, Golzius, Cornelis and Jan Visser, N. Berchem, and especially Rembrandt.

Ploos van Amstel's own works consist chiefly of imitations of drawings of old masters, in chalk, washed, and coloured; the coloured imitations were accomplished by printing with several plates. In 1765 he published a collection of forty-six such imitations in various styles, after drawings by Zaftleven, A. Vandevelde, Rembrandt, Ostade, Van Campen, Vandyck, Van Goyen, Gerard Dow, Backhuyzen, Metzu, Berchem, A. Bloemart, Golzius, C. Visser, Wouvermann, P. Saenredam, Van Mander, Flink, Brouwer, Mieris, Terburg, J. Steen, De Bray, and others.

There are altogether upwards of one hundred imitations of drawings by Ploos van Amstel, and many of these are published in various stages of progress, but very few impressions were taken of any. They are enumerated and described by Weigel in the 'Kunst Katalog,' and in Nagler's 'Künstler Lexicon.' A collection of one hundred of Van Amstel's and some additional similar imitations, with a portrait of Van Amstel, was published by C. Josi, in London, in 1821, royal folio; but only one hundred copies were printed, and at the enormous price of forty guineas per copy.

Ploos van Amstel died at Amsterdam, December 20, 1798, and on March 3rd, 1800, his valuable collection, with the exception of the etchings of Rembrandt, was sold by auction, and realized the large sum of 109,406 florins.

When Van Amstel's coloured prints first appeared, his countrymen disbelieved that they were produced solely by using various plates, and he accordingly drew off some impressions in the presence of a deputation of the Dutch Academy of the Sciences at Haarlem in 1768, which decided the question satisfactorily.

(Van Eynden en Vander Willigen, *Geschiedenis der Vaterlandsche Schilderkunst sedert de helft der XVIII. Eeuw*, 1816-42.)

POA (the Greek πόα, 'grass'), a genus of Grasses belonging to the tribe Festucineæ. This tribe is characterized by very short styles, protruded stigmas, and the glumes shorter than the lowest flower. The genus Poa has its glumes rather unequal; the outer palea with 3 or 5 nerves, membranous below, scarious at the tip, compressed, keeled, unarmed; the styles terminal. The species of this genus are very numerous, constituting the commonest weeds that follow the migrations of man, and generally containing a sufficient quantity of nutritive matter to render them fodder for various animals. Thirteen species of this genus are described by Babington as natives of the British Islands. Of these the most common are the *P. annua* and *P. pratensis*. The former is perhaps the commonest of British plants, springing up on every neglected spot around the habitations of man. The latter is known by the name of the smooth-stalked meadow-grass, and is found in most pasture lands. *P. nemoralis*, the wood meadow-grass, is also a common grass in shady places. Many of the recent genera of Grasses were formerly referred to the genus Poa.

POILLY, FRANÇOIS, a distinguished French engraver, was born at Abbeville, in 1622. He was the pupil of P. Daret, and studied some time in Rome. He adopted the somewhat hard style of engraving of Bloemart in direct cross-lines, in which he was completely successful: his drawing also, which is quite correct, adds much to the value of his finely executed engravings. Though Poilly's style is very laborious, there are about 400 prints which bear his name, in which however he was of course assisted by his pupils. His master-piece is the print from Mignard's celebrated picture, now lost, of San Carlo Borromeo administering the Sacrament to the Milanese attacked with the Plague. A catalogue of his prints was published by R. Hecquet in 1752; it comprises several after Raphael, including the Vierge au Berceau, La Vierge au Linge, the large Holy Family in the Louvre, and other Holy Families by Raphael. Poilly died at Paris in 1693. His brother Nicolas and nephew Jean Baptiste Poilly were likewise distinguished engravers.

(Watelet et Levesque, *Dictionnaire des Arts*, &c.; Huber, *Manuel des Amateurs*, &c.)

POINDING, in the law of Scotland, is a process for enforcing payment of a debt, against the property of the debtor. It is divided into 'personal poinding,' and 'poinding of the ground.' The former is the method by which any ordinary creditor attaches the moveables of his debtor; the latter is peculiar to the holders of real rights over estates belonging to others—as to superiors entitled to feu duties or the holders of real securities entitled to payment of the interest—who can by this process attach the rents or other proceeds of the estate, and pay themselves. Personal poinding is the most usual form—it is of very frequent occurrence, and is a rapid and effective process. The procedure was simplified and regulated, and was brought within the authority of the sheriff's local court, by 1 & 2 Vict. c. 114.

POISONING, SECRET. When the knowledge of the nature of mineral, vegetable, and animal compounds was less known than at present, it was not uncommon for individuals to become acquainted with the poisonous properties of bodies, and to keep this a secret for the purpose of exercising a control over the lives of their fellow creatures. The entire ignorance that existed of the means of ascertaining the presence of poisons, or of the symptoms of poisoning as distinguished from other diseases, gave to persons who had accidentally discovered a poison a great power, and offered a temptation to crime. In antient history many instances are recorded of persons who died under suspicious circumstances and who were supposed to have been secretly poisoned. Beck in his 'Medical Jurisprudence,' says that 'Theophrastus speaks of a poison prepared from aconite which could be moderated in such a manner as to have effect in two or three years, or at the end of a year or two years; and he also relates that Thrasyas had discovered a method of preparing from other plants a poison which, given in small doses, occasioned an easy but certain death without any pain, and which might be kept back for a long time without causing weakness or corruption. This last poison was much used at Rome about two hundred years before the Christian era.' During the reigns of Caligula, Claudius, and Nero, a woman named Locusta seems to have been frequently employed for the purpose of administering poisons whose powers were known to herself alone. Locusta was employed by the second Agrippina, to poison her husband the emperor Claudius, and also by Nero to poison Britannicus, the son of Claudius and Messalina. (Tacitus, *Annal.* xii. 66; xiii. 15.)

The poisons used by the Greeks and Romans seem to have chiefly belonged to the vegetable kingdom, and were chiefly obtained, it is supposed, from the aconite, hemlock, and poppy. One of their animal poisons is said to have been the acrid juice secreted by a species of Tectibranchiate mollusca, called the sea-hare, the Aplysia depilans of Linnæus. They did not seem to be acquainted with mineral poisons.

In modern times secret poisoning has often been carried on to a great extent; although the relation of many of the incidents has been so connected with superstition, and a belief in supernatural powers, that it is sometimes difficult to distinguish between the true and fictitious. The aid of poisons appear sometimes to have been resorted to to obtain credence for the powers of the witch and the wizard. A singular combination of poisoners was discovered at Rome during the pontificate of Alexander VII. in 1659. It was observed that many young married women became widows, and that many husbands died who were known to have become disagreeable to their wives. Great exertions were used to detect the poisoners, when at length suspicion fell upon a society of young wives whose president was an old woman who pretended to foretell future events, and who had often predicted very accurately the death of many persons. At length the society was detected, arrested, and every member put to the torture, and the old president, by name Spara, with four others were publicly hanged. It appeared that Spara was a pupil of Tofania, an infamous woman who lived at Palermo and afterwards at Naples. The poison used by Tofania went by the name of Aqua Tofana [AQUA TOFANA, P. C.], but its composition was never accurately made known.

The practice of secret poisoning was carried to a great extent in France about the year 1670. One of the most distinguished agents in this business was Margaret d'Aubray, wife of the Marquess de Brinvilliers. She formed an improper intimacy with a villain named Sainte Croix, who taught her the art of poisoning, which she put in practice in order to better her circumstances. For the purpose of ascertaining the strength and action of her poisons, she assumed the dress of a nun, and distributed food to the poor, nursed the sick in the Hotel Dieu, and administered to them her poisons. She poisoned her father and brother, but was at last discovered. She was publicly beheaded in Paris on the 16th of July, 1676. She left behind her a complete catalogue of all her crimes. The principal poison used by herself and accomplices was the corrosive sublimate. The practice at this time had extended so widely in France that the government thought it necessary in 1679 to institute a court under the title of Chambre de Poison, or Chambre Ardente. The powers of this court however were abused, and very shortly after its institution it was suppressed.

Wherever evidence has been left sufficiently positive to admit of an inquiry into the nature of these secret poisons, it has been found that they contain ingredients well-known at the present day. It is only where the sciences of chemistry and medicine are not sufficiently known, or where they are neglected in the inquiry that secret poisoning can take place. In this country we have recently seen an instance at Happisburgh in Norfolk, where, from the neglect of inquiry, a man succeeded in poisoning at different times his wife, two grandchildren, and other members of his family, and several neighbours, amounting in all to 16 or 18 people, and eventually poisoned himself without discovery till after his death. Secret poisoning is at the present day practised in Turkey. Mr. Madden says, that whilst residing in that country he witnessed eight cases, in most of which death ensued within twelve hours, and in all within forty-eight hours. It is not uncommon amongst uncivilized nations. Dr. James, in his account of Major Long's Expedition, says that 'The celebrated chief, Black Bird, of the Omahaws, gained great reputation as a medicine man; his adversaries fell rapidly before his potent spells. His medicine was arsenic, furnished him for this purpose by the villany of the traders.'

(Beckmann, *History of Inventions*; Beck, *Medical Jurisprudence*; Adams, *Edinburgh Medical and Surgical Journal*, vol. xxxiii.)

POISSON, SIMEON DENIS. We regret that we are unable, from want of materials, to give any account of the private life of this very eminent mathematician. He was born June 21st, 1781, in an humble station, and was admitted in 1798 a pupil of the Ecole Polytechnique. M. Fourcy, in his history of this school, records the manner in which the young student, at the age of eighteen, attracted the notice of Lagrange by an improvement in the method of demonstrating the binomial theorem, which the latter read publicly to the class, and announced his intention of abiding by it for the future.

Poisson never held any political situation, or took public share in anything but education. In 1828 he was baron, officer of the legion of honour, repetiteur-adjoint and permanent examiner of the Polytechnic School, member of the Council of Public Instruction, and of the Academy of Sciences. He died April 25th, 1840.

As far as so few words can go, it may be said that the labours of Poisson were directed to the introduction of the use of definite integrals into all branches of mathematical physics, and the extension of the various branches by their means. There is nothing out of which to make a popular reputation; the successes of Poisson are all purely mathematical, and none but the mathematician can as much as understand the description of them.

The greater part of the writings of Poisson are contained in various periodicals, particularly the Memoirs of the Institute, the Journal of the Polytechnic School, the *Annales des Mathématiques*, the *Connaissance des Tems*, &c., &c. There is hardly any subject on which they do not treat, and almost always with decided success; electricity, magnetism, heat, gases, capillary attraction, gravitation, the pendulum, &c. &c., are titles each of which suggests to the well-informed mathematician of our time the memory of some ably-written paper by Poisson. His object was to leave no branch of physics unexplored by aid of the new and powerful methods of investigation which a school yet more modern than that of Lagrange and Laplace had added to the pure mathematics. Towards the end of his life he began to collect his scattered memoirs into separate works, with the additions which his subsequent researches had given.

Poisson's separate works are—1, 'Traité de Mécanique,' Paris, 1811, 2 vols. 8vo.; second edition, Paris, 1833, 2 vols. 8vo. Perhaps this is the best elementary work on a branch of mathematical physics which exists, considered as an introduction to the use of modern analysis. An English student should read with it some of our own writers, who abound in examples. 2, 'Nouvelle Théorie de l'Action Capillaire,' Paris, 1831, 4to. The principal distinction between this theory and that of Laplace, physically speaking, is the consideration of the variation of density which takes place at the end of the capillary column of fluid. 3, 'Théorie Mathématique de la Chaleur,' Paris 1835, 4to. The data from which Poisson starts are derived from the experiments on the nature of heat, made subsequently to the time of Fourier, his great predecessor in this branch of the subject. 4, 'Recherches sur la Probabilité des Jugemens en Matière Criminelle et en Matière Civile,' Paris, 1837, 4to. This is, in fact, a treatise on the theory of probabilities, with especial reference to its application to matters of evidence, particularly of the judicial kind. With the exception of some partial substitution of definite integrals for series, there is little advance, mathematically speaking, upon Laplace; but the application is much more extensively treated, and in new points of view. Accordingly, Poisson has, with great judgment, made the application the heading of the whole work, though it occupies only the quarter of its space. It is said that Poisson left another work nearly finished; but it has not yet been published.

POLANI'SIA (from πολ, many, and ἄνισος, unequal; stamens numerous and unequal), a genus of plants belonging to the natural order Capparideæ. It has 4 spreading sepals, 4 petals, a small torus; silique sessile within the calyx or hardly stipitate, terminated by a distinct style.

P. icosandra has a stem covered with viscid glandular hairs, 3 to 5 foliolate leaves, the leaflets obovate, cuneate, or oblong pubescent, scarcely longer than the petiole. The stamens are about 10 in number. The silique terete striated, rough with glandular horns, sessile and acuminated. It is native of the East Indies, and is used in Cochin China as a counter-irritant in the same way as sinapisms in Europe, and as a vesicant. The root is used as a vermifuge in the United States of America.

P. graveolens is a plant beset with glandular hairs; it has trifoliate leaves, elliptical oblong leaflets, from 8 to 12 stamens, oblong siliques narrowed at the base, glandularly muricated and pubescent. It is native of North America, and is employed as a vermifuge.

The species of this genus are all annual plants from tropical countries: the seeds require to be sown in a hotbed frame, and when the plants are of sufficient size they should be planted out in the open border in a sheltered situation, but this should not be done before the middle of May. A plant of each should be kept in pots and placed in the greenhouse during the summer in order to secure seeds for next year's sowing, in case the summer should prove unfavourable for ripening in the open border.

(Don, *Gardener's Dictionary*; Lindley, *Flora Medica*.)

POLARIZATION. [CIRCULAR POLARIZATION, P. C. S.; ELLIPTIC POLARIZATION, P. C. S.]

POLARIZATION, MOVEABLE, is the name given by Biot to a supposed oscillatory movement of the molecules of polarized light in passing through a plate of doubly refracting crystal; and the hypothesis was proposed in order to account for certain variations of tint observed in the coloured images produced by the *ordinary* and *extraordinary* pencils of light.

This philosopher assumed that, in permanently polarized light which has been transmitted through a doubly refracting medium, the molecules composing the ordinary pencil or ray have their axes at right angles to those of the molecules which compose the extraordinary pencil; and M. Arago having observed that the tints of the two images formed after the transmission of a pencil of polarized light through a plate of sulphate of lime varied with the thickness and position of the plate—that at certain angles of incidence the red rays entered wholly into one image and the green or violet rays into the other, while at other angles of incidence the contrary phenomena occurred,—he was led to imagine that the polarized pencil, after having entered the plate, does not assume the character of permanently polarized light till it has penetrated to a certain depth, depending on the degree of attractive or repulsive power to which the particles are subject in the medium; and he conceived that, previously to being in that state, the axes of the molecules assume, in a series of alternations, first one and then the other of two particular planes of polarization.

Considering then that the phenomena of the colour seen in polarized light are analogous to those of Newton's rings, the ordinary and extraordinary rays giving rise to colours corresponding to those of the rings seen after transmission and reflexion respectively, M. Biot infers that, as these transmissions and reflexions take place alternately at intervals between the plates which, for homogeneous light of any colour, are comprehended between the terms in the series of distances 0, e, $2e$, $3e$, &c., so, in the passage of light through the plate of sulphate of lime, the alternate polarizations take place at intervals equal to those between the terms in a corresponding progression, these intervals being, however, much greater than the others. Thus, till the polarized light has penetrated to a depth represented by e' in the crystal, the molecules are conceived to be polarized in the original plane of polarization; between the depths represented by e' and $2e'$ they are supposed to be polarized in a plane making with the origina plane of polarization an angle equal to that which the two axes of the biaxal crystal make with each other; within the next depth, that is between $2e'$ and $3e'$, they appear to be again polarized in the first plane, and so on.

In the same kind of crystal the values of e' are supposed to differ for the different kinds of light, but the limits of the oscillation are the same for all particles whose motions are in the same direction; and the oscillatory motion is supposed to cease when the luminous particles quit the posterior surface of the plate and pass into the air, or enter into any other medium which has not the property of double refraction.

The phenomena presented by mica, beryl, rock-crystal, Iceland spar, and many other crystals, are the same as those presented by sulphate of lime, except with respect to the thicknesses at which the periodical variations of the tints take place; and they are equally capable of being explained by the hypothesis of a moveable polarization: the oscillations, however, do not take place on each side of a line bisecting the angle between the two axes of the biaxal crystal, but on each side of the plane towards which the axes of the particles in the pencil ordinarily refracted by the plate would be turned if those particles had acquired a permanent polarization.

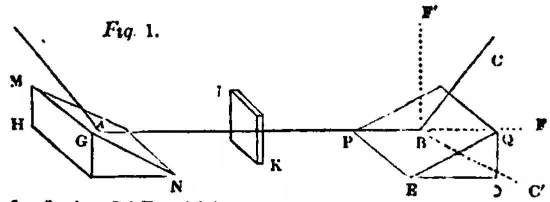
Though Biot's hypothesis of moveable polarization has been found capable of explaining most of the phenomena of polarized light, both that in which the incident pencil consists of parallel rays and that in which, the rays being convergent, coloured rings [POLARIZED RINGS, P. C. S.] are produced, yet it is known to be, in many respects, defective. The displacement of the plane of polarization in plates of crystal may be satisfactorily explained on the principles of the undulatory theory: thus, suppose a polarized ray to be incident perpendicularly on a crystallized plate having its principal section inclined to the plane of primitive polarization in a certain angle; that ray will then be resolved into two, the vibrations of the ætherial molecules in which are respectively performed in the principal section and perpendicularly to it. Now, if the thickness of the plate be such as to render the difference between the lengths of the paths of the rays within the crystal equal to an exact number of vibrations, the rays will emerge from the plate in exact accordance: in this case the ordinary and extraordinary rays being polarized in opposite planes, they will not destroy each other, and it will be found that the resultant ray, at emergence, is, in respect of intensity and polarization, similar to the incident ray. But if the difference between the lengths of the paths within the crystal be an exact odd multiple of half an undulation, the waves at their egress will be in discordance, and the resultant ray, at emergence, will become polarized in a plane making an angle with the plane of the incident ray equal to twice that at which the principal section of the plate is inclined to the plane of primitive polarization.

POLARIZED RINGS. Between the year 1812 and 1816 several important properties of polarized light were discovered by philosophers in England, France, and Germany, and of these the formation of the coloured rings which are seen when polarized light is transmitted through plates of a doubly refracting crystal, are the most remarkable.

As early as 1811 MM. Arago and Biot had observed the variations in the colours of images, which take place when polarized light is transmitted through plates of mica: and in 1812 Dr. (Sir David) Brewster had made similar observations with agate, mica, and topaz. But the British philosopher vastly extended this branch of optics by his discovery of the systems of rings, which may be seen both in bi-axal and uni-axal crystals when conical pencils of polarized light are transmitted through them; and his experiments, with those of Young, Wollaston, and Sir John Herschel, in England, have afforded ample materials for determining the laws of the phenomena. In 1813 Brewster observed circular rings in ruby, emerald, and beryl; in the following year the like were witnessed by Dr. Wollaston in Iceland spar and in 1815 they were seen by M. Biot in France and by Dr. Sebeck at Nürnberg.

In order to understand the manner in which the phenomena may be observed, it will be convenient to imagine that the light is polarized by reflexion: thus let MN be the upper surface of a plate of glass either parallel or inclined to the horizon; (a plate of obsidian or a pile of glass plates placed one on another may be employed) its posterior surface being blackened; and let PQ be the surface of a second plate of glass having its posterior surface also blackened. The former is called the polarizing and the latter the analyzing plano. Let SA be the axis of a slender pencil of light from the clouds or from a lamp surrounded by unpolished glass, and let it fall on MN at an angle of incidence equal to 56° 47′, the reflected pencil, of which let AB be the axis, will then be polarized in the plane

Fig. 1.

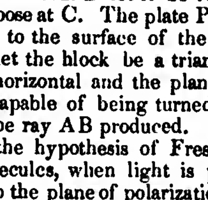


of reflexion SAB, which may be called the plane of primitive polarization; and in this state let it fall on PQ at an equal angle of incidence: from B let it be reflected to the eye of the observer, suppose at C. The plate PQ should be attached, as in the figure, to the surface of the block PQED; and, for convenience, let the block be a triangular prism of which the plane PD is horizontal and the plane EDQ vertical: the block should be capable of being turned on an axis as BF in the direction of the ray AB produced.

Agreeably to the hypothesis of Fresnel the vibrations of the ætherial molecules, when light is polarized, take place perpendicularly to the plane of polarization; therefore, if the plates MN and PQ are disposed as in the figure, so that the course SABC of the ray is in one plane (suppose vertical) and no object is placed in the direction of the pencil AB, the vibrations will take place after reflexion from PQ, exactly in the same manner as they take place between the mirrors, and the spectator will have a strong perception of the reflected light. But if PQ be turned on the axis ABF, the perception of the reflected light diminishes; and when the base PD is perpendicular to its first position, in which case the planes SAB and ABC are at right angles to one another, the vibrations are destroyed in consequence of a polarization with respect to the plane ABC′, so that the eye at C′ has no perception of reflected light.

Now, let a thin plate of Iceland spar, ruby, emerald, or other uni-axal crystal cut with parallel surfaces, each perpendicular to the axis of the primitive crystal, be placed as at I K in the direction of the polarized pencil AB, the former state of the pencil BC will be partially restored; and an eye at C′ receiving the pencil through a small aperture, there will be

Fig. 2.



seen in the field of view a number of concentric circular rings of different colours, traversed by a black cross consisting of branches at right angles to one another. When the phenomenon is observed with common white light polarized as above said, the centre of the field is occupied by a black spot surrounded by a deep blue colour, which gradually declines to whiteness; and, proceeding from the centre outwards, the colour becomes successively a pale yellow, orange and deep red, similar to the first series of Newton's rings. [COLOURS OF PLATES, P. C. S.] The colours in the succeeding rings are arranged in the like order till the rings cease to be perceptible, the cross remaining black.

The phenomena may be observed with equal or greater facility by placing the plate of Iceland spar or other crystal between two plates of tourmaline parallel to each other and to the plate of spar, and observing the lights directly through them: the plate of tourmaline which is farthest from the eye polarizes the light transmitted through it as the plate MN (*Fig.* 1) polarized it by reflexion; and the plate nearest to the eye, having its axis perpendicular to that of the former plate, performs the same office as the analyzing plate PQ, when the surface of the latter is perpendicular to MN. The plates of tourmaline should be cut with their surfaces in planes passing through, or parallel to, the axis of the natural prism; and what is called the axis of the plate is any line drawn on either of its surfaces parallel to the axis of the prism.

In 1813 Dr. Brewster observed that certain crystals, when polarized light was transmitted through them, exhibited two distinct systems of rings; and his first observations were made on blue topaz: a plate of this mineral being placed, as at IK (*Fig.* 1), and the analyzing plate PQ being turned round on BF till PD was in a vertical position, that is, till the plane ABC was at right angles to SAB, there appeared a system of rings, apparently elliptical with a rectilinear band quite dark in the direction of the major axis: the colours of the rings apparently corresponding to those of Newton's rings when seen by reflexion. By turning the plate PQ on BF as an axis 90° further, or 180° from the position in the figure, the series of rings appeared with colours seemingly complementary to those of the former series, or, apparently similar to those of Newton's rings seen by transmission. But, turning the plate PQ on an axis BF′ perpendicular to BF in the plane SAB of primitive polarization, there was found a position in which, by the reflected ray BC, there was seen a system of oval rings similar to the first. Dr. Brewster observed the like phenomena with plates of mica, nitre, sulphate of lime, &c.; and this led to the discovery that, in such crystals, there are two axes along which there is no double refraction. These are the *optic axes* of the crystal, or, as they were called by Brewster, axes of no polarization. In different crystals these axes have different inclinations to one another; in mica they make with each other an angle of 45°, in nitre much less; and a plate of crystal cut for the purpose of exhibiting the double system of rings should have its faces cut perpendicularly to a line bisecting the angle formed by the optic axes.

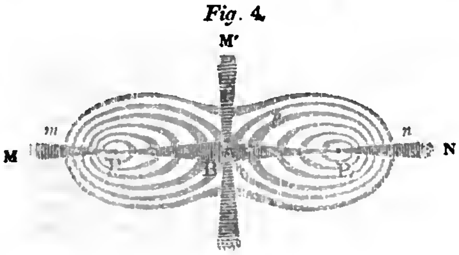
Now, if a plate of any bi-axal crystal, as mica, nitre, &c., be placed as at IK in the direction of the polarized ray, and be turned so that one of the optic axes is coincident with that ray; the analyzing plate PQ (*Fig.* 1) being also turned so that the reflected ray BC may be in a plane at right angles to SAB, there will be seen, about a dark point P (*Fig.* 3), representing that in which the axis intersects the field of view, a series of oval rings brightly coloured and divided

Fig. 3

unequally by a dark band MN. A like series of rings about a point corresponding to P, with a dark band like MN passing through that point, will be seen if the plate of crystal be turned so that the other optical axis is in the direction of the polarized ray AB. And when the angle which the optical axes make with one another, or with a perpendicular to the surface of the crystal, is small, as in nitre, both series of rings with their bands may be seen at the same time.

When a plane passing through AB (*Fig.* 1), and the two optic axes of the crystal is made, by turning the plate of crystal on the ray AB, to coincide with the plane SAB of primitive polarization, the dark curves passing through the two polar points P and P′ (*Fig.* 4) become one straight line MN; the coloured rings come together as in the figure and

Fig. 4.



are crossed by another dark line as M′N′ passing through B the centre at right angles to the former. This appearance takes place at every quarter revolution of the crystal plate IK (*Fig.* 1), on the axis AB; and by actual admeasurement the coloured rings are found to have the form of lemniscates, whose principal property is that the product of two lines drawn from the points P and P′ to any point in each curve is constant.

The general equation of Bernoulli's lemniscate is

$$(x^2+y^2)^2-p^2(x^2-y^2)=0$$

in which p is equal to half the axis mn of the particular curve, x and y are rectangular co-ordinates of any point as p in the curve, B the centre being the origin. If BP or BP′ be represented by a, and p be made equal to $a\sqrt{2}$, the product of two lines as Pp, P′p (not drawn in the figure) will be equal to a^2. But, in order to allow B P to be constant for all the different curves, the equation may be put in the form

$$(x^2+y^2)^2+a^2(a^2-b^2)-2a^2(x^2-y^2)=0,$$

in which b may be of any magnitude whatever from zero to infinity; and from this equation the value of the rectangle Pp, P′p for any one curve is the product ab.

In explaining the phenomena of polarized rings on the undulatory hypothesis, it is assumed that a pencil of polarized light, in its passage along the axis, or along one of the axes of a doubly refracting crystal, ceases to have its ordinary and extraordinary ray polarized in planes exactly at right angles to one another, in consequence of the different degrees of retardation which the waves in the two kinds of rays experience in passing through the crystal, so that they emerge from it in different phases: hence, instead of the dark spot which, on looking into the plate PQ (*Fig.* 1), when the planes SAB and ABC are at right angles to one another, would present itself to the eye, the light partially depolarized gives rise, on entering the eye, to the perception of the coloured rings.

The crystal being uni-axal, let v be the velocity of light before it is incident on the crystal, λ the length of a wave, and a^2 the expression for the intensity of the impression of light when the vibration is a maximum: also within the crystal, let $a \sin. \frac{2\pi}{\lambda} vt$ be the extent of a vibration of polarized light (perpendicularly to the primitive plane of polarization) in the ordinary ray; and, representing the excess of the retardation of the extraordinary ray above that of the other by R, the vibration of a particle perpendicular to the plane of primitive polarization, in the most retarded ray will be represented by $a \sin. \frac{2\pi}{\lambda}(vt+\mathrm{R})$.

By two successive resolutions of forces, the vibrations perpendicular to the plane of primitive polarization reduced first to directions perpendicular and parallel to a plane passing through the optic axes of the crystal (the angle between these planes being represented by θ), and then to directions perpendicular to the plane of polarization at the analyzing plate, (those vibrations alone producing a perception of light in the eye, which are perpendicular to the plane of polarization) the angle between that plane of polarization and the plane of primitive polarization being represented by α; a resolved vibration, for the ordinary pencil produced by the double refraction of the crystal becomes

$$a \cos. \theta \cos. (\theta+\alpha) \sin. \frac{2\pi}{\lambda} vt \quad ,$$

and, for the extraordinary pencil,

$$a \sin. \theta \sin. (\theta+\alpha) \sin. \frac{2\pi}{\lambda}(vt+\mathrm{R}).$$

Developing $\sin. \frac{2\pi}{\lambda}(vt+\mathrm{R})$ and then adding together the squares of the coefficients of $\sin. \frac{2\pi}{\lambda} vt$ and $\cos. \frac{2\pi}{\lambda} vt$ the sum

$$a^2\left\{\cos.^2 \alpha - \sin. 2\theta \sin. (2\theta+2\alpha) \sin.^2 \frac{\pi}{\lambda} \mathrm{R}\right\}$$

is, by the undulatory theory, an expression for the intensity of light in the image, at a point where the apparent field of view is intersected by a ray whose inclination to the axis AB (*Fig.* 1) enters into the expression for R; the plane passing through such ray and the axis AB making with the plane of analyzation a variable angle equal to $\theta+\alpha$.

Putting ψ for $\theta+\alpha$ the above expression has the form

$$a^2\left\{\cos.^2 \alpha - \sin. (2\psi-2\alpha) \sin. 2\psi \sin.^2 \frac{\pi}{\lambda} \mathrm{R}\right\} ; \qquad (a)$$

and, when $\alpha=90°$, or the planes of polarization for the rays AB and BC are perpendicular to one another, the last expression becomes

$$a^2 \sin.^2 2\psi \sin.^2 \frac{\pi}{\lambda} \mathrm{R} \quad : \qquad (b)$$

the length λ of a wave differs for the different kinds of light, but the conclusion arrived at being independent of any particular value of λ, it follows that all the light vanishes when $\psi=0$, 90°, 180° and 270°; consequently there are at the same time two lines or bands traversing the coloured field of view at right angles to one another, in which the light vanishes; and thus there is produced the appearance of a dark cross, the point of intersection being in the centre of the field, or where the latter is traversed by the ray AB.

When $\alpha=0$, or the planes of polarization in AB and BC are coincident, the expression (a) becomes

$$a^2 \left(1-\sin.^2 2\psi \sin.^2 \frac{\pi}{\lambda} R\right) \qquad (c)$$

which when $\psi=0$, $90°$, $180°$, and $270°$ becomes a^2, a maximum: hence the coloured field of view will be traversed by a white cross whose arms are at right angles to one another.

If ψ have other values, the expression (b) or the density of light will vanish when $R=0$, $R=\lambda$, $R=2\lambda$, &c. But the equivalent of R containing, as a multiplier, $\sin.^2 i$; (i being the incidence of a ray on the crystal after diverging from A; or the angle which, as above mentioned, a ray from A makes with the axis AB) one giving successively to R the values 0, λ, 2λ, &c., it is found that $\sin. i$ has corresponding values proportional to 0, $\sqrt{\frac{2\lambda}{T}}$, $\sqrt{\frac{4\lambda}{T}}$, $\sqrt{\frac{6\lambda}{T}}$, &c.; (T being the thickness of the plate of crystal) and since the expression (b) has the same value, and vanishes or is a maximum, for all rays whose angles i of incidence in the conical pencil diverging from A are the same, it follows that, about the axis of the field of view, there are dark rings whose radii have the proportions of $\sqrt{2}$, $\sqrt{4}$, $\sqrt{6}$, &c. The expression (b) is a maximum when $R=\frac{1}{2}\lambda$, $\frac{3}{2}\lambda$, $\frac{5}{2}\lambda$, &c., or when $\sin. i$ has values proportional to $\sqrt{\frac{\lambda}{T}}$, $\sqrt{\frac{3\lambda}{T}}$, $\sqrt{\frac{5\lambda}{T}}$, &c.; and it follows that, about the axis of the field, there is a series of bright rings whose radii have the proportions of $\sqrt{1}$, $\sqrt{3}$, $\sqrt{5}$, &c.

The expressions (b) and (c) added together produce a^2; hence the tints of the several rings formed when the planes of polarization in AB and AC are coincident are complementary to those which are formed when those planes are perpendicular to one another: and in the former case the bright rings have radii which are proportional to $\sqrt{2}$, $\sqrt{4}$, $\sqrt{6}$, &c., while the dark rings have radii proportional to $\sqrt{1}$, $\sqrt{3}$, $\sqrt{5}$, &c.

For the investigation of the phenomena of the rings seen (as in *Fig.* 4) when IK is a bi-axal crystal having its surfaces cut perpendicularly to the plane passing through the axis; and also for the phenomena presented when a plate of crystal, uni-axal or bi-axal, is so cut that the surfaces are not perpendicular to the axis, or to the plane passing through the two axes, see Airy's Tracts (Undulatory Theory). The reader is referred also to Sir David Brewster's Treatise on Optics in the Edinburgh Encyclopædia, and to Sir John Herschel's Treatise on Light in the Encyclopædia Metropolitana.

POLEMO'NIUM (πολεμώνιον of Dioscorides), a genus of plants, the type of the natural order Polemoniaceæ. It has a campanulate 5-cleft calyx, a rotate corolla, and a short tube with a 5-lobed equal erect limb: 5 equal stamens inserted in the throat of the corolla with filaments dilated at the base, bearded in a continuous ring, and nearly closing the throat, and incumbent anthers; a roundish capsule with membranous crustaceous valves, covered with the permanent calyx and many-seeded cells; the seeds oblong, trigonal, and filled with albumen; the radicle twice as long as the cotyledons. The species are erect herbaceous plants, with alternate unequally pinnate leaves; the flowers terminal, bracteated, arranged on panicled corymbs, with blue or white corollas. About twelve species have been described, most of them being cultivated and known in our gardens as Greek Valerian.

P. cæruleum, common Greek Valerian, Jacob's Ladder, or Ladder of Heaven, has a glabrous stem, pinnate leaves, ovate lanceolate acuminated leaflets, the segments of the calyx ovate or elliptic, lanceolate, pointed; the panicle downy, glandular. The stem is one or two feet high, the leaves alternate, the flowers numerous, bright blue or white, somewhat drooping. It is a native of Europe and America, and is found in Great Britain, but is a rare plant. A great number of varieties have been described. It is a favourite plant in our gardens, and will grow in any common garden soil, and may be readily propagated by dividing the root or by seed. Although deriving its generic name from the Polemonium of Dioscorides, it does not appear to agree at all with his description of that plant, and Fraas refers it to Hypericum olympicum. Great virtues were attributed to the antient Polemonium, and these were transferred to the modern plant; but neither the antient nor modern plant possesses any active medical properties. Slight astringency is the only property possessed by any of the species of Polemonium.

(Fraas, *Synopsis Plant. Floræ Classicæ*; Don, *Gardener's Dictionary*; Babington, *Manual of Brit. Bot.*)

POLICE. In Scotland the larger towns have separate police statutes, by which the management and control of the system is put into the hands of elected commissioners. The act 3 & 4 Wm. IV. c. 46, is a general police act, the provisions of which, or a portion of them, may be adopted, so as to become law, by any royal burgh, burgh of regality, or burgh of barony, at a meeting of a specified number of ten-pound householders. The act provides for the election of commissioners with power of management and control, by the same class of persons who are entitled to decide on the adoption of the act. By 2 & 3 Vict. c. 65, called the Rural Police Act, the commissioners of supply of any county are authorised, at a meeting called on requisition by ten of their number, to assess the county for maintaining a constabulary force. The act directs the commissioners to publish annual accounts of receipt and expenditure. The system is co-operative with the expenditure of an old established fund for rural police purposes, called the 'Rogue Money.'

POLLA'JUOLI, PIERO and ANTONIO, two distinguished Florentine painters and sculptors of the fifteenth century; they were the sons of Jacopo del Pollajuolo. Piero was the pupil of Andrea del Castagno; Antonio was the more distinguished, he was the pupil of Lorenzo Ghiberti, and assisted him in the celebrated gates of the baptistery of San Giovanni; he became also a famous goldsmith, and was as such without a superior in Florence; Maso Finiguerra was his contemporary. The two brothers generally executed their paintings together; the best of them, says Vasari, is the Martyrdom of St. Sebastian, painted in 1475, in the church de' Servi at Florence. St. Sebastian was painted from nature and is one of the best figures that had been painted up to that time; it is engraved in the *Etruria Pittrice* of Lastri. Antonio is said to have been the first artist who studied the dead subject for the purposes of design. Antonio Pollajuolo was invited to Rome in 1484, after the death of Sixtus IV., by Innocent VIII., and he made the monuments of Sixtus IV. and of Innocent VIII.; that of Sixtus, in 1493, is now in the chapel of the Sacrament in St. Peter's; the monument of Innocent is also in St. Peter's. Antonio was also a medalist, and he engraved three or four plates, which are extremely scarce.

(Vasari, *Vite de' Pittori*, &c., and the notes to Schorn's German translation; Rumohr, *Italienische Forschungen*; Cicognara, *Storia della Scultura*; Baldinucci, *Notizie dei Professori del Disegno*, &c.)

POLLAJUOLO, SIMONE DEL, or Simon Masi, a distinguished architect, commonly called Il Cronaca, from his ability in relating stories, was born at Florence in 1454. He was related to Antonio del Pollajuolo, and lived with him some time at Rome. He is chiefly distinguished for the Palazzo Strozzi, one of the most solid and imposing buildings of Florence; it was commenced in 1489 by Benedetto da Maiano, but was completed by Cronaca, and the great cornice or entablature and the court in the interior are from the designs of Cronaca. The ironwork and the beautiful lanterns are by Niccolo Grosso, commonly called Caparra, a nickname which was given to him by Lorenzo de' Medici on account of his always persisting in being paid before he delivered his work; Caparra signifies deposit or advance-money. Grosso was the most celebrated smith of his time.

Cronaca built also the great council-hall for the Signoria of Florence, which was afterwards enlarged and embellished by Vasari; the church of San Miniato al Monte, the convent Dei Servi, and the Sacristy of Santo Spirito. He was a follower of Savonarola: he died in 1509.

(Vasari, *Vite de' Pittori*, &c.; Gage, *Carteggio Inedito d'Artisti.*)

POLLOK, ROBERT, a poet and miscellaneous writer, was born at Muirhouse, in the parish of Eglesham, in Renfrewshire, in 1799. He studied at the university of Glasgow, and afterwards followed the course of theological education necessary to fit him for a charge in the United Secession Church, of which he became a licentiate in 1827. His principal work, which is in some respects auto-biographical, speaks of the solitude and pastoral simplicity of the scenes in which he passed his youth:—

In rural quietude, 'mong hills and streams
And melancholy deserts, where the sun
Saw, as he passed, a shepherd only here
And there, watching his little flock, or heard
The ploughman talking to his steers.

He was a hard student, and appears to have been early endowed with a strong ambition to create for himself a permanent name in literature. In his own words—

The ancient page he turned, read much, thought much,
And with old bards of honourable name
Measured his soul severely; and looked up
To fame, ambitious of no second place.

Just before he received his licence, he had finished the poem on which his literary reputation rests, 'The Course of Time.' A work so ambitious, from the hands of a country student attached to a small body of dissenters, was not likely to find a patron among publishers. It happened to be shown to Professor Wilson, of Edinburgh, as a curiosity, and he was astonished to discover in it great poetic power. In deference to his recommendation it was published by Mr. Blackwood, of Edinburgh, and speedily passed through several editions. Its flight of genius was a novelty in the class of evangelical religious literature to which it belonged, and besides pleasing those who are partial to that class of religious literature, it was a boon to many who are inclined to read religious books, but are repulsed by their general dryness and insipidity, while it was warmly admired by the literary world at large. Mr. Pollok's partial admirers expected for him a place on a level with Milton. After the novelty of such a phenomenon had however passed off, the book became neglected by purely literary readers; and at this day it may be said that it is estimated too highly by the religious, and too insignificantly by the literary world. It is a work of great power, but meagre fancy. It has a considerable amount of sentiment deeply tinged with religious asceticism. Many sentiments are spun out or repeated, and the interest frequently flags. The work exhibits a great command of the English language and a power of terse rapid melodious diction. Pollok's mind was evidently imbued with 'Paradise Lost,' and he follows Milton often to the verge of slavish imitation. Before the publication of his poem this interesting young man had undermined his constitution by excessive mental labour, and he scarcely lived to see its success. On the recommendation and through the assistance of his friends he was preparing for a journey to Italy. The simplicity in which his family was brought up, may be imagined from the circumstance that his sister, who was to accompany him, obtained a certificate of good character from the minister and elders of her parish, believing that such a testimonial was all the more necessary as they were about to proceed to 'the land of graven images.' The disease had however made too great progress to admit of his leaving Britain, and he died near Southampton on 15th September, 1827.

POLYCARPON (from πολύ, many, and καρπος, a seed or fruit: seeds numerous), a genus of plants belonging to the natural order Paronychieæ. The sepala are slightly cohering at the base, the petals 5 and emarginate. The stamens from 3 to 5; styles short and 3 in number. The fruit is 1-celled, 3-valved, and many-seeded capsule.

P. tetraphyllum has triandrous leaves, emarginate petals, the stem-leaves in fours, and the leaves on the branches opposite. In young plants the leaves are often all opposite. It is a native of the coasts of the south-west of England, of Europe, and the Canary Islands.

There are two other species of Polycarpon: *P. alsinefolium*, an inhabitant of Europe, the Cape of Good Hope, and Holland; and *P. peploides*, a native of Sicily and France. The seeds of the annual species require only to be sown in the open border in spring. The last species, being perennial, should be grown in a small pot, and placed among other alpine plants.

(Don's *Gardener's Dictionary*; Babington's *Manual of British Botany*.)

POLY'GONUM (the Greek πολύγονον, 'much-productive'), a genus of plants belonging to the natural order Polygoneæ. It has a 5-parted perianth, from 5 to 8 stamens, and from 2 to 3 styles; a 1-seeded trigonous or compressed nut, lateral incurved embryo, the cotyledons not contorted. This is a very extensive genus, containing the knotgrasses, bistorts, persicarias, and buckwheats of our own waysides, fields, and gardens. They grow in almost any soil, some being aquatic, and others flourishing in sandy sterile tracts

P. Bistorta, Snake-weed, has a dense spike, ovate subcordate leaves, the radical leaves with winged foot-stalks, the stamens half as long again as the perianth, the nut triquetrous, its faces ovate, smooth. The calyx is rose-coloured and deeply five-cleft, obtuse, and spreading. The fruit is black and shining. This plant is one of the most powerful vegetable astringents, its root contains tannin and gallic acid in abundance; a decoction of it is employed in gleet and leucorrhœa as an injection, as a gargle in sore-throats, and as a lotion to ulcers attended with excessive discharge. Internally it has been used combined with gentian in intermittents. It may also be employed in passive hæmorrhages and diarrhœa.

P. amphibium has a dense ovate cylindrical spike, stalked ovate oblong floating leaves, a compressed smooth shining nut, 5 stamens, and a creeping root. The flowers are of a bright crimson colour. It is a native of England in ponds, ditches, and wet places. It is a fine showy plant, but one of the most difficult to eradicate from lands recovered from rivers or drained lakes and marshes. The subaquatic stems root at every joint, and extend to a surprising length, rising through the soil. They bear some resemblance to sarsaparilla, and according to Coste and Willemet they are substituted for this drug by the herbalists of Nancy; these authors also report that the apothecaries and druggists of Lorraine give it the preference.

P. hydropiper, the Water-Pepper, has drooping filiform interrupted spikes, lanceolate wavy leaves, glandular perianths, a large compressed nut, its faces ovate, acute, and of a purplish black colour. It is a hot acrid plant, and is reputed to be a powerful diuretic, but it loses its activity by drying, and therefore requires to be used in a fresh state. It dyes wool of a yellow colour. The seeds, according to Bulliard, are used in some of the French provinces instead of pepper. The leaves are so acrid as to act as vesicants. It is native of England in ditches and wet places.

P. aviculare has from one to three flowers together, axillary lanceolate leaves, or elliptical plane stalked lanceolate acute ocreæ, with few distant simple nerves at length by growth becoming torn, a triquetrous nut with raised points shorter than the perianth. Its numerous seeds supply abundant food for small birds; they are said to be emetic and cathartic. Thunberg says that in Japan a blue dye is prepared from this plant. There are many other species of Polygonum, natives of Great Britain and other parts of the world, but too numerous for description here. *P. tinctorium* is cultivated in France and Flanders on account of the fine blue dye extracted from it. The seeds of *P. barbatum* are used in medicine by the Hindu practitioners, and are said to ease the pain of griping in the colic. The leaves of *P. hispidum* are said by Humboldt to be substituted in South America for tobacco; and *P. anti-hæmorrhoidale* is esteemed in Brazil on account of its astringency in baths, poultices, &c. &c. The juice, as well an infusion of the ashes when burned, is employed by the Brazilians in the clarification of syrup and the condensation of sugar.

P. Fagopyrum, the Buck-wheat, is now referred to *Fagopyrum esculentum*. [FAGOPYRUM, P. C. S.]

(Lindley's *Vegetable Kingdom*; Babington's *Manual Brit. Bot.*; Burnett's *Outlines of Botany*; Lindley's *Flora Medica*.)

POLYPO'DIUM. [FILICES, P. C. S.]

POLYPO'GON (from πολύ, and πώγων, a beard), a genus of grasses belonging to the tribe Agrostideæ. It has scarious nearly equal glumes, each furnished with a long seta from just below the emarginate summit. The pallæ are shorter than the glumes, the outer ones usually curved from below the summit.

P. monspeliensis has the setæ more than twice as long as the rather obtuse glumes. It has a fibrous root, a stem from a foot to foot and a half high, a dense lobed silky panicle often two inches long. The glumes are linear and hairy. It is a very beautiful grass, and is a native of Great Britain in salt marshes. It is the ἀλωπέκουρος ('fox-tail') of Theophrastus, *Hist. Plant.* 7, 17.

P. littoralis has its setæ equalling the acute glumes. The root is somewhat creeping, the stem about a foot high, the panicle close lobed and purplish. The glumes are linear lanceolate. It is a British species and is found in muddy salt marshes.

(Babington's *Manual of British Botany*.)

POLYTECHNIC SCHOOL. This Institution, which has produced so many men eminent for their attainments in pure and physical science, originated, at the time of the great revolution in France, with one of the representatives of the people, named Prieur (de la Côte d'Or), who being a member of the Committee of Public Safety, and charged with the duty of superintending the practice of the arts which relate to the service of the country, introduced a plan for the establishment of the school to one of the particular committees which had been appointed by the National Convention. In consequence of a report made by Fourcroy in the name of three united committees, the institution, under the designation of 'Ecole centrale des Travaux publics,' was, by a decree of the Convention, dated 21 Ventose, An II. (Feb. 13, 1794), directed to be formed; and the charge of organizing it was assigned to Monge, La Grange, Berthollet, and Guyton Morveau: the first, in particular, was appointed to determine the branches of science which were to constitute the course of study.

The school was to consist of 400 pupils, who were to be admitted on undergoing, satisfactorily, an examination respecting their knowledge of the elements of arithmetic, algebra, and geometry; and, after remaining three years at the institution, during which time they were to be instructed in the higher branches of mathematical science, they were to receive appointments for the posts of civil or military engineers. The course of instruction was divided into two principal branches: the first consisted of mathematical analysis with its applications to geometry and mechanics; and to these were added a course of descriptive geometry [MONGE, P.C.], with its application to stereotomy, architecture, and fortification: the second branch consisted of chemistry and natural philosophy. A building in the Rue Ste. Geneviève was chosen, and the students were divided into classes, each consisting of 20 youths, who carried on their studies, each class in a separate hall, during six hours of the day: at certain times, however, they attended lectures in the theatre of the institution; and on two days in every ten they were employed in performing chemical experiments in the laboratory. They were required to execute all drawings relating to the subjects of their studies, and to perform experimenta with their own hands, conformably (as is stated in the programme) to the method followed in the school formerly existing at Mézières, for military engineers, and in the school of chemistry and mining at Schemnitz in Hungary.

Such was the origin of an institution of which, with respect both to the talents of its professors and the contributions which science has received from so many of its *élèves*, France may be justly proud; and it is worthy of remark that it was formed at a time when some of the most influential men in the government of the country proposed to put all the learned men to death, and to annihilate science as being inimical to the interests of the new republic.

Outlines of the lectures delivered by the professors during the first year were published in 1795 in a volume forming the first of those which constitute the 'Journal de l'Ecole Polytechnique;' and among these are one on stereotomy, by Monge, on architecture by Baltara, on fortification by Dobenheim and D'Arçon, on drawing by Neveu, on chemistry by Fourcroy, and on analysis by Prony.

In the course of the same year, 1795, the National Convention decreed that the 'Ecole centrale des Travaux publics' should take the name of 'Ecole Polytechnique,' and some new regulations were made concerning the subjects in which the candidates for admission were to be examined. In mathematics there was required a knowledge of algebra, as far as the resolution of equations of the four first degrees, with its application to geometry; the summation of series; trigonometry and the properties of conic sections. For the convenience of persons residing in the provinces, the examinations for admission to the school were appointed to be held, at the same time, at towns situated in different parts of France; the municipal authorities of the towns were to be present, and the examinations were to be conducted by duly qualified persons who were to attend for the purpose. A youth between 16 and 20 years of age only was admissible; and before a candidate was allowed to present himself for examination, he was required to exhibit a certificate of good conduct, and of his attachment to *republican principles*; or, as the sentiment was sometimes expressed, *his love of liberty and equality, and hatred of tyrants*. A successful candidate was required to report himself to the chiefs of the institution in Paris, on an appointed day: an allowance of money equal to that which was made to a private artillery-man of the first class being assigned to him for his travelling expenses; and, during the time that he remained at the school, the pupil was to receive as pay 1200 livres (50*l.*) yearly. Three years were considered as the time necessary for the completion of the appointed course of study; and a student was not, under any circumstances, to remain at the school longer than four years. Public examinations were to take place at the end of each year; and pupils who should not be found to have attained the requisite proficiency in at least three-fourths of the subjects constituting the prescribed course of education were to be withdrawn from the institution.

In the following year (1796) the National Convention decreed the formation of eight special schools for instruction in matters concerning the different professions which relate to the public service; these were the Ecole d'artillerie at Châlons; des ingénieurs militaires at Metz; des ponts et chaussées, des mines, des géographes, des ingénieurs de vaisseaux, de navigation, and de marine, at Paris: and the students in all these institutions were to receive salaries from the state.

A student desirous of serving the country in any one of the professions for which the special schools were appointed, might, after being two years at the Polytechnic School, become a candidate for that particular profession; and if, after examination, he was found qualified, he was either admitted in the special school or was, on a vacancy occurring, appointed immediately to a post in the department to which he aspired. An unsuccessful candidate might remain at the Polytechnic School during the third year; and, at its expiration, he might again present himself as a candidate for examination. A student admitted to exercise the functions relating to any particular department of the service was also allowed to remain during the third year at the Polytechnic School, in order that he might complete the course of study at that institution. The government of the school was placed under the direction of the minister of the interior; and it was the duty of that minister, under the Executive Directory, to assure himself that the regulations were carried into effect: the number of students was, at the same time, reduced to 360.

At the end of the first year, 40 young men were taken from the school to servo as officers of engineers; and these performed duty in Paris till their services were required with the armies in the field: nine were admitted to the school for military engineers and several were appointed to posts in the other special schools.

The necessity of having teachers for the purpose of preparing the junior pupils, or such as required more detailed instruction than could be afforded by the professors, led, in 1796, to the appointment of assistant preceptors; and these were selected from among the students who, having completed their course of education, were qualified to perform that duty: at the same time, also, the students were made to wear a military uniform. It is remarked that Bonaparte, after his return from the campaigns in Italy, often visited the institution, where he took pleasure in encouraging the youths to prosecute their studies; and when he sailed on the expedition to Egypt he took with him twenty of the most advanced pupils: he was also accompanied, in that expedition, by Monge, who was the principal professor.

In the year 1800 the school was re-formed and the number of students was reduced to 300: the mathematical course was increased; and it was decreed that candidates who had served in the armies of the republic during three years should be admissible till they were 26 years of age. The pupils, in general, had then the rank of serjeants of artillery, and their daily pay was 98 centimes (9¾ pence). The military uniform was continued, and on the margin of the buttons were the words 'Ecole polytechnique:' some alterations were made in the mode of conducting the examinations; and a council was appointed for the purpose of attending to tho state of the school, and also of suggesting measures for its improvement.

When Bonaparte became emperor, in 1804, the school was again remodelled, and Monge was replaced at its head: it then acquired the title of 'Ecole polytechnique impériale,' and it received an organization completely military. While that extraordinary man governed France the institution may be said to have been in its most flourishing state: and the subjects of the course of study were then arranged under thirteen heads, as follow:—Mathematical analysis; mathematical analysis applied to geometry; descriptive geometry; mechanics; machinery; natural philosophy; chemistry; geodesy; topography; the military art; architecture; drawing of figures and landscapes; grammar and the belles-lettres. At that time also, the following were the subjects a knowledge of which was required for admission to the school:—1. Arithmetic, with an explanation of the metrical system. 2. Algebra, containing the resolution of equations of the two first degrees—indeterminate equations of the first degree—the composition of equations—demonstration of the binomial theorem—the method of commensurable divisors, and that of equal roots—the resolution of numerical equations by approximation—and the elimination of unknown quantities in equations of any degree having two unknown quantities. 3. The theory of proportion—progressions and logarithms. 4. Elementary geometry and plane trigonometry. 5. Part of the course of descriptive geometry. 6. Discussion of lines represented by equations of the first and second degrees with two unknown quantities—the principal properties of conic sections. 7. Statics demonstrated synthetically and applied to the equilibrium of simple machines, as the lever, wheel and axle, &c. 8. The candidates were also required to translate part of a Latin author in prose, and give a grammatical analysis of French phrases. 9. To construct, with scale and compasses, any geometrical figure which the examiner might indicate. And 10. To draw and shade, with pencil, a figure from a given model.

In 1814 the students of the school took a share in the defence of Paris, and even assisted in serving the guns directed against the allies. On the restoration of the Bourbon family, the school was for a time suppressed; but it was afterwards revived, and it then received the title of 'Ecole Royale Polytechnique,' which it still retains. Occasionally since, unmindful of the submission due to the government which educates them, the students have, as in 1816 and 1830, manifested dispositions to put themselves in opposition to its measures: the acts of insubordination which took place in 1845 appear to have originated merely in a dislike which, for some reason, the students entertained to a person who had been appointed one of the examiners; but those acts were so violent that the king, Louis-Philippe, entirely suppressed the institution. It has, however, again been revived, and, except a few of the most culpable, the same students have been readmitted.

The object of the Polytechnic School is still the same as at its formation; and the young men are educated for the following branches of the public service: viz., l'artillerie de terre et de mer; le génie militaire et le génie maritime; la marine royale et le corps des ingénieurs hydrographes; les ponts et chaussées et les mines; le corps royale d'état-major; les poudres et salpêtres, and l'administration des tabacs.

The number of students is now reduced to 200, and the duration of the course of instruction is two years. Each student subscribes annually 1000 francs (41*l.* 13*s.* 4*d.*), and the expense of his clothing is, in addition, about half that sum. The commander-in-chief of the French armies is the head of the institution, and all the students are subject to military law. A candidate for admission must be a native of France, or a naturalized subject of the kingdom, and he must be between sixteen and twenty years of age. Military men are, however, admitted till the age of twenty-five; but they cannot receive leave of absence, to prepare themselves for the examination, till they have been two years with their regiments.

The government does not engage itself to receive in its employ all the young men who have been educated at the school: but such as pass their final examination are allowed, according to the degree of merit which is awarded to them by the *jury* appointed to decide respecting their qualifications, to enter one of the branches of the public service as far as the vacancies will permit. In the gift of the Ministre de la Marine there are four scholarships, in that of the Ministre de l'Intérieur eight, and in that of the Ministre de la Guerre twelve; and these are for the benefit of youths whose parents or guardians are unable to pay the subscription. They are called 'places gratuites,' and each is equivalent to two 'places demi-gratuites' which the minister may grant to persons who are capable of paying half the amount of the subscription. The programme of the subjects, a knowledge of which is required preparatory to admission, is very nearly the same as that which has been given above. The students rise at 5 A.M., and breakfast at 7½: their hours of study and recreation for each day are regulated, and they dine at 2 P.M. They sup at 8, and at 9½ P.M. the lights are extinguished.

The 'Journal de l'Ecole Royale Polytechnique' continues to be published by the 'Conseil d'Instruction,' and it contains many valuable essays on subjects relating to the highest branches of mathematical science. The earlier papers were contributed by La Grange, Monge, La Place, Poisson, Prony, and other celebrated men; and those of more recent date are written by the ablest mathematicians of France, several of whom have been pupils of the institution.

PO'MEÆ, a section or sub-order of the natural order of Rosaceæ. [ROSACEÆ, P. C.] The following is a synopsis of the genera belonging to this section of plants:—

1. *Cratægus* (κράταιγος). Calyx urceolate, 5-cleft; petals orbicular; ovary 2-5-celled; styles 2-5, glabrous; the fruit fleshy, ovate, containing a bony putamen. [CRATÆGUS, P. C.]

2. *Raphiolepis* (from ῥαφις, a needle, and λεπίς, a scale). The limb of the calyx funnel-shaped, deciduous; the ovary 2-celled, 2-styled; the fruit with a thickened closed disk, and a papery putamen containing 2 gibbous seeds.

3. *Chamæmelis* (from χαμαί, the ground, and μῆλον, an apple). Calyx truncate, with 5 little teeth; the petals small, erose; the stamens 10-15; the ovary 1-celled; the style single; ovules 2, erect.

4. *Photinia* (from φωτεινός, shining). Calyx 5-toothed; petals reflexed; ovary villous, 2-celled; styles 2, glabrous; fruit 2-celled inclosed in the fleshy calyx.

5. *Eriobotrya* (from ἔριον, wool, and βότρυς, grape). Calyx woolly, 5-toothed; petals bearded; styles 5, pilose, inclosed; fruit closed, 3-5-celled.

6. *Cotoneaster*. Flowers polygamous; calyx turbinate, bluntly 5-toothed; petals short; stamens length of the calycine teeth; styles glabrous, shorter than the stamens; 2-3 carpels, parietal, inclosed in the calyx with 2 ovules. [COTONEASTER, P. C. S.]

7. *Amelanchier*. Calyx 5-cleft; petals lanceolate; stamens rather shorter than the calyx; ovary of 10 cells or 5 bipartite ones with a solitary ovule in each partition; styles 5, joined at the base; fruit 3-5-celled; seeds 3-5; the endocarp cartilaginous.

8. *Mespilus*. Calyx 5-cleft; segments foliaceous; petals nearly orbicular; disk large, filled with honey; styles 2-5, glabrous; fruit turbinate, open at the apex, 5-celled; endocarp bony. [MESPILUS, P. C. S.]

9. *Osteomelis* (from ὀστέον, a bone, and μῆλον, an apple). Calyx 5-cleft; petals oblong; styles exserted, the same length as the stamens, bearded below; ovary 5-celled; cells 1-seeded; fruit closed, woolly; endocarp bony.

10. *Pyrus*. Calyx urceolate, 5-lobed; petals roundish; styles usually 5, rarely 2 or 3; fruit closed, 5-celled; cells cartilaginous; seeds 2 in each cell. [PYRUS, P. C.]

11. *Cydonia*. Calyx 5-cleft; petals orbicular; styles 5; fruit closed, 5-celled; cells cartilaginous, many-seeded; seeds covered with pulp.

The species of the genus Raphiolepis are known by the name of Indian Hawthorns. They are natives of various parts of Hindustan and China. There are six species of this genus, four of which have been cultivated in this country, and introduced as species of Cratægus or Mespilus. These are—*R. Indica*, a native of India and China; *R. pheostemon*, a native of China; *R. rubia*, a native of Cochin-China; and *R. salicifolia*, a native of China. All the species are trees in their native climates, with evergreen crenated coriaceous reticulated leaves; flowers in terminal racemes, with white petals, and red stamens. The species will grow well in a mixture of sand, loam, and peat. *R. Indica*, in British gardens, is an evergreen shrub flowering from February to August, and in many instances has borne our winters for many years. It is probable all the species would bear our winters if planted against a south wall, and covered with mats in severe weather.

The genus *Chamæmelis* was constructed by Lindley for a single species, *C. coriacea*, which is found in the island of Madeira. It grows on the sea-cliffs to the east of Funchal, about a mile from the town on the road to Canico.

The species of the genus *Photinia* are evergreen trees with undivided coriaceous serrated or entire leaves, and flowers in terminal corymbose panicles, followed by small fruit. They require the same treatment as the species of Cratægus, and are eminently ornamental.

P. serrulata has oblong acute serrulated leaves, and is a native of Japan and China. It has been long cultivated in Great Britain as a standard in the open air, in warm situations. Where it is too cold to grow it as a standard, it may be placed against a wall. 'Fit associates for it against a wall are Photinia arbutifolia, Cratægus glauca, C. mexicana, Raphiolepis indica, and Eriobotrya japonica.' (Loudon.) Three other species of Photinia, *P. arbutifolia*, *P. integrifolia*, *P. dubia*, have been cultivated in this country. There are four or five other species described, natives of Asia, which might probably be cultivated with success.

The species of *Eriobotrya* are less hardy than those of the last genus. They are small trees with tomentose branches, broad simply serrated leaves, which are woolly beneath, with woolly compound terminal racemes of flowers, and subulate deciduous bracts. *E. japonica* is the common Loquat. It has broad elliptic serrated rather wrinkled leaves, tapering at the base and tomentose beneath; the lobes of the calyx rounded. This plant is a small tree attaining a height of from 10 to 20 feet, and is a native of China and Japan. The fruit is of a middling size, pear-shaped, yellow, downy, and disposed in large pendulous branches. The fruit of the loquat resembles the apple, and is said to be equally good with that of the mango. Lord Bagot has grown this tree at Blithfield, where it bears fruit, which is represented as having a flavour equal to that which is produced in Ceylon. It should be placed out in a warm place in the months of July, August, and September, and kept in a very warm house during the rest of the year. There are four other species of Loquat described, but none have been introduced into cultivation in this country.

Amelanchier is another genus separated by Lindley from the old genus Mespilus. The species are small trees, natives of Europe and North America, with simple serrated deciduous leaves, white racemose flowers, and linear-lanceolate deciduous bracts. They are cultivated in British gardens on account of their early white showy flowers, their fruit which ripens in June, and the deep yellow red which their vegetation assumes in autumn.

A. vulgaris, the common Amelanchier, has roundish-oval bluntish leaves, downy beneath, glabrous afterwards; the fruit dark blue. It is a native of mountainous woods among rocks in many parts of the continent of Europe. It has been in cultivation in England since the year 1596.

A. botryapium, the Grape-Pear, has oblong-elliptical cuspidate leaves, somewhat villous when young, and afterwards glabrous. It is a shrub or low tree in this country, but in its native districts in Virginia and Canada, in America, it reaches a height of 30 or 40 feet. The fruit is of a purplish colour, and ripens in June. It has an agreeable sweet taste. *A. sanguinea*, *A. ovalis*, and *A. Florida*, are other species cultivated in this country. They are all hardy, and well fitted for shrubberies: they may be propagated by laying down the branches or by cuttings, which should be placed in a sheltered situation, with a hand-glass over them; also by suckers and seeds.

The *Pyrus anthyllidifolia* of Sir J. E. Smith has been made into the genus *Osteomelis* by Lindley. At present this is the only known species. It is a shrub, native of the Sandwich Islands, with pinnate leaves and a small fruit crowned by the styles and calyx.

The species of *Cydonia* yield the fruit called the Quince. [CYDONIA VULGARIS, or QUINCE, P. C.] Independently of this recommendation, they are very useful as stocks for other species of Pomeæ, and are deserving a place in every ornamental plantation. *C. vulgaris*, the common Quince-tree, is most commonly cultivated, and several varieties are described. It has ovate leaves, obtuse at the base, entire, tomentose beneath; the calyx tomentose, its lobes serrulated, and a little leafy, the stamens in one row. The quince is a low tree with a crooked stem and tortuous rambling branches; the leaves are duskish green above and downy underneath. The flowers are large, pale red or white, succeeded by a large globular or pear-shaped bright yellow fruit. It is at the present day apparently indigenous in the south of France, Germany, and the banks of the Danube, but it has been cultivated from time immemorial. The κυδώνιον of Theophrastus, *Hist. Plant.* lib. 2, cap. 3, is the variety *Cydonia vulgaris maliformis* of modern botanists, whilst the στρουθίον mentioned in the same place is the *C. v. pyriformis*.

In cultivation the quince prefers a moist but free soil near water. The finest specimens in this country are found in orchards near ponds. The best mode of propagating it is by layers. It may also be grown from cuttings planted in the autumn in a moist sandy soil.

Two other species, *C. sinensis* and *C. Japonica*, the Chinese and Japan Quince, are often cultivated in this country. They require the same general treatment as the foregoing. The Portugal Quince is a variety of the first species. There is one other species of Cydonia, *C. Sumboshia*, a native of Nepaul, where it is called *Sumboshi-swa* or *Bhee*, but it has not been introduced into this country.

(Don, *Gardener's Dictionary*; Loudon, *Arboretum et Fruticetum Britannicum*.)

PONTEDERA'CEÆ, a natural order of plants belonging to the class of Endogens. It has a 6-parted tubular coloured perianth, more or less irregular, with a circinate æstivation. The stamens arising from the calyx 6 or 3 opposite the petals, the anthers turned inwards, opening lengthwise. The ovary is free, more or less completely, 3-celled, many-seeded; one style, the stigma simple. The capsule 3-celled, occasionally acquiring an adhesion to the perianth, 3-valved with loculicidal dehiscence; the seeds are indefinite, attached to a central axis; ascending hilum small; the embryo with its radicle rather enlarged, orthotropal in the axis of somewhat mealy albumen. The species are aquatic or marsh plants. The leaves sheathing at the base, with parallel veins in the larger species, arrow-headed, cordate, or dilated. The flowers are either solitary or in spikes or umbels, spathaceous; frequently blue, sometimes yellow. The aquatic plants comprehended in this order are distinguished by the divisions of their flowers being rolled inwards after flowering, to which may be added mealy albumen and an indefinite number of seeds. They are natives exclusively of North and South America, the East Indies and tropical Africa. Very little is known of their uses. Some of the species are employed by the native Indian practitioners in liver complaints and diseases of the stomach.

Rubbed down in butter and drank, they are said to remove redness of the eyes; powdered and mixed with sugar, to relieve asthma; and when chewed, to remove tooth-ache; brayed with milk, some are administered in fever and some eaten as pot-herbs.

(Lindley, *Vegetable Kingdom*.)

PONTIUS, PAUL, a celebrated engraver, was born at Antwerp in 1596 according to some accounts, according to others in 1603. The date of his death appears not to be known: the Slaughter of the Innocents, after Rubens, one of his principal works, is dated 1653.

Pontius was the pupil of Vorsterman, and he is chiefly distinguished for his excellent prints after Rubens, which he executed under that great painter's inspection. He engraved also a celebrated set of portraits after Vandyck, including those of many of the most distinguished Flemish painters.

PONTORMO, JA'COPO DA, or Jacopo Carrucci, a distinguished Florentine painter, was born at Pontormo, in 1493, and died at Florence in 1558. He was a short time the pupil of Leonardo da Vinci, and he studied under Albertinelli, Piero di Cosimo, and Andrea del Sarto. He painted for some time in a similar style to Andrea, and was that painter's rival; but he frequently changed his manner, and three distinct styles are ascribed to him, progressively inferior; the last imitated from the works of Albert Dürer. Towards the close of his life he spent eleven years in painting some frescoes of the Deluge and the Last Judgment in the church of San Lorenzo, in the manner of the imitators of Michael Angelo, but they have long since been whitewashed over.

(Vasari, *Vite de' Pittori*, &c.; Lanzi, *Storia Pittorica*, &c.)

POOR LAWS, SCOTLAND. The foundation of the Old Poor Law of Scotland was the act of parliament, 1579, c. 74, which in so many respects resembled the celebrated English statute of the fourteenth of Elizabeth, passed a few years earlier, as to have been considered a mere adaptation from it. The Scottish act, however, fell short of the English in the one important particular of not providing for the care of the able-bodied. By this old act, a settlement was acquired by birth, and once so established could not be changed unless by a seven years' industrial residence in another parish. By the act of 1672, c. 18, this period was shortened to three years. The method of administering the law, which arose partly out of the terms of the old acts, partly out of custom, and partly from the directions given to these sanctions by the judgments of the courts, was as follows:—In the rural parishes, the 'kirk sessions,' or lowest ecclesiastical judicatories, consisting of the parish clergyman and certain elders, shared the management with the 'heritors,' or rated landed proprietors; but it became customary for the latter body to interest themselves solely in the voting and levying of the rate, leaving its distribution and the management of the poor to the former. In those municipal corporations holding rank as royal burghs, the assessment and management lay with the corporate authorities. The funds for the relief of the poor were of two kinds. The collections at church doors, along with certain fees and eleemosynary bequests, constituted the one department; and rates assessed on the parish, or a substitute voluntarily paid instead of an assessment, the other. Of the sums collected at the church doors only a half went to the regular relief of those legally entitled to relief; the other became a fund for general charitable purposes at the command of the kirk session. In many cases there was no assessment, and the regular practice came to be, that if the miscellaneous sources were insufficient for the relief of the poor, the heritors and session in a country parish, or the magistrates in a town parish, might levy a rate. It became a common practice for the parties chiefly interested to agree to a 'voluntary assessment,' for the purpose of postponing the imposition of a fixed legal rate. When an assessment was imposed, it became a rule that one half of it should be levied on the proprietors of land, in respect of their land; the other on householders, in respect of their 'means and substance,' or their incomes so far as not derived from land. The adjustment of the rating was the ground of much dispute, and different parishes followed very distinct methods in practice.

For a considerable period, the Scottish system was very favourably received by political economists, who saw the country in a comparatively sound moral condition, with a parsimonious poor law, while the lavish system of England seemed to promote profligacy and idleness. But from the time when these doctrines were first promulgated to the completion of the great change of the English poor law, a vast internal alteration had taken place in the social economy of Scotland. The comparative low rate of wages, attracting manufacturing capital from England, had caused a more than average migration of the rural labourers to the manufacturing districts, and a peculiarly rapid increase of the city population. It was found that with these complicated materials, the simple parochial system adapted to a state of society where each man watched over the interests and the conduct of his neighbour, was incapable of grappling. It was found that even for poor country districts the system was unsuitable, because, though still far behind the English system in profusion, the administrators were compelled by the voice of public opinion to become more liberal in their dispensations, while the managers of the country parishes not subject to the same influence, kept down the allowances, and thus gave the poor an inducement to endeavour to obtain a settlement by three years' industrial residence in the cities. Dr. Chalmers was the great champion of the old system. With the assistance of some enthusiastic followers, he organised the administration of a parish in the poorer parts of Glasgow, as a demonstration of the efficiency of which the system was capable. It was a very pleasing picture, but the public soon felt that the success with which one energetic individual and his enthusiastic followers might voluntarily perform the duties generally exacted by legal compulsion, was no sufficient ground for believing that the rest of the community can be at all times and in all places depended upon for the performance of onerous public services without the coercion of law.

The public were first awakened to the imperfections of the Scottish poor law by Dr. W. P. Alison, a physician in Edinburgh, and professor of the practice of medicine in the university. Having frequently administered professional services to the poorer classes, he showed from his own experience that the utter inadequacy of the provision afforded to those who, by inability to work, or bad seasons, or revulsions in trade, were reduced to want, was an extensive cause of disease, vice, and misery. The city population speedily answered to this appeal, and associations were formed, and inquiries made in various directions. It was shown that the amount expended on the relief of the poor in Scotland amounted to little more than a sixth part of the sum distributed throughout an equal population in England by the economised poor law. In England, the expense of supporting the poor amounted to 6*s.* 10¾*d.* per head of the population; in Scotland, to 1*s.* 2¼*d.* In some of the Highland parishes, whence the most destitute objects emigrated over the rest of the country, the allowances were ludicrously small; and a Report made to the General Assembly of the Church of Scotland in 1839, enumerated instances where sums averaging from 3*s* to 1*s.* yearly were solemnly awarded to destitute people, as the provision which the poor law made for their wants. In the mean time, the discussion of these matters had a tendency gradually to increase the amount of the provision for the poor. The practice of assessments made considerable progress, and a return to parliament in 1843 shows that between 1836 and 1841 the sums raised by assessment had increased from 89,101*l.* to 128,858*l.*; while the sums raised by voluntary assessment had risen from 15,829*l.* to 22,385*l.* A commission was at last appointed to inquire into the whole state of the subject, and after hearing much evidence, they presented a Report, accompanied by a voluminous appendix, in 1843. The amendments proposed in this Report were supposed to be of a somewhat narrow nature; the country expressed dissatisfaction with them; and in 1845 a measure was passed embodying alterations considerably more extensive.

By this act, 8 & 9 Vict. c. 83, a board of supervision is appointed, consisting of persons connected with the municipal bodies and the administration of justice in Scotland, with one salaried member, who gives constant personal attendance. The office of the board is in Edinburgh. This board is endowed with ample means for ascertaining, in all parts of the country, the condition of the poor, and the method in which the system of relief is administered. The board has, however, no directory or prohibitory control over the proceedings of the local boards. These bodies are, however, re-organised by the act. In the rural parishes where there is an assessment, the local board is to consist of landowners to the extent of 20*l.* annual value, the kirk session, and certain elected representatives of the other rate-payers, according to the number fixed by the board of supervision. In city parishes, the boards are each to consist of four persons named by the magistrates, deputies not exceeding four from each kirk session in the city, and certain elected persons according to a number and qualification fixed by the board of supervision. In parishes where there is no assessment the management is to continue under the old system. There is thus in this act no machinery for levying or exacting a rate for the poor, unless in those parishes where the persons more immediately concerned agree to such a measure. It is held, however, that the facilities which the statute gives the poor for exacting from the respective parochial authorities the relief to which they are entitled, will render it necessary to put more extensive funds at the disposal of the distributors of relief, and this can only be accomplished through the system of assessment. When persons apply for relief, it is provided that, though they have no settlement, if the claim would be just in the case of their having one in the parish where it is made, subsistence must be afforded them till it is determined what parish is liable. When relief is refused, the applicant may apply to the sheriff, who may grant an order for temporary relief, and then hear parties, and decide whether the applicant is or is not entitled to relief. In this form, however, neither the sheriff nor any other judge can decide on the *adequacy* of relief. The initial step to any judicial appeal against the amount of the relief afforded, is by an application to the board of supervision, and on that body reporting its concurrence, the applicant is placed on the poor-roll of the court of session, where he has the privilege of the question being discussed gratis. By this act, provision is made for medical attendance and medicines, being part of the system of pauper relief, and for the education of pauper children. It is provided, that for the purposes of the act, parishes may be united into 'combinations.' By a special clause, nothing in the act is to be construed as entitling the able-bodied to relief, and their claim is thus left in the state of doubt in which it stood before the passing of the act. Men deserting their wives and children are made liable to punishment as vagrants, a provision which it is hoped may afford a remedy to a defect which has long characterised the law of Scotland—the absence of any means by which deserted wives can make effectual claims on their husbands for sustenance to themselves and their children, without a regular action in the court of session. By the new act, a new and more specific mode of apportioning the assessment between landed and other property has been attempted to be established, but this provision is already a fruitful source of dispute and litigation. The time necessary to acquire an industrial settlement is increased from three to five years.

POPLARS, PO'PULUS. [SALICACEÆ, P. C.]

PORCE'LLIA, a fossil genus of Heteropod Mollusca allied to Bellerophon. From the mountain limestone. (Leveillé.)

PORES OF PLANTS. [STOMATES, P. C.]

POROSITY is that condition of material bodies which consists in the discontinuity of their molecules, the intervals between these being called pores (from πόρος, a passage). Porosity is a property common to all the bodies of nature, at least we know none in which the particles are contiguous to one another. In some, as sponge and cork, the pores are visible to the eye, and in others they may be rendered so by the aid of a microscope. In bodies whose pores are not thus manifest, the existence of the intervals between the molecules is proved by various circumstances. Thus water or mercury being contained in an open vessel of wood over the exhausted receiver of an air-pump will, by the pressure of the atmosphere, be forced through the wood and fall from thence in a shower: liquids also are frequently filtered by being made to pass through the pores of paper; and in the Florentine experiment, for determining whether or not water is compressible, the fluid was by pressure forced through the pores of the vessel of gold in which it was contained. Again, the porosity of bodies is inferred from their elasticity and the sounds which are heard when the molecules are in a state of vibration: also, in transparent bodies (and the most dense metals are, when rendered sufficiently thin, found to be transparent) it is inferred from the fact that the particles of light pass through them, or that the vibrations of an ætherial fluid take place among the molecules. Finally, the porosity of bodies is proved from the fact that they suffer contraction of volume by being exposed to cold, and by mechanical compression, since such contractions can only take place in consequence of the particles being forced closer together than they are in the usual states of the bodies.

When salt is dissolved in water, the particles of the former seem to introduce themselves between those of the latter, so that the volume of the mixture is less than the sum of the volumes of the separate substances; and the like may be said of the mixture of alcohol with water; in which cases the particles of one of the kinds of substance appear to enter and occupy the spaces between the particles of the other. The intervals between the particles of gaseous substances are very great; and though, in some cases, the volume of a mixture is equal to the sum of the volumes of the separate gases, yet, in others, it is equal to not more than $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, or $\frac{1}{8}$ of the sum of the separate volumes. A body of aqueous vapour composed of a volume represented by $2v$ of hydrogen gas, and a volume v of oxygen gas, is equal in volume to $2v$ only.

All material substances being subject to attractive forces, it has been made a question whether the attractions which take place between the molecules of bodies, and which are insensible at all appreciable distances from them, are the same as that general attraction which extends indefinitely through space; modified, however, by the figures and mutual distances of the molecules, by heat, electricity, and perhaps by powers which are at present unknown to us: but, in order that this hypothesis may be admissible, the dimensions of the molecules of bodies should be extremely small compared with those of the spaces among them; and the densities of the molecules immensely greater than the densities of the bodies themselves. La Place estimates ('Système du Monde,' ch. xviii. 4th edit.) that a molecule of a spherical form, whose diameter is one millionth part of a mètre, ought to have a density more than six million times as great as the mean density of the earth in order that it might exercise an attraction equal to that of terrestrial gravity; and he observes, that the attractive forces exercised by the molecules of bodies, which are probably only the excesses of the entire attractions of the molecules over the repulsive forces of the caloric in the intervals, must be vastly greater than that of gravity, since the actions of the molecules of a body produce visible inflexions of the rays of light, which cannot be asserted concerning the attraction of gravity.

PORTER, SIR ROBERT KER, K.C.H., was born at Durham in 1780, but his early boyhood was passed in Edinburgh, whither his mother removed upon the death of her husband, who was an officer in the English army. He was the brother of Anna Maria Porter and Jane Porter. His strong natural disposition for the arts was first called into activity by the celebrated Flora Macdonald. Sir Robert, then a boy of only nine or ten years of age, was spending the evening with his family in the house of that extraordinary lady, who, perceiving his fixed attention to a certain battle-piece, explained to him that it was one of the battles of '45; and she proceeded to describe the battle in all its details in such glowing terms that the boy's blood kindled, and from that moment he became a painter of battles. He from this time was incessantly sketching battles, and his mother was induced by his evidence of talent to take him to London, in order that he might have the opportunity of instruction in the Royal Academy. His mother took him, in about 1790, to West, the president of the Royal Academy, who is said to have been so much struck with the spirit of the boy's sketches, that he procured his admission into the academy, and predicted his certain success with confidence. Sir Robert's career certainly was remarkable, and the early part of it as much so as any other. In 1793 he had already evinced such extraordinary progress as to receive a commission to paint an altar-piece for Shoreditch church. In 1794 he presented an altar-piece of Christ allaying the Storm to the Roman Catholic chapel at Portsea; and in 1798, another of St. John preaching in the Wilderness, to St. John's College, Cambridge. His most extraordinary productions, however, were his great battles. In the year 1800 he exhibited an immense picture 120 feet long, in the Lyceum Great Room, representing the storming of Seringapatam. He is said to have been only six weeks in painting the picture, and yet the execution was in no part neglected. West, after he had seen it, went to some of the academicians then occupied in preparing the exhibition, and said, 'he had just looked on what he must consider a wonder in the art: a work of such dimensions, finished throughout, in a brevity of time which any other man would demand even to sketch out his designs, done by young Ker Porter, hardly then in his twentieth year.' This picture was burnt in the fire which consumed a friend's warehouse where the painter deposited it before he left England to go to Russia; but the sketches exist, and were sold at the sale of Sir Robert's effects in 1843. Another great battle was the Siege of Acre, exhibited also in the Lyceum Room in 1801; he published at the same time a book entitled 'The Siege of Acre, chiefly intended as a companion to the great historical picture painted by Robert Ker Porter, now exhibiting at the Lyceum, 1801;' it contains spirited etchings of the picture. These were followed by a third great battle-piece, Agincourt, which he presented to the City of London, and it is still in the possession of the corporation: it was hung up in the Guildhall a few years ago. He painted also pictures of the Battle of Alexandria, and the Death of Sir Ralph Abercromby. In 1804 he went to Russia, and was appointed historical painter to the emperor. While he was in St. Petersburg he gained the affections of the Princess Mary, the daughter of the Prince Theodore de Sherbatoff, of Russia, and the marriage was arranged; but some ministerial differences caused him to leave Russia; in the year 1811, however, the marriage took place, and the princess survived him. He painted at St. Petersburg, on the walls of the Admiralty, Peter the Great planning the port of Cronstadt and St. Petersburg. After his return to England, about 1806, he published 'Travelling Sketches in Russia and Sweden.' In 1808 he accompanied Sir John Moore's expedition to the Peninsula, and attended the campaign throughout, up to the closing catastrophe of the battle of Corunna. On his return to England he published some anonymous letters from Spain and Portugal.

After his return from a second visit to Russia, after his marriage, he published, in 1813, 'An Account of the Russian Campaign,' and he was knighted by the Prince Regent in the same year. He executed many sketches of the campaign in Portugal, and some Cossack affairs. 1817 to 1820 were occupied in his extensive travels in Asia, of which he published a detailed account in 1821-22—'Travels in Georgia, Persia, Armenia, Ancient Babylonia, &c., during the years 1817-18-19-20, with numerous engravings of Portraits, Costumes, Antiquities, &c.,' 2 vols. 4to. In this work are many excellent designs in outline from the fine characteristic antient sculptures of Nakshi Roustam, Nakshi Rajab, Shiraz, and Persepolis. A comparison of Sir Robert's representations of the bassi-rilievi of the steps at Persepolis will show how extremely inaccurate and insufficient are the previous engravings given by Le Brun, Niebuhr, and Chardin. Some of the figures of these sculptures, which in Le Brun's time (1704) were mere headless trunks, are represented by Niebuhr ('Reisebeschreibung,' &c., ii. 136), half a century afterwards, with eyes and noses complete, but executed without the least skill whatever; the representations of Sir John Chardin are not much better.

In 1832 Sir Robert Ker Porter was created Knight Commander of the order of Hanover, by William IV.; he was appointed a few years before British consul at Venezuela, where he resided at Caracas until 1841, and he painted while there three sacred pictures, which were his last principal works; he also made numerous sketches of scenery in the meanwhile. The first of these three pictures was Christ at the last Supper blessing the Cup, painted as an altar-piece for the chapel of the Protestant burying-ground, of which he had procured the establishment; but he removed it afterwards on account of the heat of the sun, and put up in its stead a tablet with the ten commandments in the native language. The second was our Saviour blessing the little Child; and the third and last an 'Ecce Homo.' He painted also a portrait of General Bolivar. In 1841 he paid his last visit to St. Petersburg, and the cold winter appears to have been too much for his constitution, then inured to the warm climate of Venezuela. Sir Robert himself, in a letter dated only the 3rd of May, announced his intention to his brother, Dr. Porter, of Bristol, of embarking immediately for England; on the following day, however, a letter was written by the chaplain of the British embassy announcing his death by apoplexy. The following is an extract from the letter:—'Yesterday Sir Robert went to court to pay his respects to the emperor, and afterwards he made two or three visits to private friends: on arriving at his home about three o'clock in the afternoon the servant, on opening the door of the carriage, perceived that his master was holding himself in, and that he moved to the door with much difficulty; but before he could descend the steps he fell down from the effects of an apoplectic stroke, and was carried up stairs; he took a little water, soon after which consciousness ceased, and he expired at eight o'clock this morning (May 4, 1842), in his sixty-second year.' His effects were publicly sold in London, in March, 1843.

(*Athenæum*, 1842-43, and the Artist's Works.)

PORTFIRE is a composition consisting of saltpetre, sulphur, and mealed gunpowder, mixed together by being rubbed between the hands, and, after being passed through hair-sieves, moistened with spirits of wine: the mixture is then rammed or driven into a paper case of a cylindrical or conical form, and less than an inch in diameter. A piece of portfire sixteen inches long will burn from twelve to fifteen minutes.

It is sometimes used as a match for firing artillery, in which case the saltpetre, sulphur, and powder are in the proportion of 6, 2, and 1, respectively; but it is frequently employed in firing mines or in blasting rocks, when the proportions of the like ingredients are as 7, 2, and 8, respectively. For these last purposes the portfire is attached at the extremity of the train, or is inserted in the shaft bored in the rock or object to be blasted; and the fire is applied to it by a match.

POSIDONOMY'A. [POSIDONIA, P. C.]

POSSESSIO FRATRIS. [DESCENT, P. C.]

POST HORSES. [POSTING, P. C.]

POTAMO'GETON (from ποταμος, a river, and the termination γετον, which probably means 'produced'), a genus of plants belonging to the Endogenous class, and the natural order Potameæ. It has a perfect flower, a 4-parted perianth, 4 sessile anthers opposite to the divisions of the perianth, 4 ovaries, and 4 drupes or nuts. The species are water-plants.

P. natans is a British plant, with floating ovate stalked leaves, the petioles plano-concave above, the nuts large, rounded on the back when fresh keeled; when dry the peduncles are equal. There is a creeping rhizoma at the bottom of the water. The roots are sometimes eaten in the wilds of Siberia by men, but in more temperate regions are fed on only by swans, who devour them with avidity.

P. crispus has a compressed stem, pellucid oblong linear leaves, sessile and wavy, the nuts with long beaks, keeled on the back; when dry the peduncles are equal. It is a native of Great Britain.

P. densus has its leaves all opposite, pellucid, clasping, elliptical-lanceolate or lanceolate; the spikes shortly stalked, ultimately reflexed; the spike is 4-flowered. It is found in ditches and ponds of water in England. Ducks feed on the seeds and leaves of both these species, but they serve a more important purpose in giving out oxygen, and rendering the water respirable for fish and other aquatic animals. There are twenty British species of Potamogeton, and Haller says that in the Swiss lakes *P. serratum* grows to the length of from 10 to 20 fathoms, forming extensive subaquatic forests.

(Burnett's *Outlines of Botany*; Babington's *Manual of British Botany*.)

POTAMOMY'A, a genus of Conchifera from the freshwater strata of Headon Hill, in the Isle of Wight. (Sowerby.)

POTENTILLA (*potens*, powerful, from the supposed medical qualities of some of the species), a genus of plants belonging to the natural order Rosaceæ. It has a concave calyx from 4-to 5-parted, with 4 or 5 bractlets; there are from 4 to 5 petals, numerous stamens, a lateral or nearly terminal style. The fruit consists of numerous small nuts placed on a flattish dry receptacle; the seeds pendulous or ascending, the radicle superior; the flowers white or yellow, rarely red.

P. reptans, Creeping Cinquefoil, is a common British species: it is found likewise in other parts of Europe. The stem is filiform, procumbent, and creeping; the leaves quinate and stalked; the leaflets obovate, serrated; the peduncles solitary; carpels granulate, scabrous. The flowers are large bright yellow, and on long hairy axillary stalks. It appears to have been the officinal plant of the antients, and is the πεντάφυλλον of Theophrastus, ix. 13, and of Dioscorides, iv. 42. Pliny mentions it as Quinquefolium, 25, 9. 27, 10. It is still used as a febrifuge by some practitioners.

P. tormentilla has a procumbent or ascending stem, ternate sessile leaves, and longitudinally wrinkled carpels; the leaflets are acute and somewhat hairy. The flowers are bright yellow, small, with the parts of the calyx and corolla in fours on slender hairy stalks much longer than the leaves. It is the *Tormentilla erecta* of Linnæus. It abounds in Great Britain. The roots are very astringent, and have been used medicinally. In the Western Isles of Scotland and the Orkneys they are used for tanning leather, and are preferred even to oak-bark. They are also used for dyeing a red colour. We are told that pigs are fed on them in Killarney, and they are also thought to be serviceable in some diseases to which sheep are subject.

P. anserina has a creeping stem, interruptedly pinnate leaves; the leaflets numerous, oblong, acutely serrate, silky beneath; the peduncles solitary. The flowers are large and yellow, and the leaves form a favourite food with geese: they are sometimes used as pot-herbs. Its roots are eaten both by hogs and men; they taste like a parsnep, but are small; the common people roast or boil them for food. In the islands of Tiray and Col they answer in some measure the purposes of bread, and have been known to support the inhabitants for months together during a time of scarcity.

The leaves of *P. fruticosa* and *rupestris* are employed in Siberia as a substitute for tea.

P. hirta has a pilose erect few-flowered stem; the leaves with 5 or 7 leaflets, pilose, and cut at the apex; the stipules lanceolate, entire; the petals obcordate, longer than the calyx. It is native of the Pyrenees, South of France, Silesia, &c., and is the Πεντάφυλλον of Hippocrates ('Ulc.,' 880).

All the species of Potentilla are of easy cultivation, and some of them are handsome when in flower. They will grow in any common garden-soil and are easily propagated by dividing at the roots or by seed. The shrubby kinds are very proper for the front of shrubberies, and they grow freely from cuttings planted in the autumn in a sheltered situation.

(Don, *Gardener's Dictionary*; Lindley, *Vegetable Kingdom*; Lindley, *Flora Medica*; Babington, *Manual of British Botany*; Burnett, *Outlines of Botany*; Fraas, *Synop. Floræ Classicæ*.)

POTE'RIUM (from ποτήριον, poterium, a drinking-vessel or cup, one of the species being infused in drink), a genus of plants belonging to the natural order Rosaceæ. It has monœcious or polygamous flowers; a 4-cleft calyx, with three external scales at its base; and a quadrangular tube. The petals are wanting, the style terminal, stamens numerous, and the seed suspended.

P. sanguisorba, lesser Burnet, is an herbaceous plant, with a slightly angular stem, the calyx of the fruit quadrangular and hardened. The leaves are pinnate, with numerous small ovate coarsely serrate leaflets, glabrous or slightly hairy beneath. It is found on dry calcareous soils in Great Britain. It forms a useful fodder for cattle, and at one time was extensively cultivated for that purpose, but is now generally superseded by *sainfoin* and other artificial grasses. On the Continent, and occasionally in this country, the young leaves are eaten as salad, and it is said to form one of the ingredients of the favourite cool tankard. It is said to give the name to the species, from the custom of infusing it in liquors. The common people of Siberia eat the roots. There are about nine species of Burnet described, which are distributed over Europe, Africa, and America. The hardy herbaceous species will grow in any common garden soil, and are best propagated by seeds, as most of them are little better than biennial plants. The shrubby species thrive best in a light rich soil, and young cuttings readily take root under a hand-glass.

(Don, *Gardener's Dictionary*; Lindley, *Vegetable Kingdom*; Babington, *Manual of British Botany*; Burnett, *Outlines of Botany*.)

POTTING OF PLANTS. When plants are placed to grow in a small earthen vessel, like a garden-pot, their condition is very different from that to which they are naturally exposed. The roots have not liberty to extend themselves as they choose, and they are either obliged to grow back upon themselves or round the vessel in which they are confined; they are likewise exposed to great varieties of temperature and depend on an uncertain supply of moisture. It is therefore the object of the careful gardener to obviate as much as possible these evils, and at the same time to secure the advantages derived from the operation itself. These advantages consist mainly in the facility with which it enables the gardener to change the arrangement and position of his plants; it also, hy cramping the roots, diminishes the tendency to form leaves, and increases the disposition to flower. It secures a constant and effective drainage from the roots, and renders it more easy to expose them to a favourable amount of bottom heat. For the raising and nourishment of young seedlings it is also an advantageous process. Exhaustion of the soil is one of the inconveniences which result from this system. In order to remedy it liquid manure should be applied; or the plants placed in *pan-feeders*, shallow earthen vessels containing manure, to which the roots have access through holes in the bottom of the pot. It is however to *shifting* more particularly that recourse should be had for renovating the soil; and this, if skilfully performed without injuring the plant, is most successful. It is not alone for the purpose of improving the soil that shifting is desirable; the roots if allowed to remain long in a confined space form a hard knotted mass, which is very unfavourable to the retention of moisture and the growth of the plant. All the earth therefore which clings to the roots should be carefully separated before the plant is placed in the fresh soil. The roots of a plant are always found to be in contact with the sides of the pot, and this, being generally composed of a highly absorbent substance, is snbject to great variations of temperature. The practice of plunging greenhouse plants into the earth during the summer to obviate this is very undesirable, as when they are again taken up the roots are generally found to have taken advantage of the earth around them and to have fastened themselves in it. The best mode of counteracting the injurious effects of unequal temperature is hy the use of double pots, as recommended in the *Gardener's Mag.* ix. 576, the space between the two pots being filled with moss or some other substance retentive of moisture. The drainage of potted plants is of great importance, and in all cases a quantity of broken pieces of tiles and earthenware should be placed at the bottom of the pots to prevent the stagnation of water about the roots. To be managed perfectly a young plant should be placed in as small a pot as it will grow in, and gradually and successively transferred to large pots as it advances. Dr. Lindley says 'It is by paying constant attention to the shifting of the growing plant, by the employment of a very rich stimulating soil, and by a thorough knowledge of the kind of atmosphere which suits them hest, that have heen obtained those magnificent pelargoniums, cockscombs, and balsams, &c. that have so often and so justly excited the admiration of even the most experienced gardeners.'

(Lindley, *Theory of Horticulture.*)

POUNDAGE. [SUBSIDY, P. C.]

POWER. We find that the article ROOT, P. C., does not answer the reference made from POWER, P. C. We briefly supply the defect here, and take the opportunity of describing some important suggestions which have been recently made as to the manner of conducting algebraical operations.

In FACTORIALS, P. C. S., the manner in which the term *power* was introduced into arithmetic is seen. By definition, the fourth power of x means the product of four $x$es, or $x\times x\times x\times x$; and the same of other powers. But it is far more symmetrical to begin from unity; and to say that the fourth power of x is the result of four multiplications hy x, unity being understood as the commencement. Thus the successive powers of x, first, second, third, &c. are $1\times x$, $1\times x\times x$, $1\times x\times x\times x$, &c.: denoted by x^1, x^2, x^3, &c. And the term *root* is the inverse of power, as follows:—If A be the mth power of B, B is the mth root of A, denoted hy $\sqrt[m]{A}$. The peculiar algebraical character of the roots is explained in ROOT, P. C.

It is thus easily proved that when m and n are any two integers,

$$x^m\times x^n=x^{m+n};$$

that when m is greater than n,

$$x^m\div x^n=x^{m-n}.$$

$$\text{Also that } x^m\times y^m=(xy)^m,$$
$$(x^m)^n=x^{mn},$$
$$\text{and that } \sqrt[n]{x^m}=x^{\frac{m}{n}},$$

whenever m is divisible by n without remainder. These rules, if applied in defiance of the restrictions first mentioned, lead to such results

$$\text{as } x^0,\ x^{\frac{2}{3}},\ x^{-4},\ x^{-\frac{2}{3}},\ \&c.,$$

which are unintelligible as far as the definitions have yet been stated. Their proper interpretations [INTERPRETATION, P. C.] are as follows:—First, x^0 must be allowed to stand for unity, whatever x may be; secondly, x^{-a} must be understood to be $1\div x^a$; thirdly, $x^{\frac{m}{n}}$, m and n being positive integers, must stand for $\sqrt[n]{x^m}$. When these new definitions are added, all the rules remain true, whether m and n be positive or negative, integral or fractional: and the system of algebraic powers is complete.

An algehraic expression is said to be arranged in powers of a letter, say x, when the powers of that letter which enter are made to enter in ascending or descending order of algebraic magnitude. Thus $ax^2+bx^{-3}-x^4-x^{-1}$ is not at present arranged at all. To arrange it in ascending or descending powers of x, we must write it thus—

$$bx^{-3}-x^{-1}+ax^2-x^4,\ \text{ascending};$$
$$-x^4+ax^2-x^{-1}+bx^{-3},\ \text{descending}.$$

But even yet it is incomplete for many algebraical purposes, having no written indication of the fact that the ascent or descent is interrupted. Completely written in ascending powers, it should be

$$bx^{-3}+0x^{-2}-x^{-1}+0x^0+0x^1+ax^2+0x^3-x^4.$$

Written in this form, which may remind us of the use of a cipher in writing ordinary numbers, it is clear that we hardly read the expression less easily, and write it much more briefly, if we omit x and its powers altogether, and make some distinctive mark, analogous to the decimal point, between the parts which belong to the positive and negative powers. Thus the above might be written—

$$b+0-1+\mid 0+0+a+0-1,$$
$$\text{or}\quad -1+0+a+0+0\mid -1+0+b;$$

the mark | being on that side of the adjacent + or − which belongs to the positive powers. This mark however is not necessary in what follows.

The late Mr. Horner [INVOLUTION, &c., P. C. and P. C. S.] was the first who suggested the systematic rejection of the ascending or descending powers. An example of multiplication and division will sufficiently explain it. Suppose it required to multiply $7x^3-2x^2-3$ and $2x^4+x^2-4x-5$:—

$$\begin{array}{l}
2+0+1-4-5\\
7-2+0-3\\
\hline
14+0+7-28-35\\
\quad -4+0-\ 2+\ 8+10\\
\qquad\quad -\ 6+\ 0-\ 3+12+15\\
\hline
14-4+7-36-27+\ 7+12+15
\end{array}$$

Accordingly the answer is $14x^7-4x^6+7x^5-36x^4-27x^3+7x^2+12x+15$; and every stroke of the pen which the usual method contains, more than is in the preceding, is mere waste, and risk of error into the bargain. Now let it be proposed to divide $4x^6-3ax^5+2a^2x^4-11a^5x-a^6$ hy $x^3+2ax^2-a^3$:—

$$\begin{array}{l}
4-\ 3+\ 2+\ 0+0-11-1(1+2+0-1\\
4+\ 8+\ 0-\ 4 \qquad\qquad\quad 4-11+24-44\\
\hline
\quad -11+\ 2+\ 4+\ 0\\
\quad -11-22+\ 0+11\\
\hline
\qquad\quad 24+\ 4-11-11\\
\qquad\quad 24+48+\ 0-24\\
\hline
\qquad\qquad -44-11+13-\ 1\\
\qquad\qquad -44-88+\ 0+44\\
\hline
\qquad\qquad\quad 77+13-45
\end{array}$$

Accordingly the quotient is $4x^3-11ax^2+24a^2x-44a^3$ and the remainder is $77x^2+13ax-45a^2$.

Mr. Horner himself did not live to publish this suggestion, which, simple as it is, seems never to have been made before him. The possessor of his papers, Mr. T. S. Davies of Woolwich, published some extracts from those papers in an appendix to a reprint of the paper on the solution of equations, which reprint appeared in the 'Ladies' Diary' for 1838; having previously introduced the simplification into the 11th edition of Hutton's Course. Since that timo a paper on *Algebraical Transformation*, sent by Mr. Horner to the Royal Society, but not printed in the 'Philosophical Transactions,' has been published in the first and second volume of the *Mathematician*. Details and examples are given in Mr. Davies' 'Solutions of Questions contained in Hutton's Course,' 1840, and in the 12th edition of that course, 1841.

But the greatest improvement in the operation of division, and one which contains the principle of a class of improvements, is one which Horner called the *synthetic method*, which amounts to deferring the actual steps of subtraction until they are wanted. If we were to proceed one step farther with the preceding division, -44 in the quotient would be followed by $+77$. This $+77$, if we look at all its components from the beginning, arises from $+0-11-0+88$. In like manner -44 arises from $+0+4-0-48$. Now arrange the process as follows:—

$$\begin{array}{r|l} 1 & 4-3+2+0+0-11-1 \\ \hline -2 & \quad -8+0+4-11+24-44 \\ +0 & \qquad +22+0+0+0 \\ +1 & \qquad\quad -48+88 \\ \hline & 4-11+24-44 \mid +77+13-45 \end{array}$$

Write the coefficients of the dividend horizontally a, b, c, &c., and of the divisor vertically p, q, r, &c., taking care to change the sign of every term of the divisor *except the first*.

$$\begin{array}{r|l} p & a+b+c+d+e+f+g+h \\ \hline +q & \quad +uq+ur+us+ut+vt+wt+xt+yt \\ +r & \qquad +vq+vr+vs+ws+xs+ys \\ +s & \qquad\quad +wq+wr+xr+yr \\ +t & \qquad\qquad +xq+yq \\ \hline & u+v+w+x+y \mid +u'+v'+w'+x' \end{array}$$

Divide a by p, giving u, and then write uq, ur, us, and ut in the successive columns which follow that of u. Make up $+b+uq$, the second column, and divide by p, giving v: write vq, vr, vs, vt, in the successive columns which follow that of v. Make up $c+ur+vq$ and divide by p, giving w: write wq, wr, ws, wt, in the columns which follow that of w, and so on. Then $u+v+w+$ &c., will give the coefficients of the quotient, and $u'+v'+$ &c., made from the columns which have not been used to find quotient terms, will give the coefficieuts of the remainder. For example, we want to find some terms of the quotient of x^4+1 divided by x^3+x^2-3x:—

$$\begin{array}{r|l} 1 & 1+0+0+0+1 \\ \hline -1 & \quad -1+3+0+0+0+0+0 \\ +3 & \qquad +1-3+12-21+60 \\ +0 & \qquad\quad -4+7-20 \\ \hline & 1-1+4-7+20 \mid -41+60+0 \end{array}$$

Hence the quotient is $x-1+4x^{-1}-7x^{-2}+20x^{-3}$, and the remainder is $-41x^{-1}+60x^{-2}$.

When the first coefficient is anything but unity, fractions are introduced into the quotient. To avoid this, proceed as follows:—Let a be the coefficient of the first term of the divisor. Multiply the successive coefficients of the dividend by 1, a, a^2, a^3, &c.: turn the first coefficient of the divisor into 1, and multiply the second, third, fourth, &c. by 1, a, a^2, &c. Proceed as above with the coefficients thus altered, and suppose that in the last line the quotient terms become $u+v+w+$ &c., and those for the remainder $u'+v'+$ &c. To find the true quotient terms write

$$\frac{u}{a}+\frac{v}{a^2}+\frac{w}{a^3}+,\ \&c.$$

and for the true remainder terms write

$$\frac{u'}{a^m}+\frac{v'}{a^{m+1}}+,\ \&c.$$

where a^m is the last power used in the quotient terms, *repeated*, not the next one to it. Suppose for example, we are to divide $x^3+mx^2+m^2x+5m^3$ by $2x^4+m^2x^2-3m^4$. Here, since x descends and m ascends regularly, we throw out x and m, and the abridged dividend and divisor become

$$\begin{array}{llll} 1+1+1+5 & \text{and} & 2+0+1+0-3 \\ 1\quad 2\quad 4\quad 8 & & 1\quad 2\quad 4\quad 8 \end{array}$$

underneath which we have written the multipliers. Hence we begin with $1+2+4+40$ and $1+0-2+0+24$:

$$\begin{array}{r|l} 1 & 1+2+4+40 \\ \hline +0 & \quad +0-2+0+24+48+48+864 \\ -2 & \qquad +0-4+0+0+0 \\ +0 & \qquad\quad +0-4-72 \\ +24 & \qquad\qquad +0 \\ \hline & 1+2+2+36 \mid +20-24+48+864 \end{array}$$

Hence the quotient is

$$\frac{1}{2}\frac{1}{x}+\frac{2}{4}\frac{m}{x^2}+\frac{2}{8}\frac{m^2}{x^3}+\frac{36}{16}\frac{m^3}{x^4}$$

and the remainder is

$$\frac{20}{16}\frac{m^4}{x}-\frac{24}{32}\frac{m^5}{x^2}+\frac{48}{64}\frac{m^6}{x^3}+\frac{864}{128}\frac{m^7}{x^4}.$$

One of the easiest modifications of this rule is the division of $ax^m+bx^{m-1}+\ldots$ by $x-p$ or $x+p$, as explained in FRACTIONS, DECOMPOSITION OF, P. C. S.

POZZO DI BORGO (sometimes BARGO), CARLO ANDREA, the late distinguished diplomatist, was one of that considerable number of remarkable men produced by the island of Corsica in the earlier part and middle of the last century. His family had ranked among the nobility of the island ever since the twelfth century; and he was born on the 8th of March, 1764, at Ajaccio, also the native place of Napoleon Bonaparte. The latter was the younger by five years, but they were in early life intimate friends. After having received a careful elementary education in his own country, Pozzo di Borgo went to finish his studies at Pisa; whence he had not long returned when Corsica, now under the dominion of France, was excited and shaken, like all the rest of that kingdom, by the outbreak of the Revolution of 1789. He had attached himself to General Paoli; and, under the patronage of that venerable head of the patriots, he was appointed, along with General Gentili, to proceed to Paris with the thanks of Corsica to the Constituent Assembly for having declared the island an integral portion of the French territory. This mission led to his being nominated a member of the Legislative Assembly, which commenced its sittings in October, 1791. While occupying this position he is stated to have attracted considerable notice by the knowledge and talent he showed in the diplomatic committee. When the Legislative Assembly was dissolved, in September, 1792, he returned to Corsica, and there joined Paoli in those efforts by which he accomplished the liberation of his country for a season from France, and the restoration of a native government under the protection or supremacy of England. When the new constitution was established, in the summer of 1794, Pozzo, who had previously acted as one of the Secretaries of the General Consult held at Corte, by which the constitution was drawn up, was appointed, according to his biographer M. Capefigue, President of the Council of State, that is, we suppose, the Board of Council, nominated by the King of England to assist the Viceroy. When the English abandoned Corsica, in 1797, he came to this country with the Viceroy, Sir Gilbert Elliot, (afterwards Earl of Minto); and he remained here for about a year and a half. While in England Pozzo was considered as the principal adviser and agent of the French refugees; and it is from this period of his life that we may date the real, if not the formal, commencement of his diplomatic career. In 1799 he proceeded to Vienna, where he attempted unsuccessfully to bring about a coalition between Austria and Russia. He continued to reside at Vienna during the short peace that followed the treaty of Amiens. Soon after the recommencement of hostilities (in May, 1803), he entered the diplomatic service of Russia, in which he spent the remainder of his life. Having been made a Councillor of State, he was first sent on a mission to Vienna, whence, after a few months, he was despatched in the character of Russian commissioner to the army, composed of English, Russian, and Neapolitan forces, in the North of Italy. After the battle of Austerlitz and the peace of Presburg (December, 1805) he returned to Vienna, and thence proceeded to Petersburg. When Prussia rose against Napoleon in October of the year following, and was about to be joined by Russia, Pozzo received the military rank of colonel, and was to have accompanied the emperor as one of his suite, when the scheme of the confederates was struck to the ground and annihilated by the fatal battle of Jena (14th October, 1806). He now proceeded once more to Vienna, where he endeavoured, without success, to induce Austria again to take up arms. Meanwhile war had, at the instigation of France, been declared against Russia by the Porte (30th December, 1806); and in the beginning of the year 1807 Pozzo joined the English fleet which was sent, under Sir Thomas Duckworth, to force the passage of the Dardanelles. He was present in the battle fought between the Russian and Turkish fleets near the island of Tenedos on the 1st of July, when the Turks were signally defeated. But on the 7th of the same month Russia made peace with France by the treaty of Tilsit, one of the articles of which provided for an armistice between

Russia and the Porte, which was accordingly concluded on the 24th of August following. Pozzo, all whose feelings were vehemently anti-Gallican, now obtained Alexander's permission to travel; upon which he proceeded to Vienna, and he continued to reside in that capital till the destruction of the fifth Anglo-Austrian coalition against France by the peace of Vienna (14th October, 1809).

He now betook himself to Constantinople, whence he proceeded to London, which he reached in October, 1810. There he remained till after the expulsion of the French from Russia in the winter of 1812, when he was recalled by Alexander; and, passing through Sweden, he met the emperor, after a separation of five years, at Kalitz. Bernadotte, prince royal of Sweden, had already engaged to join the combination against France by the treaty of Petersburg (24th March, 1812); but he still hesitated to commit himself by any actual movement. Pozzo, who had had an interview with him on his way to Kalitz, was now therefore sent to urge him, at the same time that other negotiations were opened with Moreau, and with Murat and Eugene Beauharnais; and he at last succeeded in overcoming his scruples. After the Congress of Prague (July, 1813), Pozzo, now raised to the rank of major-general, was sent to Bernadotte at Berlin; and it is said to have been by his representations that the Swedish prince-royal was prevailed upon to take part in the battle of Leipzig (18th October, 1813). Meanwhile, immediately after the previous affair of Gros-beerin (23rd August), Pozzo had been despatched to Frankfort, to take part in the military conferences held there by the allies; and thence, in the beginning of January, 1814, he proceeded to London, charged with a request from the allied sovereigns that Lord Castlereagh might be sent over to join their deliberations. He soon returned to the Continent accompanied by the English minister, with whom he proceeded to Baden, where the allied sovereigns were now assembled. He continued in close attendance upon the Emperor Alexander at the Congress of Châtillon, where he strenuously opposed the reception of the offers made by Bonaparte, and throughout the rest of the campaign of the first months of 1814, till they had the satisfaction of entering Paris together on the memorable 31st of March. Pozzo, to whom is attributed great influence in keeping Alexander steady and in determining him in favour of the restoration of the Bourbons, was now nominated Russian commissioner to the provisional government, and was soon after despatched to England to bring over Louis XVIII., with whom he returned to Paris on the 3rd of May. He remained in the French capital till the meeting of the Congress of Vienna in the beginning of November. At the conferences there he advised that the dethroned emperor should be sent out of Europe; and he is said to have produced some coldness towards him for a time on the part of Alexander by the opposition he made to tho project then entertained by the Czar of restoring the old kingdom of Poland. The changed aspect of things, however, that followed the escape of Bonaparte from Elba (1st March, 1815) at once chilled Alexander's liberalism and restored Pozzo to favour. The latter immediately proceeded to Louis XVIII. at Ghent, and, having then joined the allied army as Russian commissioner, he was present in that character at the battle of Waterloo, where he received a wound. He now returned to Paris, and, declining Talleyrand's invitation to take office in the French ministry, resumed his former functions of Russian ambassador, and in that capacity he signed the Treaty of Paris of the 20th November. Soon after the Duke de Richelieu, now head of the ministry, conferred upon him the rank of a count and peer of France. He does not appear to have again left Paris till he was sent, after the Spanish campaign of the Duke of Angoulême in 1823, on a mission to Madrid, from which, however, he soon returned to the French capital. The death of the Emperor Alexander and the accession of Nicholas (31st March, 1825) did not alter his position; and he received new letters of credence to King Louis-Philippe after the Revolution of 1830; but he at last revisited St. Petersburg in 1834. Passing on his journey thither through Vienna and Berlin, he had the Order of the Red Eagle conferred upon him by the former court and that of St. Stephen by the latter. On the breaking out of the War of the East in 1835 he was sent on a mission to London; after a stay of only a few months he returned to his former post at Paris; but he was soon sent back to this country as ambassador extraordinary to the King of Great Britain. According to M. Capefigue, he felt this appointment as both a mortification and a disgrace, and it afflicted him greatly; but M. de Nesselrode consoled him with the promise that as soon as they should have turned the Duke of Wellington from his inclination to join with Austria (de se rapprocher de l'Autriche) in the Eastern question, and should have supported the Tories in an effective manner, then M. Pozzo should return to Paris to follow his tastes and accustomed pursuits. M. Capefigue, as is well known, deals largely in all his writings in information of this sort, of which no other writer has had the luck to hear, and which we must believe upon his simple assertion—if we believe it at all. Count Pozzo, however, got back to Paris ere long; and all that there is further to be told of him is that he died in that capital on the 15th of February, 1842.

(Abstracted, with the exception of the dates, most of which we have supplied, from a very elaborate article in the *Biographie Universelle*, vol. 77 (Supplement), pp. 497-507, by M. Capefigue, which has also been published separately.)

PRELATE. [Bishop, P. C.]

PRESCRIPTION has, by the law of Scotland, a much wider operation than either by the civil law or the law of England, supplying the place of the Statute of Limitations in the latter system. It not only protects individuals from adverse proceedings which other parties might have conducted if the lapse of time had not taken place, but it in some instances creates a positive title to property. The prescription by which a right of property can be established is that of forty years—a period probably borrowed from the *Praescriptio quadraginta annorum* of the Romans. Whatever adverse right is not cut off by the other special prescriptions of shorter periods, is destroyed by the *long* prescription. It may be said generally to preclude the right of exacting performance of any claim, as to which no judicial attempt has been made to exact performance for forty years from the time when it was exigible. To create a title to real property, the long prescription must be both positive and negative. The party holding the property must, by himself or those through whom he holds, have been forty years in unchallenged possession of the property on a title ostensibly valid—this is called positive prescription; and the claimant and those whom he represents must have been forty years without an ostensible title, and must, by not judicially attacking it, have tacitly acquiesced in the possessor's title—this is called negative prescription. An action raised in a competent court interrupts the long prescription. It is usually stated in the Scottish law-books that it is interrupted by the minority of any person who could challenge the opposing right; but it would be more correct to apply in this case the phraseology of the French lawyers, who say it suspends prescription, as the years of minority are merely not counted in making up the period of forty years, while, when there is a judicial interruption, a new period of forty years commences to run. When the prescription applies to a pecuniary obligation, payment of interest or an acknowledgment of the obligation will interrupt it. It may be observed that, by a sort of analogy from the system of prescription, when there is in Scotland any judicial inquiry as to the antiquity of a custom, it is usual to limit the period of the inquiry to forty years, as sufficient to establish its having existed from time immemorial. It having been the practice in the neighbourhood of Edinburgh for the proprietors of land to irrigate fields with the contents of the city sewers—the system increasing until it became offensive to the neighbourhood—these proprietors produced evidence of their having continued the practice for forty years; and although it had during that time increased from an evil felt only by the individuals immediately concerned with the practice, to the extent of a public nuisance, these proprietors have, so far as the dispute has hitherto gone, been able to defend themselves on the ground of prescription.

The other and shorter prescriptions cut off particular descriptions of claims or methods of supporting them. By the vicennial or twenty years' prescription, holograph writings, not attested with the usual solemnities of Scottish writs, cease to 'bear faith in judgment.' An obligation of cautionary or suretyship is limited to seven years. Bills of exchange and promissory notes cease to have force after six years; but the debts which they represent, if they do represent debts, may be proved by other means. The quinquennial prescription cuts off all right of action, after the lapse of five years, on bargains proveable by witnesses. It also protects agricultural tenants from a demand for rent after they have been five years removed from the land to which the demand applies. The triennial, or three years' prescription, is very important. It cuts off claims on account of goods or services, the three years running from the date of the last item of the account; and also claims for wages, each year's wages running a separate prescription, and ceasing to be exigible, if not pursued for, in the lapse of three years from the time when it became due.

PRESENTATION TO A LIVING. [ADVOWSON, P.C.]

PRESENTMENT OF A BILL OR NOTE. [BILL OF EXCHANGE, P. C.]

PRESS, BRAMAH'S, or HYDRAULIC. [HYDRAULICS, P. C., p. 384; BANDANAS, P. C. S., p. 169; OILS, MANUFACTURE OF, P. C. S., p. 374.]

PRESS. [PRINTING-PRESS, P. C., p. 18; SCREW-PRESS, P. C., p. 111; OILS, MANUFACTURE OF, P. C. S., p. 374.]

PRESS, LIBERTY OF THE. [CENSORSHIP, P. C. S.]

PRESTON, THOMAS, was a master of arts of Cambridge and a fellow of King's College; and he was afterwards created a doctor of law and master of Trinity Hall. In 1564 he acted with great applause before Queen Elizabeth, in Rightwise's Latin play of Dido. About the same time, or a litle earlier, he wrote 'A Lamentable Tragedy, mixed full of pleasant mirth, containing the life of Cambises king of Persia, &c., and last of all his odious death by God's justice appointed: done in such order as followeth.' This rude and imperfect old piece is curious from its early place in the history of the English drama; but its tumidity made it a fair mark for Falstaff in proposing to be tragical 'in King Cambyses' vein.' The play is printed, from the undated black letter edition, in Hawkins's 'Origin of the English Drama,' 1773.

PRI'MULA, a genus of plants belonging to the natural order Primulaceae. It has a tubular 5-cleft calyx, a salver-shaped regular corolla, as long as the calyx, or longer; a spreading limb in 5 rather deep inversely heart-shaped obtuse segments; a free 1-celled ovary, with a free central placenta. It has a capitate stigma and 1 style. The fruit is a capsule with numerous roundish seeds.

P. vulgaris, Primrose, is one of our commonest British plants. It has oblong, ovate, wrinkled crenate leaves; single flowered scapes and a tubular calyx; linear, lanceolate, attenuated teeth very acute; the limb of the corolla flat. It is found in woods and thickets, and is one of the earliest of our spring flowers.

P. elatior, Ox-lip, has ovate leaves contracted below, wrinkled and denticulate, many-flower umbellate scapes, a tubular calyx; lanceolate acute teeth; the limb of the corolla concave, with cordate ovate segments; nodding flowers and erect fruit. It is found in woods and meadows, but rarely in England.

P. veris, Cowslip, has ovate wrinkled crenate leaves, contracted below, many-flowered umbellate scapes; a bell-shaped calyx, rather downy, with short ovate teeth; the limb of the corolla concave, or cup-shaped, of a deeper yellow on the upper side, with 5 orange spots. It is found plentifully in meadows and pastures in England. The flowers possess well-marked sedative and diaphoretic qualities, and make a pleasant soporific wine. The fresh root has also a smell resembling anise, and was formerly employed as a tonic medicine and also as a diuretic.

P. farinosa is distinguished by its mealy obovate lanceolate leaves, oblong ovate calyx, linear teeth, and obcordate segments rounded below, distant, and as long as the tube. It is found in the North of England and Scotland, and is called the Bird's-eye Primrose.

P. scotica is found only in the North of Scotland. It is known by its swollen calyx, with short ovate obtuse teeth; the limb of the corolla is flat, with broadly obcordate approximate segments half the length of the tube. The flowers are of a bluish purple colour with a yellow centre.

The leaves of *P. auricula* are used in the Alps as a remedy for coughs. Swine are the only animals that feed upon any of these species as their especial sustenance. They are valuable chiefly on account of their beautiful appearance and their early blossoming.

(Lindley, *Vegetable Kingdom*; Lindley, *Flora Medica*; Burnett, *Outlines of Botany*; Babington, *Manual of British Botany*.)

PRINGLE, THOMAS, was born January 5, 1789, at Blaiklaw, in Tiviotdale, Scotland. His father was a respectable farmer in Roxburghshire. Pringle's right limb, when he was very young, was dislocated at the hip-joint by an accident, which the nurse imprudently concealed till reduction was no longer practicable, and he was thus obliged to use crutches for life. In his fourteenth year he was sent to the grammar-school at Kelso, and three years afterwards went to Edinburgh to complete his studies at the university; after which he became a clerk to the Commissioners on the Public Records of Scotland. His employment was merely that of copying old records, and his salary was barely sufficient for his humble wants.

In 1811 Pringle and a friend published a poem called 'The Institute,' which seems to have been satirical, and obtained them some praise but no profit. In 1816 he was a contributor to 'Albyn's Anthology,' and the author of a poem in the 'Poetic Mirror,' called 'The Autumnal Excursion,' which was praised by Scott, and was the origin of Pringle's acquaintance with him. About the same time he was busy with the project of establishing a magazine as a rival to the 'Scots' Magazine,' and when his plan was pretty well advanced he resigned his situation in the Register Office, which he could resume if his project was unsuccessful. Among his coadjutors were Lockhart, Wilson, Clegborn, Dr. Brewster, and Hogg. Early in 1817 the 'Edinburgh Monthly Magazine' appeared, of which Pringle was the editor. His most important contribution to the first number was an article on the Gipsies, the chief materials for which were furnished by Scott, unasked for and gratuitously, and which Scott had himself intended to work up into an article for the 'Quarterly Review.' About the same time Pringle became editor of the 'Edinburgh Star' newspaper. The magazine soon fell into the hands of other proprietors, and changed its title to that of 'Blackwood's Magazine,' Pringle still continuing to be the editor, at the same time that he became joint editor of 'Constable's Magazine;' but disputes between Pringle and Blackwood led in a short time to a separation. Before this untoward event took place he had married. Soon afterwards he published 'The Excursion, and other Poems,' with little or no profit. The editorship of 'The Star' newspaper was unprofitable, and he resigned it; and he probably derived little emolument from 'Constable's Magazine,' for in January, 1819, he was again on his former seat in the Register Office, performing the laborious drudgery of a copying clerk to the Record Commission.

Meantime Pringle's four brothers, all of whom were farmers, had become more or less unprosperous, and he proposed that they should avail themselves of the government scheme of colonizing the unoccupied territory at the Cape of Good Hope. One brother had previously emigrated to the United States of North America. The other brothers agreed to his proposal, though the eldest brother could not get his affairs arranged in time to accompany them; but be promised to follow them, and Pringle undertook the management of his farm till his arrival.

The party of twenty-four persons, consisting of twelve men, six women, and six children, having set sail, arrived at the Cape of Good Hope in April, 1820. On the 21st of June they reached Roodewal, on the Great Fish River, and after a toilsome march of some days arrived at their place of settlement, in the upper part of the valley of the Baavians' River, or River of Baboons, one of the smaller tributaries of the Great Fish River.

The small colony, having surmounted the first difficulties, became tolerably prosperous, and Pringle's brother having arrived in July, 1822, he resigned his farm, and went to seek employment at Cape Town, as had been his original intention. Scott, Sir John Macpherson, and others, had exerted their influence with the colonial secretary, and Pringle was offered and accepted the situation of librarian to the government library. The salary was only 75*l.* a year, but afforded a fair ground-work of income to a working literary man. He at first received pupils for private instruction, and then, in conjunction with the Rev. Mr. Faure, a Dutch clergyman of the town, made arrangements for the publication of a periodical in English and Dutch. Lord Charles Somerset, however, who was then governor, on being applied to in February, 1823, would not permit any journal to be published except the Government Gazette. Pringle was obliged to submit, and wait the arrival of commissioners, who had been sent out by the British government to examine into the state of the colony. The commissioners, when they arrived, approved of his plan; but their powers did not extend beyond that of making a report to the home government.

Meantime Pringle, in conjunction with his friend Mr. Fairbairn, who had followed him from Scotland, organized a private academy on an extensive scale, which was prosperous beyond their expectations. While occupied with this new business, he was surprised to receive a communication from the governor authorizing him to commence his periodical, the plan of which, it seems, had met with the approbation of Lord Bathurst, who was then colonial secretary.

The 'South African Journal' forthwith appeared, one edition in English and one in Dutch. Soon afterwards, Mr. Greig, a printer, commenced the 'South African Commercial Advertiser,' a weekly newspapor, of which Pringle became editor, as well as of the 'Journal.' The two works were prosperous, the pupils of the academy increased, and Pringle fancied himself about to make a rapid fortune.

A man of the name of Edwards was tried for a libel on the governor, and the trial, like others, was expected to be reported. On this occasion, however, the Fiscal was ordered to proceed to the printing-office, and assume the office of censor of the press. Pringle states that everything likely to be personally offensive to the governor had been carefully expunged; but he refused to submit to this assumption of arbitrary power, and having no legal means of resistance, threw up his editorship. Greig discontinued the publication of tho uewspaper, announcing to his readers his intention of appealing to the British government. Greig's press was immediately ordered to be sealed up, and himself commanded by warrant to leave the colony within a month. The Fiscal at the same time assumed the censorship of the Magazine also, stating that if he had been aware of certain paragraphs in the second number ho would have expunged them or suppressed the numbers. Pringle disclaimed his right of censorship, and, on the 15th of May, 1824, announced the discontinuance of the work in the Gazette. A petition to the king in council was got up by the respectable inhabitants, and the governor became alarmed. He summoned Pringle to appear before himself and Sir John Truter, the chief justice. Ho at first attempted to hully Pringle into submission, and, failing in that, tried to cajole him, and bring him over by flattery; Pringle, however, resolutely refused to recommence the Magazine unless he received a promise that the press should not be interfered with except by legal process. To this the governor would not agree, and Pringle retired, and immediately resigned his appointment as librarian. The result was that the governor's resentment pursued him till, finding himself ruined in circumstances and prospects, he deemed it prudent to leave the Cape, and in July, 1826, arrived in London. He applied to the government for compensation for his losses, which he estimated at 1000*l.*, but in vain. Meantime he was engaged as secretary to the Anti-Slavery Society, a situation which he held till slavery was abolished; he became the editor of 'Friendship's Offering,' wrote and published a 'Narrative of a Residence in South Africa,' and contributed to the chief periodical works of the day.

In June, 1834, Pringle wrote to his doctor, to say, that in taking supper a crumb of bread passed down the windpipe, and brought on a violent fit of coughing; that a little blood flowed, which however soon ceased; but that in the morning he felt a sensation as if there had been some slight abrasion of the part. This slight abrasion seems to have produced consumption, and his medical advisers informed him that removal to a warmer climate afforded the only chance of saving his life. He was preparing to return to the Cape, and had actually engaged a passage for himself, his wife, and her sister, when an attack of diarrhœa, operating upon his weak state of body, occasioned his death, December 5, 1834.

The greater part of Pringle's works probably consist of fugitive pieces written during the timo when he was secretary to the Anti-Slavery Society; but his reputation as an author depends mainly on his 'Narrative' and his 'Poems.' His 'Narrative' is very entertaining; somewhat diffuse perhaps, but simple, distinct, and effective, interspersed with passages of picturesque power and beauty, and characterized throughout by the appearance of undeviating truth. He published also an 'Account of English Settlers in Albany, South Africa,' 12mo. His poetry has great merit. It is distinguished by elegance rather than strength, but he has many forcible passages. The versification is sweet, the style simple and free from all superfluous epithets, and the descriptions are the result of his own observations. His 'African Sketches,' which consist of poetical exhibitions of the scenery, the characteristic habits of animals, and the modes of native life in South Africa, are alone sufficient to entitle him to no mean rank as a poet.

(*The Poetical Works of Thomas Pringle, with a Sketch of his Life*, hy Leitch Ritchie.)

PRINOS (πρῖνος is the Greek name of the Holly, which the present genus much resembles), a genus of plants belonging to the natural order Aquifoliaceæ. It has polygamous flowers, a permanent half 6-cleft calyx, a rotate 6-parted corolla, 6 subulate erect filaments, a short style with an obtuse stigma, and a berry with 6 stones. The species are shrubs with alternate deciduous or permanent leaves.

P. verticillatus has oval deciduous acuminated leaves, serrated, pubescent beneath; small white flowers in little imperfect axillary umbels, which are nearly sessile. The calyx is small, 6-cleft, and persistent; the corolla monopetalous, spreading, without a tube, the border divided into 6 obtuse segments. The fruit is a bright scarlet, roundish, supported by the persistent calyx and crowned with the stigma, 6-celled, containing 6 long seeds which are convex outwardly and sharp edged within. The bark is very bitter, and has been substituted for Cinchona bark in cases of fever. Dr. Meere recommends it for its antiseptic powers, and the American practitioners employ it as a lotion in cutaneous disorders and in cases of gangrene. The berries are said to be tonic, and Bigelow asserts that they are emetic.

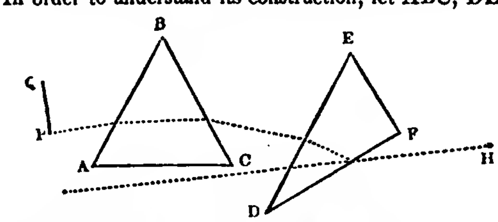
P. glaber, Glabrous Winter Berry, has rather pubescent branches, evergreen cuneate lanceolate coriaceous smooth shining leaves, a little toothed at the apex; the pedicels are axillary, usually solitary, for the most part 3-flowered. It is native of North America from Canada to Florida. The berries are black, and are called in Jersey *Ink Berries*. It is a low handsome shrub, and is said to be one of the plants the leaves of which are sometimes used instead of Paraguay Tea. The hardy species of this genus are well suited for shrubberies, and will thrive well in any common light soil, but they prefer peat. They are readily propagated by laying down the shoots or hy seeds. The stove species will grow well in a mixture of loam and peat, and ripened cuttings will root in sand under a hand-glass in moderate heat.

(Don, *Gardener's Dictionary*; Lindley, *Vegetable Kingdom*; Burnett, *Outlines of Botany*.)

PRINTS AND ENGRAVINGS. [Copyright, P. C.]

PRISMATIC TELESCOPE AND SEXTANT. Instruments bearing these names were invented by Professor Amici, at Modena, and the former is briefly described by Sir John Herschel in the Treatise on Light in the 'Encyclopædia Metropolitana.' In its simplest form it consists of two pairs of triangular prisms of glass, each pair being such that an object seen through the two shall he free from colour.

In order to understand its construction, let ABC, DEF, in

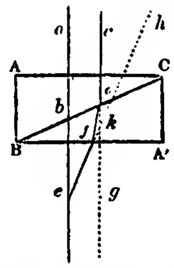


the plane of the paper, be the principal sections of the prisms, and PQ be one side of a square object having its surfaces perpendicular to the paper, so that the sides which pass through P and Q perpendicularly to the paper may be parallel to the refracting edges of the prisms; also let the eye of the spectator be situated at H: then the light proceeding from the surface of the square will, after refraction in the prisms, produce in the eye an image of a rectangular form, having the breadth in the direction of PQ greater than PQ, the length perpendicular to the paper being unaltered. If now tho rays emergent from the second prism be made to pass through two others similar to ABC and DEF, but having the plane of their principal sections perpendicular to that of the former prisms, the visible image of the square on PQ will have the length perpendicular to the paper increased as much as PQ was before increased while PQ retains the magnitude which it had acquired. Thus, after refraction through four such prisms, the image of an object is equally magnified in every direction, and is quite free from colour: and it is easy to perceive that by suffering the rays of light to pass through other systems of prisms, similarly formed and disposed, any required degree of magnifying power may be produced.

Sir John Herschel conceives that a telescope of this nature might be used with advantage for viewing bright objects, as the sun, since it would require no darkening glasses, and would be exempt from all the inconveniences which oppose the perfection of telescopes of the usual construction when applied to this particular purpose.

An optical instrument, which is also called a prismatic telescope, has been formed hy placing between the object-glass and its focus two prisms of a douhly refracting medium; thus producing two images of an object, which being, by moving the prisms, made to approach to or recede from one another, permit the instrument to be used as a micrometer. It was invented or improved by M. Rochon, and is sometimes employed for the purpose of ascertaining the magnitudes of terrestrial objects, or their distances from an observer: it has been also used in measuring small angular distances in the heavens.

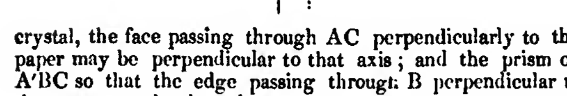
The two prisms may be of Iceland spar, or rock crystal, and each is cut in the form of a wedge whose principal section is a right angled triangle, as ABC or A′BC, and the two are applied in contact with each other as in the figure. The prism on ABC is cut so that, AB being the axis of the natural



crystal, the face passing through AC perpendicularly to the paper may be perpendicular to that axis; and the prism on A′BC so that the edge passing through B perpendicular to the paper may be the axis.

Now, if rays of light fall perpendicularly on the surface which passes through AC perpendicularly to the paper, those which, as *abe*, suffer the *ordinary* refraction, will preserve, in passing through the double prism and also on emerging from thence at the surface passing through A′B, the same directions as they had at their incidence on the opposite face; while the rays which, as *cd*, suffer the *extraordinary* refraction will, on arriving at the surface passing through BC, be turned from the original direction and take some other as *df* towards either B or A′ according as the crystal is of the kind called attractive or that which is called repulsive (suppose the former); then, on emerging from the surface standing on A′B, tho rays will proceed in some direction as *fe*, as if they came from points corresponding to *k* in the rays *cd* produced, and will cross the ordinary rays in points corresponding to *e*. An eye placed near *e* so as to receive the rays of both kinds will perceive two images of the object from whence they proceeded before they fell on the prism. The constant angle at which the rays are inclined to another is measured by *aeh*, *h* being in the direction of *ef* produced; and when the prism is of Iceland spar tho angle *aeh* may exceed 43 degrees; when of rock-crystal it may amount to 10 degrees.

Let the double prism be placed between the object-glass O of a telescope and its focus, the face standing on AC being



towards the former and perpendicular to the optical axis; and for simplicity, let the object be a straight line XY in a vertical position having one extremity X in the axis OE: then x and y being the foci of pencils diverging from X and Y, after being refracted through tho object-glass O, the line xy may represent the image of XY formed as usual by the ordinary rays in the pencil of light, and $x'y'$, in a vertical line passing through xy, the image produced by the extraordinary rays; the angle xkx' or $yk'y'$ being that which was denoted by *aeh* abovo. Therefore, if the angular deviation of the images formed by the two kinds of rays is small enough to permit the rays to enter the eye near E, after passing through the eye-glasses of the telescope (the angular deviation not being altered by the refractions in those eye-glasses) corresponding points in the two images will in general appear to subtend some angle at the eye. If the points k and k' in the prism are at the foci x and y of the object-glass, the two images of XY will evidently coincide; but, on moving the prism towards O, the images will separate gradually from one another, the angular deviations being proportional to the distance of k from x.

Now, on the exterior of the telescope in a direction parallel to its axis, there may be formed a scale which, by means of an index moveablo with the prisms, will serve to measure any subtended angles; thus:—The angle subtended at the naked eye of the observer by any object as XY, which may represent a straight line or the diameter of a circular disk, being less than the constant angle xkx', there will be found a certain position of the prisms at which one extremity Y of the line or diameter seen by the ordinarily refracted rays will appear to coincide with the opposite extremity X of the same line or diameter seen by the extraordinarily refracted rays. Then, the angle which the same object subtends at the eye in that position being determined trigonometrically or otherwise, the point at which the index stands should be numbered so as to express that angle. The like operation being performed for an object subtending a different angle at the eye, if the interval between the points at which the index stands be divided into a number of equal parts corresponding to the difference between those angles, and the divisions be continued in opposite directions, there will be constituted the required scale, by which the angle subtended when the images of any other line or disk are placed in contact, by moving the prisms, may be measured.

The *Prismatic Sextant*, invented by Professor Amici, is described in Zach's 'Correspondance Astronomique,' tom. vi. p. 554. It has no mirror, but, nearly at the place where the index-mirror is situated on a common sextant, there are two triangular prisms of glass whose parallel edges are perpendicular to the face of the instrument. One of these is fixed, and the other turns on one of its edges by the motion of the index-bar, the broadest faces being parallel to each other, and nearly in contact when the index is at the zero of the arc: the telescope also turns on a pivot near the prisms. The rays of light falling on the exterior faces of the prisms will, after two refractions and one reflexion, and after passing through the telescope, enter the eye of the observer, so that, by moving the index-bar, the images of the objects from whence the rays proceed may be made to appear in contact with each other; when the angle subtended between the objects will be rather greater than twice that which is described by the movement of the index. If the prisms are of common glass, and the broader faces of the prisms make with each other an angle of 90 degrees, the angle between the objects will be about 204 degrees.

The advantages of this sextant are that double altitudes of the sun, when on the meridian, may be observed by it, even at the equator, and that at sea the anterior and posterior horizon may be brought in contact, and thus the amount of tho horizontal refraction may be determined. It may be added that very little light is lost by reflexion, and that there is no parallax for near objects.

PRISTACANTHUS, a genus of fossil placoid fishes, from the oolite of Stonesfield. (Agassiz.)

PRISTIS. Three species of this genus of fishes are men tioned as fossil in the tertiary strata of England. (Morris's Catalogue.)

PRIVATE ACT. [PARLIAMENT, P. C.]

PRIVET. [LIGUSTRUM, P. C. S.]

PRIVY SEAL. [SIGNET, SEAL, P.C.] The Lord Keeper of the Privy Seal is a member of the Cabinet, and has a salary of 2000*l.* per annum. By an Act of 2 Wm. IV. c. 49, the Commissioners of the Treasury may abolish any of the offices of Clerks of the Signet and Privy Seal when they become vacant, and direct the duties to be performed by the remaining clerks.

PRIZE-MONEY. [PRIZE-MONEY, P. C.] Apprizements and sales of prize and capture are made by agents appointed by the commanders and other commissioned officers. A certified list of the persons entitled to share in the capture is transmitted to Chelsea Hospital by the commanding officer. There is a penalty of 500*l.* for altering names. At the end of three months from the receipt of prize-money, the treasurer of Chelsea Hospital is required to notify in the 'London Gazette' and in two London morning papers that distribution will be made at the end of one month. In this notification the share of an individual in each class must be declared. Shares of prize-money due to a non-commissioned officer or soldier, will be paid only upon personal application, or to his wife, or child, father or mother, brother or sister, or to the regimental agent of his regiment, or to any other regimental agent. If discharged, a certificate must accompany the application, signed by the clergyman and one of the churchwardens or overseers. Personating or falsely assuming the name and character of a person entitled to prize-money with fraudulent intent is punishable with transportation for life, or not less than seven years. By 3 & 4 Vict. c. 65, the Privy Council may refer to the High Court of Admiralty matters concerning booty of war (property captured by land forces). The Prize

Court of the Admiralty is the proper court for deciding on matters captured by naval forces.

PROBATE AND LEGACY DUTIES. These duties yield a sum exceeding two millions a year. The legacy duty is charged on legacies of the value of 20*l.* and upwards out of personal estate or charged upon real estate, and upon every share of residue. Legacy to a husband or wife is exempt from duty. To a child or parent, or any lineal descendant or ancestor of the deceased, the duty is 1*l.* per cent.; to a brother or sister or their descendants, 3*l.* per cent.; to an uncle or aunt or their descendants, 5*l.* per cent.; to a great uncle or great aunt or their descendants, 6*l.* per cent.; to any other relation or any stranger in blood, 10*l.* per cent. The probate duty is payable on the total sum left by the deceased. For sums above 20*l.* and not exceeding 100*l.* the duty is 10*s.* if there is a will; and if there is no will the duty of 10*s.* is chargeable on sums of 20*l.* and not exceeding 50*l.* The duties continue to increase according to a certain scale up to 1,000,000*l.* The following tables show the operation of the legacy and probate duties for nearly half a century; and in Porter's 'Progress of the Nation,' vol. iii. pp. 125-133, will be found some useful and interesting considerations on these duties as indications of the progress of national wealth :—

Duty received from 1797 to 1845 inclusive.	Legacies.	Probates, Administrations, and Testamentary Inventories.
	£.	£.
England . .	36,696,279	29,110,230
Scotland . .	2,199,715	1,521,960
Ireland . . .	829,499	1,182,705
	£39,725,493	31,814,896
Duty received in 1845.	£.	£
England . .	1,178,866	963,322
Scotland . .	88,073	66,631
Ireland . . .	61,629	65,852
	£1,328,568	1,095,805

Return, showing the Amount of Capital on which the several Rates of Legacy Duty were paid in Great Britain in the Year 1845, and an Abstract of the Total Amount paid under each Rate since 1797 :—

Per Cent.	1845. £.	Per Cent.	1797-1845. £.
1*l.* .	24,087,848	1*l.* .	662,775,286
2*l.* 10*s.*	152,493	2*l.* .	20,716,610
3*l.* .	14,599,335	2*l.* 10*s.*	70,683,131
4*l.* .	9,774	3*l.* .	848,364,319
5*l.* .	1,802,196	4*l.* .	12,666,479
6*l.* .	318,359	5*l.* .	60,804,505
8*l.* .	22,778	6*l.* .	17,797,836
0*l.* .	4,606,925	8*l.* .	11,813,294
		10*l.* .	143,798,047
Total .	£45,599,714	Total .	£1,339,419,511

PRO'CULUS, a distinguished Roman jurist, the successor of Nerva the father. He belonged to the school of Labeo, and the followers of that school derived their name Proculiani from him. [LABEO, ANTISTIUS, P. C. S.] It is generally stated that his name was Sempronius Proculus, but Pomponius (Dig. 1, tit. 2, s. 2, § 47) calls him simply Proculus. The passage of the Digest (31, tit. 1, s. 47) which is cited to prove that his name was Sempronius does not prove that it was. In this passage Sempronius Proculus sends greeting to his grandson, and asks him his opinion about a legacy. 'Proculus respondit,' Proculus gave his opinion, and therefore the grandson and Proculus are the same person; and as Zimmern remarks, Proculus the jurist might be the son of the daughter of Sempronius Proculus the grandfather, in which case his name would not be Sempronius. It has been conjectured that Proculus the jurist is the Licinius Proculus whom Otho made Praefectus praetorio (Tacitus, *Hist.* i. 46, 82, 87, ii. 39, 40, 44, 60). Proculus is often cited in the Digest, and he is specially mentioned in a Rescript of the Divi Fratres as an eminent authority (Dig. 37, tit. 14, s. 17). There are thirty-seven excerpts in the Digest from a work of Proculus, entitled Epistolae, of which there were at least eleven books (Dig. 18, tit. 1, s. 69), though the Florentine Index mentions only eight. One of the excerpts (Dig. 33, tit. 6, s. 16) has the title 'Proculus, libro iii. ex Posterioribus Labeonis,' which appears to be a separate work or commentary on the Posteriora of Labeo. But as Javolenus wrote on the Posteriora of Labeo (Dig. 33, tit. 7, s. 4), it is conjectured that the title of s. 16 (Dig. 33 tit. 6) should be 'Javolenus.' (Grotius, *Vitae Jurisconsultorum*; Zimmern, *Geschichte des Römischen Privatrechts*, p. 316.)

PRODU'CTUS, the original name given by Sowerby to a large group of fossil Brachiopoda, most frequently found in the mountain-limestone series. Producta and, for part of the group, Leptæna, are synonyms.

PROMULGATION. Promulgation is from the Latin Promulgo, which is equivalent to Provulgo, and means 'to make public.' The modern sense of Promulgation of a Law is the making of it public or giving notice of it to all persons in some way or other. Blackstone observes (*Comm.* i. 45), 'It may be notified by universal tradition and long practice, which supposes a previous publication, and is the case of the common law of England. It may be notified *vivâ voce* by officers appointed for that purpose, as is done with regard to proclamations, and such acts of parliament as are appointed to be publicly read in churches and other assemblies. It may lastly be notified by writing, printing, or the like, which is the general course taken with all our acts of parliament.' A law is a command from a political superior to a political inferior to do or not to do something, with a penalty attached to the violation of the command, and it is assumed by Blackstone that the command is made known in some way to all who are bound to obey it; or it is presumed that it is known to all. But as to 'a universal tradition and long usage,' it is a mistake to say that it supposes a previous publication. A long usage does not of itself make law: the usage must be pronounced to be law by some competent authority, and that is the only promulgation which it has. Promulgation by proclamation is very ineffectual: it only reaches those who hear it. Further, everybody cannot hear an act of parliament which is read in churches, for the churches would not hold one-fourth of the people if they all went to hear it read; and if they heard it read, very few would understand it. Printing is at present the most efficient means of promulgating a new statute; but to all those who cannot read it is ineffectual; and also to those who cannot understand.

No remedy can be provided for these difficulties, and it is simply a positive rule of law that a new statute is binding on all persons who are under the authority of the power which makes the statute, from the moment that the statute is made and completed in due form. It is a foolish way of speaking to say that a person is presumed to know a law, when it may be very easy to show in many cases that he did not know it and could not know it. One kind of legal presumption consists in the assumption of a fact, which presumption may be disproved by evidence. But the presumption that a man knows the law is not an assumption which a man is permitted to disprove even if he can, and this presumption should be struck out of the list of presumptions and placed among positive rules of law.

If a man were allowed to urge ignorance of law as an excuse, it might be urged by a great majority in many matters of contract and in other cases too; and the trial of the fact of ignorance of law would give ample room for fraud. The positive rule that all the members of a state are bound by its laws, causes less evil than the admission of the excuse would.

Promulgation of a law among the Romans meant the placing of the bill (rogatio) in some public place where it could be read before it was voted upon in the Comitia. The Roman rule was that ignorance of law (ignorantia juris) was no excuse. (Paulus, *Dig.* 22, tit. 6. s. 9.)

PROPERTIES OF IRON, MEDICAL. Iron, in a purely metallic state, does not exert any appreciable influence over the human system. Nevertheless metallic iron is recommended as an antidote to poisoning by the salts of copper. Iron filings have been administered with a view to precipitate the copper in a metallic and therefore innocuous state. White of egg is a more prompt and generally more accessible antidote. The employment of iron filings to absorb fœtid exhalations from the feet is less beneficial than that of recently prepared and freshly powdered charcoal, put every morning into the shoes of those afflicted with this annoyance. Iron filings are sometimes prescribed, but before any marked effect can be produced by them, the metal must become an oxide or a salt; the presence of any acid in the stomach or alimentary canal promotes this change, while alkalies retard it. This form has been adopted in the treatment of worms, chiefly from the notion that the worms would be annoyed and dislodged by the mechanical irritation of particles of iron. This is an erroneous view. [ANTHELMINTICS, P. C.] Tincture of sesquichloride of iron in infusion of quassia is extremely beneficial in all cases of worms, but its efficiency depends on its tonic and astringent properties.

A few only of the preparations and uses of iron can be given here. Sesquioxide of iron (rust, or the subcarbonate of some pharmacopœias), has been given in tic douloureux, in very large doses; in some instances with success. It is likewise useful in some cases of spasmodic contractions of the joints. The very large doses in which it is required to be given is a serious impediment to its use; for not only are the patients averse to it, but it clogs the intestines, which require to be frequently cleared out by a brisk cathartic.

The black oxide is not so liable to objection, as it is more readily soluble in the fluids of the alimentary canal.

Ammonio-chloride of iron possesses no advantage over the simple chloride; the tincture of which, called tincture of sesquichloride of iron, is extremely valuable, as an emmenagogue; it likewise is very beneficial in checking menorhagia proceeding from relaxation of the uterus. It checks hæmaturia from relaxation of the tissue of the kidneys. In frequently repeated small doses it relaxes spasmodic stricture of the urethra. But the sense of nausea and sinking which it causes, render patients averse to its repetition. It acts as a potent astringent when employed externally or to mucous membranes as an injection.

Sulphate of iron can be given in small doses, in pills or otherwise. Its powers are often much heightened by combination with sulphate of quinia. In nervous debility and indigestion this form is valuable.

Ferro-tartrate of iron has less unpleasantness of taste than most of the other preparations of iron, and is therefore more acceptable to children, to whom also the vinum ferri is much prescribed. Both these are nearly superseded by the citrate or ammonio-citrate of iron, which can be given in the form of lozenge or syrup. The latter given in warm water or lemonade is relished by most children.

Iodide of iron is a preparation of great value in strumous disorders.

The same may be said of the phosphate of iron, a preparation formerly in the 'London Pharmacopœia,' and now most unjustly excluded from it. In the phosphatic diathesis of feeble subjects, with a tendency to rickets, it is invaluable. The dose for children is a very few grains, cautiously increased. The numerous preparations of iron recently introduced by chemists have not been sufficiently tried to permit them to be spoken of with certainty; but in many cases their utility is obvious. Of these the chief are citrate of iron, Potassio-citrate, Sodio-citrate, Zinco-citrate, Magnesio-citrate, Ferro-citrate, and Citrate of quinine and iron; this last is of great service in tic douloureux.

Chalybeate waters often furnish the best medium for administering iron; especially when the iron is associated with much free carbonic acid. Where no free carbonic acid is present, and in some instances even where it exists, the water of the springs should be received in and drunk out of *warm* water. This often prevents the spasm which is apt to occur when very cold water is suddenly taken into the stomach.

Besides being reputed an antidote to the poisonous salts of copper, iron is asserted to prove an antidote to other violent poisons.

Hydrate of peroxide of iron, called also hydrated peroxide of iron, is considered a trustworthy antidote against arsenic, if administered promptly, while the arsenic is yet in the stomach, and not absorbed. Prussic acid may be decomposed or combined, so as to be rendered innocuous, by giving promptly, first, solution of carbonate of potass, followed by a very diluted solution of the proto-persulphate of iron; the object being to form a ferro-prussiate of potass in the stomach. (See 'Lancet,' 5th October, 1844, or 'Pharmaceutical Journal,' vol. iv. p. 373.)

Physiological Effects and Therapeutic Employment of Iron.—Iron exists both in plants and many animals, as the mammiferæ and birds, constituting an essential part of their fluids and solids; but, incorporated as it is thoroughly with them, it gives rise to none of those phenomena which it occasions when taken into the stomach. Upon the living tissues iron has a tonic influence; and as its preparations greatly promote digestion, they excite the appetite and render more easy the elaboration of the aliment. The vitality of the digestive organs being exalted, they extract from the food more of the nutritious principles, and thereby furnish a greater quantity fit to be assimilated.

These beneficial effects are best seen when the medicine is given in small and long-continued doses, or in the greatly diluted state in which iron occurs in the mineral waters or chalybeate springs. On the other hand, chalybeates occasion at times, especially if in large doses, pain of the epigastre, nausea, fœtid eructations, and great anxiety; consequences referable to the immediate impression, a sort of constrictive action, which the preparations of iron make or exercise when they reach the stomach, upon its internal surface, and the nerves which are distributed upon it. The unpleasant effects may generally be avoided by giving it at first in very small doses, gradually increased, or by diluting it with some vegetable substance of little activity.

Iron given in large doses, when it reaches the intestines, produces in some persons obstinate constipation, accompanied with a sense of great heat in the lower belly; in others it occasions colics and frequent alvine dejections; while with a third set of persons none of these effects follow its administration.

During the use of iron the fauces invariably become blackened, which is caused by the tannin of our food acting upon the iron.

In respect to the secondary effects of iron, the amount of these depends upon the quantity absorbed, and the length of time it has been given. That it is absorbed, in most instances, and carried into the circulation, is proved both by the effects of it being felt over the whole system, and by being distinctly recognisable in the urine on the addition of an infusion of galls. When used for some time, chalybeates increase greatly the power of the heart; the pulse becomes stronger and harder—effects most observable upon persons previously enfeebled by disease. If persisted in, they cause increased arterial action, followed by febrile commotion, sense of heat, and hæmorrhagic discharges from different parts of the body. These phenomena show themselves most speedily in persons of a plethoric habit and sanguine temperament; iron also rouses the absorbent organs when sluggish.

The functions of nutrition and assimilation are greatly heightened by the use of iron; but if it be too long persevered in, diseases of over-action ensue, as inflammations, hæmorrhages, &c. These symptoms indicate the necessity of discontinuing it.

The preparations of iron are unquestionably efficacious in diseases which proceed from a relaxation of the substance of the living tissues, from an inactivity of the reparative or assimilative function, or in case of weakness proceeding from deficient supply of nervous energy.

Hence they are indicated in Anæmia, in convalescence from debilitating fevers, and other tedious diseases, as well as after some of the more acute phlegmasiæ, as pneumonia, the cough remaining after which, if not occasioned by any organic change, is sooner removed by preparations of iron or bark than any other means. Chalybeates are likewise given in defective menstruation from debility of the uterus, and sometimes in sterility. In chlorosis iron is almost our sheet-anchor, while it is also very serviceable in some forms of dyspepsia, also in worms (in which the sulph.-ferri is given in large doses), in passive hæmorrhages, and is prescribed empirically in many of the cachexiæ, as scrofula.

Chalybeates are found useful in many nervous diseases, as hysteria: the cough which is often present in these complaints may be effectually removed by preparations of iron. The indurations, too, of the mammæ (apt to be considered of a cancerous nature), and of other glands in hysterical females, are often dispersed by the use of iron. Some of the forms of tic douloureux, not dependent upon organic causes, are often cured by chalybeates. Iron has likewise been prescribed in the intervals of the paroxysms of intermittents, particularly quartans. The sulphate is given in the dose of ʒi. in a pint of water,—in which circumstances it can only act beneficially, like cinchona or bitter tonics,—iron being among minerals what bitter herbs are among vegetable remedies.

Chalybeates are *contra*-indicated in plethora and all inflammatory diseases, as well as active hæmorrhages, as also during pregnancy in females of a sanguine temperament.

PROPERTY-TAX. [Taxation, P. C.]

PROPYLÆUM (προπύλαιον: the great entrance to the Acropolis of Athens was called προπύλαια, in the plural number; Thucydides, ii. 13), signifying literally a fore-portal or one detached from and placed in advance of the building to which it gave access, is used as a distinctive term for the structures through which was the entrance into the enclosure surrounding some of the Grecian temples. Unlike the vast truncated pyramidal masses or moles that enclosed the fore-court of Egyptian temples, on the entrance side, leaving only a lofty square-headed portal for access, thereby screening the main edifice and colonnades within the court, and giving the exterior the aspect of a fortress,—the propylæa of the Greeks were detached structures placed in advance of the sacred edifice itself, so as to mark very conspicuously the approach to it through the outer enclosure or boundary. They seem to have been intended in some degree to prefigure the temple itself to which they conducted, their general appearance in front being almost identically the same as that of the frontispiece-façade or pediment end of a prostyle temple;—which repetition, by the by, and sameness of design do not say much for invention on the part on tho architects, or for the capability of the style employed by them to impress distinct character on structures of so opposite a kind as a temple and the gateway conducting to it; unless we would rather suppose that the kind of prefiguration above hinted at was aimed at directly and studiously.

The general arrangement and character of a Greek propylæum may be described as similar to those of an amphiprostyle temple [TEMPLE, P. C.], shorter however on its sides than the width in frunt, and without any *cella*, yet not entirely open to both fronts, but divided by an inner wall across it from side to side, into two portions, the outer one of which, answering to the *pronaos* of a temple, was larger than the other; so that the whole may be more briefly, if not more intelligibly explained, by comparing the plan to the *pronaos* and *opisthodomus* of an amphiprostyle temple, put together without any intervening cella, being separated only by the wall above mentioned, in which were as many open doorways as there were intercolumns in front.

Such was the disposition of the propylæa both of the Parthenon at Athens and of the temple at Eleusis, the only two examples of such structures known to us, and the latter now so only by the drawings of it in the unedited antiquities of Athens: there were, indeed, as we learn from Pausanias (ii. 3) propylæa at Corinth, but of their architectural design we know nothing. Tho Athenian structure stands on the west side of the Acropolis, as may be seen by the cut in PARTHENON, P. C. (vol. xvii. page 288, col. 2), which shows its relative position to the temple itself—an irregular one, the two buildings not being on the same axis or line. This propylæum, which was begun by the architect Mnesicles in the 4th year of the 85th olympiad, and completed in five years, is of the Doric order, and hexastyle on both fronts; and the outer or western one was greatly extended by two flanking wings projecting forward at right angles, so as to enclose the platform to which an ascent of steps led up from below, and above which the portico and the two lesser colonnades forming the sides of the wings were raised upon three other steps. Thus the platform (78 feet from north to south, by 40 east and west) became an elevated open fore-court, presenting a principal portico in front crowned by a pediment, and two colonnades, which being considerably lower (their columns 19 feet, the others 28½ feet high) gave greater importance to the former; and a degree of scenic effect—combination, contrast, and variety was produced, very unusual in Grecian architecture, and which must originally have been very striking when the lower flight of steps existed, of which however there now exists no trace, they having been destroyed to make way for a Turkish battery to defend the approach to the Acropolis. In the second century of the Christian æra that first ascent was flanked on each side by an equestrian statue (one of them conjectured by Chandler, from an inscription, to have been that of Agrippa, wherefore it is probable that the other was that of Augustus), which, though later additions to the structure, must have greatly enhanced the general appearance of the architectural ensemble.

But one of the most remarkable circumstances which served to distinguish the Propylæum from a portico is that in the western or outer division there were two rows of inner columns placed not parallel with, but at right angles to the columns in front, and in a line with the two middle ones, thereby dividing the plan internally into three compartments, the centre one narrower than the other two, and forming an avenue to the principal doorway, which was the largest and loftiest of the five openings in the transverse wall, and the two end ones the smallest. These inner columns, too, instead of being of the same order as the exterior, were Ionic,—a very remarkable peculiarity, inasmuch as it evidences an intermingling of styles almost unknown to Grecian architecture. The licence—so to call it—was, however, fully justified by the circumstances of the case, because columns of lesser diameter than the external ones were required, and also of such height as to reach the architrave soffits of the internal ceiling, which are in a line with the top of the architrave of the external order.

The Eleusis propylæum resembled that of the Acropolis in nearly all particulars, except that it had no wings attached to it. Like the Athenian one, it was of the Doric order, hexastyle on both fronts, and had six Ionic columns within, similarly in two rows.

As modern structures partaking of the antient Greek propylæum character, may be mentioned Cagnola's Porta Ticinense at Milan [CAGNOLA, P. C. S.], and the London Terminus of the London and Birmingham Railway, in Euston-square, which, though only a distyle in antis in both fronts, is a fine example of Grecian Doric upon a scale of extraordinary magnitude. Both the modern examples, however, differ from the antient ones in being entirely open, without any internal transverse wall; and the Italian one has, moreover, a large open arch on each side, forming a passage through it in that direction.

PRO'TEA, PROTEA'CEÆ. [XYLOMELON, P. C.]

PROTEIN. [CHEMISTRY, P. C. S.]

PROTEST. [PARLIAMENT, P. C.]

PROTOCOCCUS. [SNOW, RED, P. C.]

PROTO'PTERIS, a genus of fossil plants, from the coal formation, includes Sigillaria punctata of Brongniart. (Presl.)

PROVIDENCE, OLD, is an island in the Caribbean Sea, about 125 miles from the Mosquito Coast, and between 13° 19′ and 13° 32′ N. lat. and 81° 20′ and 81° 23′ W. long. This island is nearly four miles and a quarter long, and two and a half in its greatest breadth: it is of an irregular oval shape. The highest ground near the centre of the island rises to 1190 feet above the level of the sea, so that it can be seen at a distance of from 33 to 36 miles. From this point other hills, mostly wooded to their summits, diverge towards the shore and terminate in a bold coast. Separated from its northern end by a cut or channel of from forty to sixty yards wide, is the island of Santa Catalina, 1800 yards long by 1300 in its greatest breadth, forming the northern boundary of a harbour in Old Providence which affords secure anchorage in two to three and a half fathoms.

These islands are surrounded by an extensive bank of coral and coarse sand, which stretches to the northward a distance of ten miles and a half. The larger part of the island is unfit for cultivation, owing to its being extremely hilly. But the soil is very productive, and affords rich crops with very little cultivation. Cotton is the chief object of cultivation, and is annually exported to the amount of 30,000 pounds; the sugar-cane and coffee are also grown, but only in sufficient quantities for the consumption of the inhabitants. Fruits of various kind, such as sapodillas, mangoes, oranges, tamarinds, plums, and limes are plentiful, and also cocoa-nuts. Yams and plantains are extensively grown, and afford the principal food. Cattle, horses, fowls and turkeys are numerous. Wild pigeons, iguanas, and land turtles abound: the last are found in the mountains, and form a delicious article of food. Sea-turtle and fish are very numerous. The exports consist of cotton, turtle-shells, and a few hides, which are paid for by the traders from Jamaica with calicoes, cloth, and a few articles of cutlery.

It is not well known when this island was discovered and taken possession of by the Spaniards. In 1664 it was taken from them by the famous buccaneer Mansvelt, who considered it well adapted to be the head-quarters of the lawless band of which he was the leader. After his death Morgan kept it, and fortified the island of Santa Catalina, but he left it when he was appointed deputy governor of Jamaica (1677). After that time it appears only to have been visited occasionally, and remained uninhabited until 1795, when a few families from Blewfields on the Mosquito Coast settled there by the permission of the Spaniards. From this time to 1817 it remained quite tranquil, when General Avery, a bold and energetic man, who had become a privateer, took possession of it and repaired the principal fort. The spoil, collected during his predatory excursions, was brought to this island, when a considerable trade was established. At his death (1822) the privateers dispersed, and the island returned to the dominion of the republic of New Granada. By the last census (1835) the population amounted to only 342 persons, about one-half of whom were slaves. They employ themselves principally in taking turtle, and they visit with their three vessels, from ten to fifteen tons burthen, the banks in the neighbourhood. They speak the English language.

(Collett, *On the Island of Old Providence*, in 'London Geographical Journal,' vol. vii.)

PRUNELLA, a genus of plants belonging to the natural order Labiatæ. It has two inferior stamens. The filaments bifid, one branch barren. The anthers all 2-celled. The corolla ringent, the upper lip concave, entire, the calyx ultimately closed and compressed, the upper lip flat, truncate, 3-toothed, the lower lip bifid.

P. vulgaris, Self-heal, is a native of Europe and Asia, very plentiful in America and Australia, and also in England. The leaves are stalked, ovate or oblong, toothed or deeply pinnatifid, the upper lip of the calyx with short truncate mucronate teeth, the lower lip with ovate-lanceolate mucronate teeth, the two longest stamens with a straight spinous root at their apex. The flowers are purple, white, or nearly red. In the British specimens the leaves are nearly entire. This plant is considered astringent, and was formerly used in fluxes and gargarisms for apthæ and inflammation of the fauces. Its repute is now merely in name.

P. grandiflora has petiolate ovate leaves, quite entire or toothed, the lateral teeth of the upper lip of the corolla lanceolate, the corollas large, more than twice as long as the calyx. It is native throughout Europe in woods and shady places; the flowers are of a purple or violet colour, seldom white. All the species of Prunella are showy when in blossom, and are therefore worth cultivation in flower-gardens and rock-work. They grow in any common garden soil, but thrive best in a damp moist situation. They are readily propagated by seed or division.

(Don, *Gardener's Dictionary;* Babington, *New British Botany;* Lindley, *Vegetable Kingdom.*)

PRUSSIC ACID—*Medical Properties of.* This acid, termed also hydrocyanic acid, has been described according to its chemical relations in P. C. Its medical employment, and its connection with medical jurisprudence, from the frequent use of it in cases of death, accidental or intentional, merit the most attentive consideration. But these are unsuited for popular discussion. A few important rules and cautions can alone be furnished here.

Much variation in strength exists in the acid (that is, the dilute acid, for the anhydrous is always of definite strength), owing to different methods of preparation Thus not only does a difference of strength exist in the acid as it is enjoined to be prepared by the Edinburgh and London colleges, but even in England two preparations are commonly met with, that enjoined by the London Pharmaeopœia, which contains 2 per cent. of real acid, and that which has been long known as Scheele's, containing 4 per cent. The substitution of the one for the other in preparing a prescription might lead to serious if not fatal consequences. A still greater difference exists in the strength of the preparations met with in different countries of the Continent. No one in travelling should ever prescribe prussic acid, unless he has previously ascertained what preparation will be employed in compounding the prescription.

As it undergoes decomposition by time, especially if exposed to the light, and is readily volatilized at a high temperature, it should be kept in the dark, and in a cool place. As it is specifically lighter than water, it rises to the surface in watery fluids. The fluid in which it is kept should be well shaken before pouring it out. When employed externally as a lotion, in which case it is used in larger doses than when meant for internal employment, great care should be observed to distinguish it, lest it should be accidentally taken internally. Even its external employment demands great care, for when the cuticle is abraded or cracked, it is readily absorbed, and may prove fatal. The cuticle, even when in a state of integrity, is not proof against the vapour of prussic acid. All bottles containing the acid should be kept well corked, as the vapour is the most potent form which can influence the human frame.

When first introduced into medical practice, high expectations were formed of the utility of Prussic Acid. Subsequent experience has moderated these expectations; but there is no doubt that it might be found useful in many instances where it is not employed, the dread of accidents deterring many medical men from using it. Such hesitation displayed by those who know its properties should furnish a salutary caution to all persons against employing it on their own responsibility. The diseases in which it has been most recommended are—affections of the lungs, whether acute inflammation, after the active stage is passed, or those of irritation. Among the former, hooping-cough is unquestionably benefited by it. But here great caution is necessary. Its premature employment, by checking the cough, induces inflammation, often of a very alarming kind. The dose should at first be very small, and most slowly increased. In some works, even emanating from medical men, large doses are most culpably ordered. More relief is obtained in consumption from Conium than from this acid. Some affections of the stomach receive signal relief; others derive not the least benefit from it. The explanation of this appears to be that in the former the causes of the disorder, as well as its seat, are in the stomach itself; while in the latter the pain is felt chiefly in the stomach, but the cause is in the spinal chord. Treatment directed to the spine will in general quickly and often permanently relieve the sufferer. (Teale's *Treatise on Neuralgic Diseases.*) Cutaneous diseases are alleviated by lotions and ointments containing hydrocyanic acid. But the cautions above given must be carefully observed during their employment.

The most useful hints which can be here given relate to the treatment of poisoning by prussic acid. So soon as it is ascertained or suspected that any one has taken an over or poisonous dose, cold water should be dashed over the head and back. The vapour of ammonia (common smelling salts) or of chlorine should be applied to the nostrils; or very dilute liquor ammoniæ may be thrown into the stomach. While these things are doing, other persons may prepare a weak solution of carbonate of potash (common pearlashes will answer); and some sulphate of iron (copperas) is to be dissolved in a large quantity of water. Some of the solution of the carbonate of potash is to be given to the patient, followed immediately by some of the solution of copperas. This, if done promptly, will save the patient. Artificial respiration, if speedily resorted to, is useful, as is likewise bleeding from the jugular vein.

PSALI'ODUS, a genus of fossil fishes, from Sheppey. (Egerton.)

PSA'MMODUS, a genus of fossil placoid fishes, from the mountain-limestone of Bristol and Armagh. (Agassiz.)

PSEUDOLI'VA, a genus of Gasteropoda, which includes one fossil species from the London clay. (Sowerby.)

PSI'DIUM (from ψίδιον, the Greek name for a pomegranate), a genus of plants belonging to the natural order Myrtaceæ. The tube of the calyx is ellipsoid or obovate, usually contracted at the apex; the limb ovate, undivided, but afterwards from 1- to 5-cleft. There are five petals and numerous free stamens inserted in a broad circle, almost through the whole undivided part of the limb; the style is filiform, the stigma capitate: the ovules are numerous, horizontal, and fixed to the margin of the placenta; the berry is many-seeded, corticate by the tube of the calyx, and crowned by its lobes. The seeds imbedded in the pulp in the mature fruit with a bony testa. The species are trees or shrubs, natives of America within the tropics. The fruit is edible, and is known by the name of Guava. It has a fragrant but peculiar odour and very sapid taste, and is eaten both raw and when made into jelly.

P. pomiferum, Apple-bearing or common Red Guava, has tetragonal branches, oval or oblong lanceolate leaves, pubescent beneath, from 3 to 8 peduncles or many-flowered. The fruit is globose, yellow, and somewhat astringent, with an agreeable odour; the root and young leaves are astringent, and are esteemed strengthening to the stomach. It is native of the West Indies, Mexico, and South America.

P. montanum has tetragonal branches, oval oblong leaves, acuminated and quite glabrous; the peduncles many-flowered, and the fruit roundish. It is native of Jamaica on the mountains. The fruit is small, acid, and smells strongly like bitter almonds, hence it is called *Almandron*. The wood is very hard and of a fine colour and grain. It works well, takes a fine polish, and is much esteemed for ornamental purposes. The species of Guava grow freely in a mixture of loam and peat. Cuttings will strike root in sand with a hand-glass over them. Some of the species bear fruit in the stoves of this country, but they are hardly worth the trouble of growing for this purpose.

(Don, *Gardener's Dictionary;* Burnett, *Outlines of Botany.*)

PSYCHO'TRIA (from ψυχή, breath, life, in allusion to the powerful medicinal qualities of some of the species), a genus of plants belonging to the natural order Chinchonaceæ and the tribe Coffeæ. The limb of the calyx is 5-lobed, 5-toothed, or nearly entire. The corolla funnel-shaped, short, 5-cleft; the limb spreading or recurved, the throat bearded or glabrous. There are 5 stamens, the anthers exserted or enclosed. The berry is drupaceous, crowned by the limb of the calyx, furnished with 10 blunt ribs in the dried state. The species are small trees or shrubs, natives within the tropics; they are very numerous and intricate.

P. emetica has a perpendicular knotted branched root with a slender axis, and a thick friable back. It is an erect simple hairy under-shrub, with oblong acuminate leaves narrowed at the base, membranous ciliated, rather pilose beneath; stipules ovate acuminate and very short. The peduncles are axillary and few, flowered somewhat racemose and white. It is the ipecacuanha supplied by South America, and is the striated ipecacuanha of some authors. The root possesses similar qualities to those of ipecacuanha, and contains, according to M. Pelletier, 9 per cent. of emetine.

P. noxia is a native of Brazil, with compressed branchlets furnished with two rows of hairs; the leaves are lanceolate, acuminated, on short petioles, approximate, glabrous; the stipules short, bipartite, the flowers 2-4 in a fascicle, sessile, bracteate, terminal, and axillary. This species is accounted poisonous in Brazil; it is known by tho name ol *Erva de rata*, and is used for the destruction of rats and mice.

P. speciosa is employed in Brazil in the same diseases as sarsaparilla; and *P. tinctoria* forms a fine red dye much valued in Peru. All the species of *Psychotria* are of most easy culture and propagation. They grow best in a mixture of loam, peat, and sand, and cuttings will strike root readily if planted in sand underneath a hand-glass. Some of them bear handsome foliage, but the flowers of all are insignificant.

(Don, *Gardener's Dictionary*; Lindley, *Flora Medica*; Lindley, *Vegetable Kingdom*.)

PSY'THIRUS, a genus of Hymenopterous insects of the family *Apidæ* and the division *Sociales*. It includes certain humble-bees structurally incapable of forming their own nests, and considered parasitic by St. Fargeau, the entomologist who established this genus.

PTA'RMICA, a genus of plants belonging to the natural order Asteraceæ. It has a campanulate involucre with the scales brown and scarious at the edge. The receptacle is flat or scarcely convex, broad, and paleaceous. The ligulæ from 5 to 20, flat, expanded, much longer than the involucre. The achænia are bald, obcompressed, the outer often somewhat winged at the edge.

P. vulgaris has a widely creeping root, very difficult to extirpate when the soil is moist. Upright stems about two feet high, angular, smooth, hollow, leafy, with small axillary rudiments of branches corymbose at the top. The leaves are sessile, linear, or slightly lanceolate acute, very minutely serrated with bristly teeth. Smooth on both sides and of a dark green. The flowers are milk-white, larger than most others of the same genus. The whole plant is pungent, and provokes a flow of saliva. Its dried leaves produce sneezing, but this is thought to be owing to their little sharp marginal teeth: the root is aromatic. The heads of *P. nana, atrata*, and *moschata* are used in the Swiss Alps as a substitute for tea. *P. moschata* is the basis of the aromatic liqueur called Esprit d'Iva.

(Lindley, *Veget. Kingdom*; Lindley, *Flora Medica*.)

PTERI'CHTHYS, a singular genus of fossil ganoid fishes, from the old red-sandstone of Scotland and Orkney. (Agassiz.)

PTERI'NEA, a fossil genus of Conchifera, allied to Avicula, and hitherto confined to the Palæozoic, and chiefly found in the Devonian strata. (Goldfuss.)

PTERIS (from πτέρον, a wing), a genus of plants belonging to the natural order Filices. The thecæ arise from the points of veins placed on a nerve-like receptacle running along the edge of the leaf, forming an uninterrupted marginal sorus; the involucres are continuous with the edge of the leaf, scarious, and opening inwards.

P. aquilina, common Fern, or Bracken, is the most abundant of our British species. It has a long tapering creeping rhizoma, externally black. The leaves are erect, from one to six feet high, repeatedly compound with horizontally spreading divisions, whose ribs are smooth; the primary leaves are nearly opposite, the lower ones more alternate, pinnatifid segments oblong, obtuse. They are all of a light bright green colour, slightly brown at the edge, which is revolute and crisped, or wavy, sheltering the dense linear masses of tawny thecæ. The main stalks are angular and sharp-edged, wounding the hands severely if plucked incautiously. When cut across, the rhizoma has a branched appearance resembling a spread eagle, whence the Latin name. There is scarcely any wood, heath, or forest in the United Kingdom where this plant does not make its appearance. It is said to be indicative of poor soil, but it is more probable that its absence from cultivated ground is to be attributed to the effects of the hoe and the plough, rather than to the quality of the soil. The geographical range of this species is very extensive; it is included in every European list, and is found also in Asia and Africa. It is used in many parts of England and Scotland for manure, and in the Western Isles the poor people gain considerable profit by collecting the leaves, and selling the ashes to soap and glass makers, on account of the large quantities of alkali contained in them. As a litter for horses, brakes or fern is in great request in Wales, Scotland, and Ireland, and when chopped up with hay they are sometimes fed upon it. In Invernesshire the poorer classes thatch the tops of their houses with the leaves, and they form a very durable covering. Pigs are fed upon the roots boiled down into a mucilaginous mass. This species is tho *Filix fœmina* of our older authors. It is likewise the θηλυπτέρις of Theophrastus, 'Hist. Pl.' 9. 18, and of Dioscorides, 4. 184. The antients are said to have used both tho rhizomas and fronds of this fern in decoctions and diet-drinks, in chronic disorders of all kinds arising from obstruction of the viscera and spleen. Some modern authors give it a high character for the same purposes, but it is now seldom used by medical practitioners. In Haller's time its reputation was very extensive as a destroyer of worms, and a bed of the green fronds was esteemed a sovereign remedy for rickets in children. The rhizoma is so astringent that in some places it is used for tanning and dressing red and chamois leather. It has been employed as a substitute for hops, and in the Canaries a miserable sort of bread is made by grinding the root with barley.

(Newman, *British Ferns*; Babington, *Manual of British Botany*; Lindley, *Flora Medica*.)

PTEROCARPUS (from πτέρον, a wing, and κάρπος, a fruit, in reference to the pods being girded with a broad wing). It has a 5-cleft calyx, a corolla with 5 petals, disposed into a papilionaceous form; 10 monadelphous or diadelphous stamens, an irregular indehiscent legume, somewhat orbicular, surrounded by a wing, woody, and often rugose, in the middle 1-3-celled. The leaves are unequally pinnated The racemes axillary, or forming terminal panicles. Tho species are unarmed trees or shrubs.

P. Draco, Dragon's-blood Pterocarpus, is a tree nearly 30 feet high, with alternate shining leaflets, about 5 on each side, and an odd one, rather obtuse, entire, veined, smooth, pale green below; the legumes nearly smooth. The wood of this tree is white and heavy, the bark thick and of a rusty grey colour. When first cut it presents no marks of redness, but in a little time red drops of juice begin to collect and exude from the wood. If left in the sun for about ten minutes they become hard and clear, and are collected under the name of *sanguis draconis*, or dragon's-blood. This resin formerly constituted an extensive article of commerce from Carthagena, but from its diminished consumption its collection has ceased, and all the dragon's-blood obtained now in the market is the produce of *Calamus Draco*.

P. marsupium is a tree with a very high trunk, scarcely ever found straight. The bark has a brown outer coat which is thin and spongy, and falls off in flakes, disclosing the inner bark, which is fibrous, red, and astringent. Tho branches are numerous, horizontal, and spreading. The leaves subbifarious, alternate, pinnate, with an odd one, 8 or 9 inches long. The panicles are terminal and very large, ramifications bifarious. The flowers are very numerous, white, and with a small spot of yellow in the centre. The bracts small, caducous, solitary below each division and subdivision of the panicle. The seed is solitary and kidney-shaped. This tree is thought by Roxburgh to be the one yielding *gum kino*, a well known astringent,—the juice hardening into a dark red and very brittle gum resin, which, on being powdered, changes to a light brown, not unlike Peruvian bark. Its taste is strong, but simply astringent. The real kino-tree however appears to be the next species.

P. erinaceus is a tree 40 or 50 feet in height. It has unequally pinnate leaves, smooth above, downy beneath; from 11 to 15 leaflets, alternate, distant, on short stalks, ovate, oblong, obtuse, or emarginate, wiry at the edge; lanceolate stipules, solitary or clustered racemes, downy from the old wood below, the young branches much shorter than the leaves. The flowers are yellow, the legumes stipulate, compressed, membranous, velvety, serrated, and undulated, prickly on the centre. When the branches are wounded, a clear bright gum exudes from them, which is the real *gum kino* of commerce, and is mentioned as such by Mr. Mungo Park. It is a very powerful remedy in obstinate chronic diarrhœas and dysenteries, and in all diseases arising from laxity of tissue. Externally it is applied as a styptic to check hæmorrhages from wounds and ulcers, and to diminish discharges.

P. santalinus is a lofty tree having alternate stalked ternate leaves, petiolate alternate leaflets smooth above, hoary beneath. The racemes are axillary, simple, or branched, and erect. The legume roundish, stalked, falcate upwards, compressed, smooth, keeled on the lower edge, the keel being membranous and undulated. From this tree is obtained the Red Sandal-wood, a timber chiefly used by dyers and colour manufacturers of the present day, but which is also used to colour several officinal preparations, such as compound tincture of lavender. Its colouring matter forms beautiful coloured precipitates with many metallic solutions.

P. flavus is the *yellow sandal-tree*, and is used for dyeing yellow. Its bark is very bitter.

The species of this genus thrive best in a loamy soil, and young cuttings not deprived of their leaves root readily in sand under a hand-glass in heat.

(Don, *Gardener's Dictionary*; Lindley, *Flora Medica*; Burnett, *Outlines of Botany*.)

PTEROPHY'LLUM, a genus of fossil Cycadeous plants from the oolite of Yorkshire and beds of the same age in Scania. (Brongniart.)

PTILODI'CTYA, a genus of fossil corals from the Silurian strata of Salop, Westmoreland, and Tyrone. (Lonsdale.)

PTYCACA'NTHUS, a genus of fossil placoid fishes from the old red and mountain limestone strata. (Agassiz.)

PTYCHO'CERAS, a fossil genus of Cephalopoda from the gault of Folkstone. (D'Orbigny.)

PTY'CHODUS, a genus of fossil fishes from the Cretaceous system of England. (Agassiz.)

PTYCHO'LEPIS, a genus of fossil ganoid fishes from the lias of England, &c. (Agassiz.)

PUBLIC HEALTH. On the 14th May, 1838, the Poor Law Commissioners presented to Lord John Russell, then Secretary of State for Home Affairs, a Report by Dr. Arnott and Dr. Kay, and two Reports by Dr. Southwood Smith, relative to the prevalence of disease among the labouring classes in certain districts of the metropolis. The House of Lords having, on the 19th of August, 1839, presented an address to her Majesty requesting her to direct an inquiry to be made as to the extent of the causes of disease mentioned in those Reports, the Poor Law Commissioners received a letter from Lord John Russell, in which he stated that her Majesty required them to make such inquiry, not only as to the metropolis, but as to other parts of England and Wales, and to prepare a Report stating the result of such inquiry.

In 1840 the subject was investigated by a Committee of the House of Commons, the result of which was a Report 'On the Health of Large Towns and Populous Districts.'

In July, 1842, the Report of the Poor Law Commissioners was presented to both Houses of Parliament, entitled a 'Report on the Sanitary Condition of the Labouring Population of Great Britain,' by Edwin Chadwick, Esq. 'Local Reports on the Sanitary Condition of the Labouring Population of England,' were presented at the same time. Of these local Reports there were twenty-six, some of which relate to certain counties and others to particular towns. At the same time were presented 'Reports on the Sanitary Condition of the Labouring Population of Scotland.' In 1843 a 'Supplementary Report on the Results of a Special Inquiry into the Practice of Interment in Towns,' by Edwin Chadwick, Esq., was presented. On this subject see some remarks under INTERMENT, P. C. S.

On the 9th of May, 1843, Commissioners were appointed by the Queen for the purpose of 'inquiring into the present state of large towns and populous districts in England and Wales, with reference to the causes of disease among the inhabitants, and into the best means of promoting and securing the public health, under the operation of the laws and regulations now in force, and the usages at present prevailing with regard to the drainage of lands, the erection, drainage, and ventilation of buildings, and the supply of water, in such towns and districts, whether for purposes of health, or for the better protection of property from fire; and how far the public health and the condition of the poorer classes of the people of this realm, and the salubrity and safety of their dwellings, may be promoted by the amendment of such laws, regulations, and usages.'

The first Report of the Commissioners was presented to both Houses of Parliament at the end of June, 1844. The Report is accompanied by 437 folio pages of evidence on which the Report is founded, an Appendix of Special Reports on the sanatory condition of several towns, among the most important of which are—Liverpool, by W. H. Duncan, M.D.; Ashton-under-Lyne, by John Ross Coulthart, Esq.; the City of York, by Thomas Laycock, M.D.; and Nottingham, by Thomas Hawksley, Esq.; besides other information on the Supply and Filtration of Water, on the Obstacles to Improvement in the Structure of Buildings, on the Cleansing of Streets and Houses, and on the application of Refuse.

The Second Report of the Commissioners was presented to Parliament in February, 1845. It treats briefly of the Causes of Disease, and at considerable length of Remedial Measures. It is followed by a Report on the State of Birmingham and other Towns, by R. A. Slaney, Esq.; a Report on the State of Bristol and other Towns, by Sir Henry T. de la Beche; a Report on the State of Large Towns in Lancashire, by Dr. Lyon Playfair; and a Supplement containing information on sewers, lodging-houses, and other matters connected with the inquiries of the Commissioners.

We have thus briefly stated the origin and progress of this important investigation into the sanatory condition of the population of Great Britain, chiefly indeed of the labouring and poorer inhabitants, but extending indirectly to all classes.

Other agencies for improving the physical condition of the labouring classes and of the poor are also at work. Among these is the 'Health of Towns' Association,' of which the Committee includes noblemen, dignitaries of the church, members of parliament, and other gentlemen. They have published a 'Lecture on the Unhealthiness of Towns, its Causes and Remedies, delivered at Crosby Hall, London, by William Augustus Guy, M.B., Physician to King's College Hospital;' a 'Lecture on the Unhealthiness of Towns, its Causes and Remedies, delivered Dec. 10, 1845, at the Mechanics' Institute at Plymouth, by Viscount Ebrington, M.P.;' and a 'Report of the Committee to the Members of the Association, on Lord Lincoln's Bill.' (Lord Lincoln's Bill was introduced into Parliament at the close of the session of 1845.)

These important inquiries have proved by undeniable evidence, that the districts inhabited by the labouring classes, and often by tradesmen, in large towns, in many small towns, and in several parts of the country, are in a very noxious state, from want of drainage, want of cleanliness, imperfect ventilation, deficiency of water, and density of population; the consequences of which are great frequency of sickness, and excessive destruction of human life. Typhus fever, cholera, consumption, scrofulous and other chronic complaints, mostly arising from causes which might have been prevented, are found to exist to an extent which it is painful to contemplate. The causes of sickness are generally most numerous and most intense in the crowded districts, and the mortality is found to be, with few exceptions, in proportion to the density of population. In the metropolis, for instance, the annual mortality is 3 per cent. in Whitechapel, but only 2 per cent in St. George's, Hanover Square. In the district of Bethnal-Green, 57 houses, on an average, were found to contain 580 persons; and in some cases there were 30 persons in a single house.

Of fifty towns which were visited by direction of the Commissioners, only eight were found to be in a tolerable state as to drainage and cleansing; and as to the supply of water the reports were still more unfavourable.

The annual average mortality in England is 2·207 per cent., or 1 in 45. In healthy districts it is 2 per cent., or 1 in 50. In the metropolis the deaths are 1 in 39; in Birmingham and Leeds 1 in 37; in Sheffield, 1 in 33; in Bristol 1 in 32; in Manchester, 1 in 30; in Liverpool 1 in 29. In Brussels they have been found to be 1 in 24. The mortality was found to be greater in Liverpool than in any other town in England. By the return made to the Town Council of Liverpool in 1841, by their surveyors, it appears that there were then 2398 courts, which contained a population of 68,345 persons. In these courts 1272 cellars were occupied by 6290 persons; of the number of cellars occupied in streets, 2848 were described as damp, and 240 as wet. The gentry in Liverpool live 35 years; the tradesmen 22; the working class 15. The average of the whole town is only 17 years. By extracting from the mortuary registers of the metropolis for 1834, the ages at death of the gentry, the tradesmen, and the working classes, who died at the age of 15 and upwards, Mr. Guy ascertained that the gentry lived 59 years, the tradesmen 49, and the working classes 48. In 1844 the deaths in the metropolis were 50,423. If the rate of mortality had been 1 in 50 instead of 1 in 39, the deaths would have been only 40,145, thus giving a saving of 10,278 lives in one year. From a Report of the Registrar-General it appears that out of every million of inhabitants 27,000 die every year in the large towns, and only 19,300 in the rural districts.

The large towns have already begun to make improvements. The improved drainage in twenty streets of Manchester has been found to diminish the annual number of deaths by more than 20 in every 110; and similar results of structural improvement have followed in other instances.

The loss of life, and the pecuniary charges consequent upon it to individuals and the community, are not the only considerations to be attended to. Not only the sickness which precedes death, but the sickness which is cured, renders the sufferers incapable of following their usual occupations, and obliges them and their families to seek relief from the parish, and from public and private charity. It has been shown that pecuniary saving would result from sanatory improvements to such an amount as to justify the action of the legislature, if it were only from motives of public economy.

The power vested in courts-leet by antient usage is resorted to in a few towns for the abatement of minor nuisances. Mr. Coulthart gives a detailed description of the various matters which have been taken cognizance of by the leet juries at Ashton-under-Lyne with beneficial effect. In most places, however, the exercise of these powers has fallen into desuetude, even where the courts still continue to be held.

The measures necessary to be adopted in order to improve the sanatory condition of large towns and populous districts are comprised under tho following heads:—

1. Drainage, including house and street drainage, and the drainage of any place not covered with houses, yet influencing the health of the inhabitants.
2. The paving of streets, courts, and alleys.
3. Cleansing, comprising the removal of all refuse matter not carried off by drainage, and the removal of nuisances.
4. A sufficient supply of water for public purposes and domestic use.
5. The construction and ventilation of buildings in such a manner as to promote rather than injure the health of the inhabitants.

The Second Report of the Commissioners gives Thirty Recommendations to the legislature, each of which is preceded by the reasons on which the recommendation is founded. We can only afford space for a summary of these recommendations.

No. 1 recommends that in all cases the local administrative body shall have the special charge and direction of all works required for sanatory purposes, but that the crown shall possess a general power of supervision.

Nos. 2 to 11 relate to *Drainage;* surveys and plans; definition of area for drainage by the crown; appointment of surveyors; investigations by authority of the crown, on representations duly made; management of the drainage of the entire area by one body; purchase of rights of mill-owners and others; construction of sewers, branch sewers, and house-drains; rating of landlords when house is let in separate apartments, or when the rent is collected more frequently than once a quarter, or when the yearly rent is less than 10*l.*; providing of funds by the local administrative body, distribution of cost among the owners of the properties benefited, and charge of house-drains on owners of houses to which they belong; power to raise money, and provision for gradual liquidation of debt incurred.

No. 12 recommends that the *Paving* be under the same management as the draining; but that it be performed by the local public officers.

Nos. 13, 14, and 15, relate to the *Cleansing* of all privies and cess-pools at proper times and on due notice; removal of large collections of dung; and abatement of nuisances arising from noxious exhalations from factories.

Nos. 17 to 21 relate to the supply of *Water*, in sufficient quantities not only for the domestic wants of the inhabitants, but also for cleansing the streets, scouring the sewers and drains, and the extinction of fires; purchase of the interests of water-companies, and placing the management of the supply of water under the local administrative body; the establishment of *public baths* and *wash-houses* for the poorer classes; and especially recommending that the supply of water in the mains be not only constant, but at as high a pressure as circumstances will permit.

Nos. 22 to 26 are regulations for *Buildings*, including power to raise money for the purchase of property, for the purpose of opening thoroughfares, and widening streets, courts, and alleys; prohibition of use of cellars as dwellings, except when they are of certain dimensions and properly ventilated; provision for building all new houses with proper privies, and for a good system of ventilation in all edifices for public assemblage and resort, especially school-houses.

Nos. 27 and 28 recommend that power be given to the local administrative body to compel landlords to cleanse houses duly reported to be in a noxious state from filthiness —and that power be given to the magistrates to license and issue rules for regulation of lodging-houses for the reception of vagrants, trampers, and persons of similar wayfaring habits.

No 29 recommends the appointment of a medical officer in each town or district, who shall report periodically on the sanatory condition of such town or district.

No. 30 recommends the establishment of *Public Walks*, and that the local administrative body be empowered to raise the necessary funds for the management and care of the walks when established.

A large portion of the 'Report of the Committee on Lord Lincoln's Bill,' before mentioned, is occupied with showing that the supply of water, wherever practicable, should be constant, not only in the main pipes, but in the branch-pipes, thus doing away entirely with the use of water-butts; and contending that in most cases such a constant supply is not only practicable but economical, and that it would contribute in the highest degree to the cleanliness of houses in crowded districts, and consequently to the health of the inhabitants.

PUBLIC POLICY. This expression sometimes occurs in the reports of law cases, and sometimes the expression 'policy of the law' occurs; neither of these expressions has a sufficiently definite meaning. An example will best explain how they are applied. One man may agree with another for a certain valuable consideration to give up to him premises in which he carried on some trade, art, or business, and agree that he will not carry on the same within the realm of England. The object of the bargain is to secure to him who pays his money, all the benefit which can be derived from it. But he who has received the money may happen to break his contract by commencing the same trade, art, or business in a distant part of the realm, as at the Land's End or Newcastle-on-Tyne, the original place of his trade, art, or business being supposed to be in London. Now if an action were brought on such a contract, it could not be maintained, and the reason would be that the contract was against public policy, which would be explained to mean that the public ought not to be deprived of a man's services by such an unreasonable contract. Yet it would be said that if the contract were that the man who received the money should not exercise his trade, art, or business within a certain limited distance of London, the contract would be valid. This would imply that the public of a given district may be deprived of a man's services in order that another individual may have an advantage, or that he may receive the full benefit of his contract. It would be a more consistent conclusion to declare the contract altogether invalid, if reasons of public policy, as they are called, are to be taken into the account in forming a judgment of the validity of the contract. But the admission that the contract is valid if it applies to a limited district, contains by implication a better reason for declaring the contract in its full extent to be invalid than reasons of public policy. The implied assumption is, that the person who pays the money is entitled to the full benefit of his contract and no more. If then it shall appear that he can sustain no real damage by the receiver of the money carrying on his trade, or art, or business at a remote place, that is a sufficient answer to his complaint. (Horner *v.* Graves, 7 Bing. 743.)

Still it may be said that there are contracts which ought to be declared void for reasons of public policy, or, to use a more correct expression of Lord Hardwicke, reasons of public utility (Earl of Chesterfield, &c., *versus* Sir Abraham Jannsen, 2 Vez. 156). Lord Hardwicke observes, 'Particular persons in contracts shall not only transact *bonâ fide* between themselves, but shall not transact *malâ fide* in respect of other persons, who stand in such a relation to either as to be affected by the contract or the consequences of it; and as the rest of mankind besides the parties contracting are concerned, it is properly said to be governed by public utility.' He gives as an instance 'premiums contracted to be given for preferring or recommending to public office or employment; none of the parties are defrauded, but the persons having the legal appointment of these offices are or may be deceived thereby.' We may suppose a case in which the person recommended is a fit person, and no damage is caused by the bargain to give a premium.

But then it may be urged, as Lord Hardwicke would argue, that damage to the public service may be caused by such bargain, and we may admit that generally it would be so. But the possible, the probable damage to the public service is perhaps not the best ground on which to assume the invalidity of such bargains. If the person who has the appointment to a place in the public service receives the power of appointment on the condition, expressed or implied, that he shall get no profit from the appointment, any premium that he might bargain for would clearly make the bargain illegal; because the thing is not a subject of bargain or sale. The same reason is equally applicable to any other person whose recommendation may help another to an office, for by the supposition the office is not a thing that can be the subject of bargain and sale. (Compare *Inst.* iii. tit. 19, s. 2.)

Possibly the so-called cases of contract which are against public policy might be determined on some legal principle, which should not require the introduction of the principle of determining that a contract shall be void because 'it is prejudicial to the public.' (Mallan *v.* May, M. & W. ii. 665.) If the validity of a contract is to be determined on this principle, it is very difficult to say what limits must be set to its application.

PULICA'RIA, a genus of plants belonging to the natural order Asteraceæ. It has an involucre laxly imbricated in few rows. The pappus in two rows, the outer one short, cup-like, membranous, and toothed, the inner one pilose.

P. vulgaris has lanceolate wavy leaves, narrow at the base and somewhat clasping; the stem much branched and downy; the heads lateral and terminal, hemispherical, with very short rays. It is the *Inula* of Linnæus. The heads are small, the florets yellow. It is found on moist sandy heaths in Great Britain. This species is the common Flea-bane; so called from its being disliked by vermin and used to drive away fleas.

P. dysenterica has a creeping root, and is a herb more or less woolly or cottony, glutinous, and with a peculiar and aromatic smell. The stem rises 12 or 15 inches high: it is round, leafy, cottony, corymbose at the summit, with many bright yellow flower-heads, whose disk is of a darker hue than their numerous spreading rays. The leaves are acute, veiny, and wrinkled, or slightly toothed or serrated, from one to two inches long, sessile, clasping the stem, the under side cottony. The fruit is bristly and obovate, the pappus rough, the receptacle slightly cellular, unequally toothed or scaly. Linnæus states, on the authority of General Keith, that this plant cured the Russian army of the dysentery. But Haller speaks contemptuously of the medical virtues of this plant, because he says it abounds in earthy matter. It is found in damp places in Great Britain.

(Burnett, *Outlines of Botany*; Lindley, *Flora Medica*; Lindley, *Vegetable Kingdom*.)

PULMONA'RIA (so named from its being supposed efficacious in disorders of the lungs, or from the spots on the leaves resembling those on some diseased lungs), a genus of plants belonging to the natural order Boragineæ. It has a tubular 5-cleft calyx, a funnel-shaped corolla with a naked throat. The stamens included in the tube filaments very short. The style is simple, the nuts smooth, attached by their truncate base with a central tubercle. The species are herbaceous plants with spotted leaves and terminal corymbose racemes of flowers.

P. officinalis, Lungwort, has ovate leaves, roundish or cordate, the upper leaves oblong. The root is thick and black. The corollas are red before expansion and then purple. The whole plant is more or less hispid. It is found in the woods and thickets of England, and is native of Europe and the Caucasus. The leaves, which are the parts of the plant recommended in medicine, have no peculiar smell, but in their recent state manifest a slightly astringent and mucilaginous taste,—hence they are supposed to be demulcent and pectoral, and have been prescribed in consumption. All these plants contain nitre in considerable quantities, and when burnt this species yields one-seventh of its weight in ashes. In the north of Europe it is eaten as a potherb, and according to Ray in his time it was brought to table in Scotland.

P. angustifolia has all lanceolate leaves. It is difficult to distinguish from the former species, but is more pubescent, and has narrower spotless leaves. The corolla is purple, and there is a variety with white flowers. It is native of Europe. All the species of *Pulmonaria* are pretty plants when in blossom, and are desirable for gardens on account of their early flowering. They are very easily cultivated, and will grow in any common garden soil: they are readily propagated by division. Most of the species grow well under the drip of trees and in moist situations.

(Don, *Gardener's Dictionary*; Babington, *Manual of British Botany*; Burnett, *Outlines of Botany*.)

PUNCTUM CAECUM, in the eye, is the part of the surface of the retina which is immediately about the spot at which the optic nerve appears to be united to that membrane. At this spot the retina has not sufficient delicacy of fibre to receive impressions from the rays of light which, coming from external objects and converging there, should form images of those objects: consequently the part contributes nothing to the perception of vision.

Its existence in each eye is proved by a well-known experiment, which was first made by Marriotte:—on a dark ground, as a black board, in a vertical position, place on a level with the eye two disks of white paper about half an inch in diameter (or on a white ground, as a wall, place two disks of black paper), the disks being from three inches to two feet asunder from centre to centre: then, standing with the right eye directly before the left hand disk, at a distance from it equal to four or five times the interval between the disks, and closing the left eye, look with the other at that object; it will be found that the right hand disk is invisible, in consequence of the light from it falling on the spot in the eye at which no image is formed. The left hand disk would disappear if the spectator, closing his right eye, should stand with his left directly before the right hand disk.

The experiment may be varied by standing with the right eye directly before the right hand object, then closing the left eye, and looking, without turning the head, obliquely at the left hand object: the right hand disk will then disappear. The left hand object will disappear if the left eye be brought directly before it, the right eye be closed, and the other be directed obliquely to the right hand object. The experiment may also be performed with three disks; the spectator should then place himself directly before the middle object, at a distance from it equal to four or five times the distances of the disks from one other; when closing the left eye, for example, and looking, without turning the head, at the left hand object, the middle disk will disappear while the others remain visible.

From an experiment made by Daniel Bernoulli it is found that the part of the retina on which the rays of light produce no impression, is a circular spot whose diameter is one-seventh of the diameter of the eye, and having its centre a little way distant from the axis, or point directly opposite the centre of the pupil. This is precisely the spot from which the optic nerve appears to expand in the interior of the eye.

PURBECK. [DORSETSHIRE, P. C.]

PURCHASE, which is corrupted from the Latin word Perquisitio, is defined by Littleton (i. 12) to be 'the possession of lands or tenements that a man hath by his deed or agreement, unto which possession he cometh not by title of descent from any of his ancestors, or of his cousins (consanguinei), but by his own deed.' Purchase as thus defined comprehends all the modes of acquiring property in land by deed or agreement, and not by descent; but it is not a complete description of purchase, as now understood, for it omits the mode of acquisition by will or testament, which however, when Littleton wrote, was of comparatively small importance, as the power of devising lands did not then exist, except by the custom of particular places. Blackstone makes the following enumeration of the modes of purchase — Escheat Occupancy, Prescription, Forfeiture, and Alienation. As to escheat, there is some difficulty in the classification, as the title appears to be partly by descent and partly by purchase; and alienation is here used in a larger sense than that which this term has in the Roman law, in which it does not comprehend acquisition by testament. Generally then, purchase is any mode of acquiring lands or tenements, except by Descent. [DESCENT, P. C.]

PURL. [ARTEMISIA ABSINTHIUM, P. C. S.]

PUTREFACTION. [ANTISEPTICS, P. C.]

PY'CNODUS, an extensive genus of fossil placoid fishes from the oolitic and cretaceous strata of England. (Agassiz.)

PYE, HENRY JAMES, was the son of a Berkshire gentleman who represented that county in parliament. He took the degree of M.A. at Oxford in 1766. Several small volumes of poems, and a translation of Aristotle's Poetry, with a commentary, were held to give him, on Thomas Warton's death in 1790, a claim to the office of poet-laureate, to the fame of which, however, he added nothing either before or after his appointment. He was for a good many years member of parliament for his native county; and on the changes which took place in the magistracy of Westminster, he was appointed one of the commissioners of police. He died in 1813, and was succeeded in the laureateship by Southey.

PY'RAMIS, a genus of Gasteropoda, which includes two species from the shales near Hebden Bridge. (Brown, *Manch. Geol. Trans.*)

PYRETHRUM (from πῦρ, fire, because of the hot taste of the root), a genus of Composite plants belonging to the tribe Asteraceæ. It has a hemispherical involucre, the receptacle flat or convex. The fruit angular and not winged. The pappus an elevated membranous border.

P. Parthenium, Feverfew, has stalked pinnate leaves, with ovate or oblong segments, and pinnatifid; they are of a hoary green, the leaflets incline to ovate decurrent and cut. The flower-heads are erect, about half an inch broad, with a convex yellow disk, and numerous short broad abrupt 2-ribbed white rays, often wanting, sometimes multiplied, and the disk being obliterated constituting a double flower. The whole plant is bitter and strong scented, reckoned tonic, stimulating, and anti-hysteric. It was once a popular remedy in ague. It is said that the odour is peculiarly disagreeable to bees, and that these insects may be easily kept at a distance by carrying a handful of the flower-heads. It is common in many parts of Europe and in England.

P. inodorum has sessile pinnatifid leaves, in numerous capillary pointed segments. A branched stem, solitary heads, the involucral scales lanceolate obtuse; the fruit rugose with two round glandular dots on the external face just below the elevated entire border. It is found in fields and waste places in Great Britain.

P. maritimum has sessile doubly pinnate leaves, with fleshy segments, convex above, keeled beneath. The stem diffuse and branched, the heads solitary; the fruit rugose, and with 2 elongated glandular spots on the external face, just below the elevated lobed border. It is found on sea-shores in Great Britain.

P. officinale is the Pellitory of Spain, once much esteemed as a sialagogue, and resorted to for relief in toothache. Grew says that 'when the root of *pyrethrum* is chewed, it makes a sensible impression on the lips, which continues like the flame of a coal betwixt in and out for nine or ten minutes.' When extracted, the acrid oil contained in the root is said to be serviceable in cases of palsy, and when cutaneous action is required, as a liniment. Ainslie says it is administered in typhus fever by the Indian practitioners.

(Burnett, *Outlines of Botany;* Lindley, *Flora Medica;* Babington, *Manual of British Botany.*)

PYRINA, a fossil genus of Echinodermata proposed by Des Moulins for the Nucleolites depressa of the green-sand.

PY'ROGEN is a term very recently applied to the electric fluid, derived from the Greek word πῦρ, fire. The views of Mr. Lake, who first proposed it a short time since, are novel, and certainly deserve consideration. He submits the change of name 'because there appears to be a degree of indefiniteness in the terms *electricity*, *electric fluid*,' &c., and hoping that he has produced sufficient evidence 'in support of its materiality and existence as a chemical body,' he conceives 'it might be an advantage if this or some similar name were adopted. *Electrine* might have been used, but as the fluid has no more connection with amber (ἤλεκτρον) than many other substances possessing like properties, he has chosen to propose an entire change of name; and as it bears the greatest resemblance to fire, and seems to have a most intimate connection with that element, the word *Pyrogen* is submitted.'

He maintains, in the first place, that as electricity produces mechanical effects upon matter (for instance, reduces the strongest oak to splinters, and some substances into powder, removes large blocks of stone out of their places, drills holes in metal vessels, and occasions earthquakes), it must be matter, as nothing of an immaterial nature can produce mechanical effects upon material bodies.

He was led, he says, to deduce the material nature of electricity from the above considerations, and a simple experiment with a small galvanic arrangement, consisting of a pair of plates 2 inches by 4 inches, in a half-pint drinking-glass, in which the wires connecting the poles were joined together and insulated by non-conducting supports. From this arrangement and the wires being insulated, the fluid could not have proceeded from without, and he considers that it was developed on pouring the acid solution into the glass, from a new chemical arrangement of the liquid matter, and, as water is the only ingredient actually decomposed, the fluid must enter into the composition of it together with oxygen and hydrogen; which view receives much support from the fact that water is formed on the combustion of these gases by the electric spark.

A difficulty however arises on this point, for these gases may be exploded by the application of any flame. But Mr. Lake removes this by proposing a new theory of combustion, or rather, ignition, by showing that flame is the electric fluid rendered visible whilst effecting the decomposition of air, and the union of the oxygen obtained from it with the hydrogen of the burning body; and in proof of this theory advances the facts, that in all the various methods adopted to obtain fire, it is generated by electric excitation (except when obtained by a burning-glass from the sun), and that in damp weather, when the atmosphere is deprived of the electric fluid, held in suspension by it at other times to a very considerable extent, fires and lights burn very dull.

In further support of this theory he offers the following explanation of the ingenious experiments of Messrs. Pollock, Gann, and Mackrell on the ignition of metals in acid solutions. It may be well to premise that the acid solution through which the electric currents were passed was composed of one part sulphuric acid and ten parts distilled water, in a common drinking-glass that held about a pint.

'Experiment 1. Fine iron wires (No. 26) were attached to the terminal wires of the battery. That connected with the positive was first immersed in the solution, and the circuit was completed by the immersion of the negative wire. The latter burned with a beautiful reddish flame. This would seem to result from the following cause:—Hydrogen and pyrogen being released at the negative pole on the decomposition of the water, and the oxygen of the acid having a greater affinity for these than for sulphur, the acid is decomposed, the sulphur is deposited on the negative electrode, and the released gas combining with the hydrogen and pyrogen, combustion (ignition) takes place. When the experiment is reversed, and the negative wire first brought into the solution, the circuit being completed by the positive, the latter became red-hot to the extent of an inch and a half under the solution. This resulted from the accumulation, as it is called, at the poles of the unconnected piles, rendering the pyrogenic current more powerful when contact is first made than at any time during its continuation. No flame appeared at the positive pole, there being no hydrogen present, all that obtained having escaped at the negative electrode.

'Experiment 2. A platinum plate, an inch long by half an inch wide, being attached to the negative wire, and a small iron wire at the positive, the platinum being first immersed in the solution, and the circuit completed by the positive wire, it became red-hot an inch and a half under the solution, as in the last experiment, and from the same cause; but when it was only brought into contact with the surface of the solution it fused, which was prevented when it was immersed.

'Experiment 3. When the iron wire was placed at the negative end of the battery and the platinum at the positive, the platinum being first put into the solution and the circuit completed by the iron wire, the latter burned with a red flame. This resulted from both oxygen and hydrogen being present at the negative pole, as in the first experiment.

'Experiment 4. A fine copper wire was attached to the positive terminal, and a platinum wire to the negative. The platinum being as usual first immersed, and the circuit completed by the insertion of the copper wire, the latter was heated an inch under the water. The cause of there being no flame is the same as in the former experiments, for the copper wire being at the positive electrode, no hydrogen was present to produce it. But when the experiment was reversed, and the copper wire placed at the negative termination and the platinum at the positive, the latter being first immersed and the circuit completed by the former, the copper or negative wire burned with a bluish flame, oxygen and hydrogen being, as before, present at that pole.

'Experiment 5. A slip of zinc was used instead of copper wire, and with the same result; for when placed at the positive termination, and the platinum at the negative, and the latter being first immersed in the solution, the zinc was heated an inch below the surface of the liquid, but when the zinc was placed at the negative, the platinum at the positive, and the latter first immersed, the zinc at the negative burned with a purple flame, hydrogen being present, as before, at that pole.

'Experiment 6. With platinum at the positive and sulphuret of antimony at the negative, the platinum being first immersed, the antimony or negative electrode fused and inflamed, depositing on the glass and surface of the solution an orange-coloured powder resembling Kermes' mineral. When the sulphuret was at the positive, the platinum at the negative, and the latter first immersed in the solution, white fumes were given off by the sulphuret, but it was not ignited, for, as in the preceding experiments, there was not any hydrogen at the positive pole.

'Experiment 7. When an iron wire was fixed to the positive, and a charcoal point at the negative termination, the iron wire being first immersed, immediately the charcoal touched the solution it became very brilliant. But when the experiment was reversed this did not occur; for when charcoal was at the negative hydrogen was present, but not when at the positive.'

Mr. Lake considers that in these experiments the ignition could only have resulted from the presence of electricity and the power it possesses of causing matter to vary its form; and that they particularly evince its property of ready combination with oxygen and hydrogen and formation of flame.

This discovery will produce an important revolution in chemical science; for if electricity enters into the composition of water it must also be a constituent part of every body into the formation of which water enters.

Mr. Lake also shows that the fluid is a component part of oxides; that, in fact, it is the medium by which the union of oxygen with its bases is brought about, and that it was by its abstraction Sir H. Davy reduced potash, magnesia, and other substances. It would also appear that it is a most important ingredient in acids, and that it forms ozone by combining with oxygen. [OZONE, P. C. S.] 'Water,' he says, 'is the medium by which many chemical substances amalgamate, or are decomposed, and new forms of matter produced. Many bodies may be placed together, ground together, and every device adopted to produce chemical action among them in vain; but let only a little water be introduced, and immediately the desired effect is produced; the substances are in part, or entirely, decomposed, and the matter of which they consisted assumes altogether different forms, and acquires different properties.

'Pyrogen acts in a similar manner, and by its abstraction or introduction chemical action takes place. Thus it is found that by discharges of it in common air nitric acid is produced; and when mercury is placed in contact with a solution of ammonia, and negatively electrified,—that is, the pyrogen drawn from it,—it expands in volume and becomes a soft solid. But the presence of pyrogen, which returns to it on breaking communication with the galvanic battery, destroys the affinity between the mercury and ammonia. Therefore, when the product of this experiment is exposed to water, the latter is decomposed by it, giving out hydrogen, whilst the former absorbs oxygen and pyrogen, leaving mercury and a solution of ammonia. If exposed to air this is also decomposed, and oxygen and pyrogen absorbed.

'Potassium, sodium, calcium, barium, strontium, and many other bodies, are obtained by the abstraction of pyrogen from their oxides, by which means the affinity between them and oxygen is destroyed, and they separate. But, as in the case of the amalgam of mercury and ammonia, and from the same cause, as soon as they are exposed to air or water, they absorb oxygen and pyrogen, and return to oxides.

'The chemical affinity of pyrogen and oxygen appears to be less with ammonia than potassium, sodium, calcium, barium, strontium, and some others; for when any of these are united as an amalgam with mercury, and exhibited in this state to ammonia, an amalgam of mercury and the bases of ammonia is formed, and the fixed alkalies or earths are reproduced, the first amalgam having absorbed the pyrogen and oxygen of the second.'

In explaining the experiments of Messrs. Schönbein and Gann with ozone, Mr. Lake deduces that zinc, nitrogen, and hydrogen, and perhaps iron and copper, are not simple bodies. He draws this conclusion as regards the metals from the different colours of the flames in the experiments of Messrs. Pollock and others on the ignition of metals in acid solutions, and, in respect to zinc, the additional singularity of the smell produced by it when used as an electrode in obtaining ozone. As to the opinion concerning the gases, he arrives at it from ozone (which he considers to be a compound of oxygen and the electric fluid) being obtained from them. [OZONE, P. C. S.]

One other point remains to be noticed, namely, the connection of the electric fluid with the acids. Concerning this our author says,—'Pyrogen enters into the composition of carbonic acid, which may be generated by the passage of a current of the former from charcoal (that is, carbon) points. By this means the oxygen of the atmosphere unites with the carbon, which has the greatest possible affinity for it when pyrogen is present in motion.' Again, 'Carbonic acid can be dissolved by the abstraction of pyrogen from it, by exhibiting to it other substances which have a greater affinity for the latter. When carbonate of ammonia is employed in producing an amalgam of the bases of ammonia and mercury, there is a most decided decomposition of this acid and formation of carbonaceous matter.'

'Pyrogen also enters into the composition of nitric acid, which is produced on passing sparks or discharges of it through atmospheric air. . . . . . By analysis, pyrogen may be obtained from nitric acid by using a solution of the latter in the experiments' on the ignition of metals in acid solutions. [OZONE, P. C. S.] In a similar manner it may be procured 'from muriatic, phosphoric, and many other acids.'

These views of this subject certainly explain many phenomena going on around us, the causes of which have hitherto been inexplicable. Thus, in one of his papers Mr. Lake says that the development of carbonic acid by plants results from the electric fluid, which is in a constant state of circulation, uniting with the carbon of the plants and oxygen of the air. He might have gone farther, and shown, upon his own theory, that plants not only make use of the fluid in this manner, but that they actually produce it from the water with which they are supplied, as is proved by Pouillet's experiments with insulated corn-plants.

The subject being new, we will not enter into further details; but the above is the substance of what has appeared concerning it.

(*Polytechnic Review*, April, 1844, p. 227; New Series, vol. i. p. 349; vol. ii. pp. 4, 93, 259; *Proceedings of London Electrical Society*, 1841-42, p. 6; Sir H. Davy, 'On the Earths,' *Philosophical Transactions*, 1808; Noad's *Lectures on Electricity*, Lecture 2.)

PY'ROLA. [WINTER-GREEN, P. C.]

PYXIDI'CULA, an obscure genus of fossi Infusoria. (Ehrenberg.)

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VOLUME II.

Q.

QUADRATURE. Not thinking of this Supplement, we inserted in the article TRISECTION, P. C., the extension given to the approximate arithmetical quadrature by Mr. Rutherford (Phil. Trans., 1841). With this reference, we take the opportunity of saying that we have re-examined the numbers, and find them correctly printed.

Strange as it may seem, this problem of the quadrature of the circle still engages attention: and persons are found to believe that they have attained even the arithmetical quadrature. It has been stated in foreign newspapers within these few years that the British government does offer, and always has offered, a large reward for the solution of this problem. This, we need hardly say, is a complete mistake: the government never at any time offered one farthing for the quadrature of the circle. The only problem for the solution of which any reward was at any time offered, was the practical mode of finding longitude: and even this offer is now retracted; rewards having been, in fact, received by several persons. Should this article fall into the hands of any, at home or abroad, who are working at any mathematical or astronomical difficulty under the impression that our government is pledged to remunerate them in case of success, they may rest assured that their information is incorrect, and that they will find it to be so on inquiry.

QUAKING-GRASS. [BRIZA, P. C. S.]

QUALITY OF ESTATES. [PROPERTY, P. C.]

QUANTITY OF ESTATES. [PROPERTY, P. C.]

QUARRIES. [MINES, P. C. S.]

QUARTER-SESSIONS. [SESSIONS, P. C. and P. C. S.]

QUASSIA. [SIMARUBACEÆ, P. C.]

QUEEN CONSORT. [QUEEN, P. C.]

QUICKSANDS are those masses of loose or moving sand which are formed on many sea-coasts and generally at the mouths of rivers: those of the Nile and Senegal are among the most remarkable for these accumulations. The sands are generally conveyed by the rivers from the interior of the country, and being at first arrested by the waters of the ocean, they become, by the action of the winds and tides, moveable *bars*, which are very dangerous to shipping. The loose sands on the coasts are, when dry, driven by winds over the land, which they then cover often to a considerable depth, overlaying the fertile ground and occasionally entombing whole villages: the coasts of Cornwall in England and of Jutland in Denmark are particularly subject to these encroachments; and it is stated that, in the latter country, there are vast beds of sand so loose as to be incapable of supporting the weight of a man. In Greenland there is a chain of ice-hills between two promontories of moving sand, which is driven by the winds far out to sea.

The sand of Bagshot Heath, which rests on London clay, is in many places, at a few feet below the surface, saturated with water so as to constitute a perfect quicksand: and, on the borders of Oman, in Arabia, there was discovered by Baron von Wrede a remarkable quicksand, which is said to be more than 60 feet deep.

QUINQUELOCULI'NA. [FORAMINIFERA, P. C.]

QUISCALUS, a genus of birds, allied to starlings. [STURNIDÆ, P. C.]

QUIT-RENT. [RENT, P. C.]

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VOLUME II.

R.

RADIATA. [Rayed or Radiated Animals, P. C.]

RADIOLA (from *radiolus*, little ray, in allusion to the rayed capsules), a genus of plants belonging to the natural order Lineæ. It has a calyx of 4 sepals connected below, deeply trifid. There are 4 petals, 4 stamens, 4 capsules, with 8 cells and 8 valves.

R. milligrana is the only species of this genus. It is the *R. linoides* of some botanists, and is a British plant. The stem is from one to two feet high, repeatedly forked, with solitary flowers in the axils as well as at the extremities of the branches. The flowers are small and white; the capsules light brown and slightly depressed; the sepals deeply and acutely 3-cleft, connected below into a tube. The seeds of this very small plant should be sown in a moist situation where they may afterwards be allowed to scatter themselves.

(Babington, *Manual of British Botany;* Don, *Gardener's Dictionary.*)

RAIA, a genus of cartilaginous fishes, established by Linnæus, and since much subdivided by ichthyologists. The rays differ from the sharks in being horizontally flattened so that their bodies with their broad and fleshy pectoral fins resemble large expanded disks. The eyes and spiracles are placed above the mouth, nostrils and bronchial orifices below. The dorsal fins spring from the tail. The common skate and the ray are familiar examples.

The following are the principal sub-genera into which *Raia* has been divided:—

Torpedo. Rays with short and rather thick tails, and having the disk of their bodies nearly circular. Their teeth are small and sharp. The torpedos are remarkable for the electrical apparatus with which they are provided; it is seated in the part between the pectorals, head, and branchiæ. Fishes of this genus are rare in the British seas, but common on the coasts of southern Europe.

Raia. The tail of the typical Rays is slender, and bears two small dorsal fins towards the extremity, with sometimes an imperfect caudal fin. The disk of the body is rhomboidal; the mouth is armed with slender thickly-set teeth arranged in quincuncial order.

Trygon. The Sting-rays, which have a slender finless tail armed with a sharp serrated spine by which the fish can inflict severe wounds; hence its popular name. The head is enveloped in the pectorals, and the teeth are slender and arranged as in *Raia* proper.

Myliobatis. Tail very long, armed and bearing a small dorsal fin; head projecting from between the pectorals, which are very broad. Teeth flat and arranged like stones in a pavement. The Whip-ray belongs to this sub-genus.

Cephaloptera. Tail also armed, and bearing a small dorsal, but the head is curiously truncated, and is placed between two horn-like processes of the broad pectoral fins, giving the creature a very extraordinary and incomplete or mutilated aspect. The teeth are small and very slender.

RAILWAYS. [Transit, Railway, P. C. S.]

RAIMBACH, ABRAHAM, one of the most distinguished English line engravers, was born in London in 1776; his father was a Swiss by birth, but he settled in England at the early age of twelve, and never afterwards quitted it; his mother was the daughter of an English farmer in Warwickshire. When an infant, Raimbach escaped from one of those rare but awful accidents which occasionally happen through the negligence of nurses; he fell from the arms of his nurse from a second-floor window; but his life was saved, partly by the inflation of his long clothes, and partly by his fall being broken by some leads below. The girl from whose arms he fell was seized with such a panic that she rushed out of the house, and was never heard of by any of the Raimbachs afterwards.

Raimbach was educated in Archbishop Tennison's library-school, where he was the fellow-pupil of the late Charles Matthews; he, however, showed an early disposition to excel in the arts, and his father apprenticed him in 1789 to J. Hall, the engraver; Sharp and J. Heath had both declined to take him. The first work engraved by the young apprentice was the explanatory key to Copley's Death of Chatham in the National Gallery, where the print also is now hanging, framed and glazed, beneath the picture. After his term of apprenticeship was over he entered as a student in the Royal Academy, anxious to qualify himself in every way for his art; he at the same time did what work he could for the booksellers; but at this period he seems to have had a difficulty in earning as much as thirty shillings a week. His first patron was a bookseller of the name of Stockdale. But, by his general attention and assiduity, he was enabled to unite the profession of a miniature painter with that of engraver, and he prospered in a short period so well in both, that he was under the necessity of giving one of them up, and confining himself to the other. According to his own account, he was influenced not a little in his choice by the uniform difficulties he met with in satisfying his sitters with his miniatures. All had opinions of their own about their looks, which it was necessary to attend to; he therefore gave up portrait painting, as he found engraving a much more independent art.

In 1802, through some prints he executed for Smirke and Forster's illustrated edition of the Arabian Nights, he was in such circumstances as enabled him to take advantage of the temporary peace, and he paid a visit to Paris to view the great galaxy of works of art which the victories of Napoleon had collected together in the Louvre. He has himself given a long account of this tour in his autobiography, published by his son. In 1805 he married and established himself in a house of his own in Warren-Street, Fitzroy-Square, in which he lived twenty-six years, and executed all his great works; the house was given to him by his father on his marriage, and his father died in the same year; in 1807 he lost his mother also. In this year he made the acquaintance of Wilkie, and soon became that painter's most intimate friend. In 1812 he became Wilkie's engraver, supplanting Burnet, who had already engraved some of Wilkie's pictures in an admirable manner. The chief reason of Wilkie's breaking with Burnet appears to have been what he considered the smallness of his interest in the prints—one-third of the profits. Burnet would not allow more than this, and Wilkie left him for Raimbach, with whom, however, he was contented with the same arrangement; and, indeed, he himself afterwards voluntarily reduced his share to one-fourth of the profits. The first fruit of this partnership was the celebrated print of the 'Village Politicians.' This print however, owing, it appears, to the indifference of printsellers to anything out of the ordinary way of business, at first went off slowly; but eventually the sale was large and steady, and a proof, of which there were 274, has sometimes been sold at auctions for fourteen or fifteen pounds. The next print was 'The Rent Day,' published in 1816; after which Wilkie and Raimbach made a tour together in the Netherlands. The rest appeared in the following order: 'The Cut Finger,' 'The Errand-Boy,' 'Blindman's Buff,' 'Distraining for Rent,' 'The Parish Beadle,' and, in 1836, 'The Spanish Mother and Child.' The last prints, compared with the 'The Village Politicians' and 'The Rent-Day,' were very unsuccessful speculations, and Raimbach thus accounts for the fact in his autobiography: For the long term of more than twenty years the prints from Wilkie's pictures had enjoyed an almost unprecedented popularity; and it can scarcely be held as a matter of reproach to the public if, after so long a period of favour in one direction, the desire of some sort of change of object should be entertained. The great talents of Edwin Landseer had been already well appreciated, when his picture of the Monks of Bolton Abbey appeared, and placed his reputation on a still higher elevation. Seconded by Cousin's admirable mezzotinto from it, there followed a rush in the track thus so auspiciously commenced, and the new lights (as in Aladdin's lamp) were preferred to the old. Raimbach never employed an assistant, but executed the whole of the plate himself. 'The Rent-Day' cost him two years and a half of incessant labour. His prints are very masterly works, and possess every quality but colour. He died January 17th, 1843, in very easy circumstances. His autobiography was published by his son in the same year, under the following title:—'Memoirs and Recollections of the late Abraham Raimbach; including a Memoir of Sir David Wilkie.' (*Athenæum*, 1843.)

RAMEAU, JEAN-PHILIPPE, a very celebrated musician, equally distinguished by his compositions and by his numerous writings on the science, was born at Dijon, in 1683. It may be presumed that he inherited a taste for music, for his father was so passionately fond of the art that after he had passed his thirtieth year he commenced studying it as a profession, and obtained the organist's chair in the *Sainte-Chapelle* of the above-named city. He taught his children to play from notes before they could read from letters, and the success of this plan, so far as relates to musical education, was manifested in the instance of his eldest son, the subject of the present notice, who when only seven years of age was thought an able performer on the harpsichord. He pursued the usual studies at the college, where his knowledge of Latin, &c. was acquired without reluctance and readily; but an invincible desire, or instinct, as his biographer calls it, led him to music, to which he at length wholly devoted himself. At eighteen he set out for Italy, in order to complete his knowledge of the art to which his future life was to be dedicated, but proceeded no farther than Milan, where he became acquainted with a professor with whom he returned to France, and together they visited several of the principal cities, exercising their talents at each with pecuniary views. Soon, however, tired of a wandering life, that allowed him no opportunity for indulging in those speculative inquiries to which he was prone, he went to Paris, and there added largely to his stock of information. Afterwards he became organist of the cathedral of Clermont, in Auvergne, and continued long in that city, in which he wrote his 'Traité de l'Harmonie;' but not finding the means for printing a large quarto volume in a provincial town, he proceeded to the capital of France, where in 1722 he published his great work, and finally fixed himself. He was soon appointed organist of Sainte Croix de la Bretonnerie, and employed his spare time in writing his various theoretical treatises, in composing his harpsichord lessons, and in teaching. He did not distinguish himself in that line in which he was destined to excel till the year 1733, when, at fifty years of age, he produced the opera of 'Hippolyte et Aricie,' the drama by the Abbé Pellegrin. The success of this provoked much professional envy, if not national discord, and a feud was raised among the admirers of Lulli [LULLI, P.C.] and Rameau, similar to that which in after times was carried to greater excess by the Gluckists and Piccinists. [GLUCK, P. C.; PICCINI, P. C.] The Prince de Conti asked Campra, the celebrated Maître de Musique of Notre-Dame, what he thought of the new work? He replied, 'There is enough of music in it to make six operas.' Till the production of Hippolyte,' Voltaire alone had discovered Rameau's genius for composition. He previously gave him his tragedy of 'Samson' to set, and discerned the beauty of the music; but its performance was prohibited under the pretext that it prostituted a sacred subject.

Of the many operas by Rameau, his 'Castor and Pollux,' produced at the Académie Royale de Musique in 1737, is the best: it was represented one hundred times. There are parts of it that must always excite the admiration of true connoisseurs. A chorus in this, of Spartans, 'Que tout gemisse,' has but few rivals, in either antient or modern theatrical music. Even M. Ginguené, who estimates his countryman at a low rate, admits the merit of this composition. His 'Dardanus,' his 'Zoroaster,' and other pieces, were equally successful. From 1733 to 1760 he produced twenty-one operas and ballets, besides harpsichord and other compositions; together with many theoretical and controversial works. His merit, long contested by envious rivals, was at length generally acknowledged. The king created for him the office of cabinet composer. Afterwards he granted him letters of nobility, and named him 'Chevalier de Saint-Michel.' The Academy of Dijon had previously received him among their members, and the magistrates of that city exempted him, and his family, in perpetuity, from the tax called 'La Taille.' He died in 1764, leaving a son and a daughter, and was interred with every mark of respect and distinction.

As a theorist Rameau is best known by his large and laboured work on the *basse fondamentale*, which he and his advocates treat as a discovery. [FUNDAMENTAL BASE, P. C.] But under other names the inversions of the perfect chord, or triad, and the chord of the seventh, were known long before Rameau entered on the subject. Brossard, in 1702, in defining *Trias Harmonica*, calls the under-note *basse*, or *son fondamentale*; and afterwards remarks that among the three sounds which compose the *triade Harmonique*, the lowest is called *basis*, or *sonus fundamentalis*. But our limits do not allow us to go further into a subject which, to explain clearly, would fill many pages with arguments and examples. It is well considered by Dr. Burney, in his 'History of Music;' and by the same in Rees's 'Cyclopædia.' Rameau's style of writing is not remarkable for perspicuity. This was felt and acknowledged by his most zealous partizan, D'Alembert, who, in his 'Elémens de Musique, théorique et pratique, suivant les Principes de M. Rameau,' has endeavoured to clear the work from the obscurity in which it undeniably is involved; but the great French geometrician has only partially succeeded in his attempt. Nevertheless, the editor of the early edition of the 'Encyclopædia Britannica' adopted D'Alembert's work. In later editions the article has been omitted, and a much better one substituted.

(*Biographie Universelle;* De Laborde, tome iii.; Burney, vol. iv.)

RAMENGHI, BARTOLOMEO, called IL BAGNACAVALLO, from the place of his birth, Bagnacavallo, on the road from Ravenna to Lugo, where he was born in 1484. He was a pupil of Raphael, and one of his principal assistants in the Vatican; and after the death of his great master he carried the principles of his style to Bologna, and assisted to enlarge the character of that school. Raphael was his model and test of excellence, and he did not attempt to look beyond him, presuming that little was to be acquired by ordinary abilities from nature compared with what the works of Raphael afforded for imitation. Though possessing less vigour than Giulio Romano or Perino del Vaga, Bagnacavallo acquired more of the peculiar grace of Raphael's style, especially in his infants, and his works were much studied by the great scholars of the Carracci. There are, or rather were, works by Bagnacavallo in San Michele in Bosco, San Martino, Santa Maria Maggiore, and Sant' Agostino agli Scopettini, in Bologna. He died at Bologna in 1542, according to documents discovered by Baruffaldi. Giovanni Battista Bagnacavallo, who assisted Vasari in Rome, and Primaticcio at Fontainebleau, was the son of Bartolomeo Ramenghi.

(Baruffaldi, *Le Vite de' più insigni Pittori e Scultori Ferraresi;* this excellent work was used by Lanzi in MS., but it has been recently (1846) published for the first time at Ferrara by Domenico Taddei, after lying in MS. for nearly a century. Lanzi, *Storia Pittorica*, &c.)

RAMMOHUN ROY, Rajah, was born about 1774, in the district of Burdwan, in Bengal, Hindustan. His paternal ancestors were Brahmins of a high order, and were devoted to the religious duties of their race, till about the beginning of the seventeenth century, when they gave up spiritual exercises for worldly pursuits. His maternal ancestors, also of high Brahminical rank, and priests by profession as well as by birth, uniformly adhered to a life of religious observances. Rammohun Roy was taught Persian under his father's roof, was sent to Patna to be instructed in Arabic, and afterwards, at the request of his maternal relations, went to Benares, in order to acquire the Sanscrit.

Rammohun Roy was a Brahmin by birth, and was trained by his father in the doctrines and observances of his sect; but his opinions seem to have become heretical at an early age. 'When about the age of sixteen,' he says, 'I wrote a manuscript calling in question the validity of the idolatrous system of the Hindus. This, together with my known sentiments on that subject, having produced a coolness between me and my immediate kindred, I proceeded on my travels, and passed through different countries, chiefly within, but some beyond, the bounds of Hindustan. When I had reached the age of twenty my father recalled me, and restored me to his favour.' Afterwards he says, 'My continued controversies with the Brahmins on the subject of their idolatry and superstition, and my interference with their custom of burning widows, and other pernicious practices, revived and increased their animosity against me; and through their influence with my family, my father was again obliged to withdraw his countenance openly, though his limited pecuniary support was still continued to me.' His father died in 1803, and he then published various books and pamphlets against the errors of the Brahmins, in the native and foreign languages. 'The ground which I took in all my controversies was, not that of opposition to Brahminism, but to a perversion of it; and I endeavoured to show that the idolatry of the Brahmins was contrary to the practice of their ancestors, and to the principles of the antient books and authorities which they profess to revere and obey.' In order to deprive him of caste, the Brahmins commenced a suit against him, which, after many years of litigation, was decided in his favour.

Of the body of Hindu theology comprised in the Vedas [VEDA, P. C.], there is an antient abstract called the 'Vedant, or the Resolution of all the Veds,' written in Sanscrit.

Rammohun Roy translated it into Bengalee and Hindustanee; and afterwards published an abridgment of it for gratuitous circulation. Of this abridgment he published an English translation in 1816, the title of which states that the 'Vedant is the most celebrated and revered work of Brahminical theology, establishing the unity of the Supreme Being, and that he alone is the object of propitiation and worship.' He afterwards published some of the principal chapters of the Vedas, in Bengalee and English. He was at different times the proprietor or publisher of newspapers in the native languages, in which he expressed his opinion freely against abuses political as well as religious, especially the burning of widows. In conjunction with the late Dwarkanath Tagore and Neel Rutton Holdar, he was proprietor of the 'Bengal Herald,' an English newspaper. Dwarkanath Tagore, an enlightened Hindoo, of liberal opinions, very rich, and a munificent benefactor to schools and charities, was born in 1795, in or near Calcutta, and died in London, Aug. 1, 1846. In 1820 Rammohun Roy published, in English, Sanscrit, and Bengalee, a series of selections from the New Testament, entitled 'The Precepts of Jesus the Guide to Peace and Happiness.' In this selection he omits the miracles and doctrinal parts, and confines himself to the simple religious and moral precepts. In 1830 he was engaged by the King of Delhi to make a representation of grievances to the British government, for which purpose the King conferred on him by firman the title of Rajah, and appointed him ambassador to the British court. He arrived at London in April, 1831. The British ministers recognised his embassy and title, though the Court of East India Directors objected to both. His negotiation was successful, and added 30,000*l.* a-year to the income of the King. He intended to return to India in 1834, but he was taken ill when on a visit at Stapleton Grove, near Bristol, where he died September 27, 1833. He was buried in a shrubbery of Stapleton Grove, without a pall over the coffin and in silence. The Christian observances were carefully avoided at his own request, lest it should be made an accusation against him by the Brahmins, and, by causing him to lose caste, deprive his children of their inheritance. His funeral was attended by his youngest son, and two native servants, who had come to England with him. Two other sons survived him in India.

Rammohun Roy was acquainted more or less with ten languages—Sanscrit, Arabic, Persian, Hindustanee, Bengalee, English, French, Hebrew, Latin, and Greek. Sanscrit and Arabic he knew critically, and as a scholar; Persian, Hindustanee, Bengalee, and English, he spoke and wrote fluently. Of the other languages his knowledge was less perfect. In person he was tall and somewhat unwieldy; his features were handsome, his complexion dark, and the general expression of his face was very pleasing. He associated a good deal with the Unitarians in this country, and frequently attended their chapels. He was a believer in the divine mission of Christ, and seems to have considered the acceptance of the doctrines of Christ to be quite consistent with a belief in the Brahminical religion as it is in the antient Sanscrit authorities.

(*Annual Biography and Obituary*, 1834; *Review of the Labours, Opinions, and Character of Rajah Rammohun Roy*, by Lant Carpenter, LL.D.)

RAMPART, probably from Ripa, an embankment, from which is derived the Italian word 'Riparo,' and the French word 'Rempart,' is, in modern fortification, a mass of earth often nearly 80 feet thick, surrounding a town or a military position, or constituting the faces of an outwork; and its use is to protect the interior of the place or work against any sudden enterprise of the enemy, as well as to give the defenders a superiority of elevation with respect to the works of the besiegers.

The ramparts of ancient fortresses were walls of stone or brick, frequently from 60 to 100 feet high and 20 feet broad, including the galleries made in them: round or angular towers were formed at intervals along the walls: and, by means of the galleries, the defenders could pass within the thickness of the wall from each tower to the next. The rampart was surmounted by a parapet seven feet high and two feet thick, which was provided with battlements; the rampart was loop-holed, and, in order that the exterior foot of the high wall might be defended, machicolations were formed at the top, particularly over the entrances. [BASTION, P. C.] A great mass of earth was raised against the interior side of the walls, nearly as high as the top, in places where elevated ground or the enemy's works on the exterior allowed access to the top of the wall to be gained in force; and on this mass the cohorts were drawn up in order of battle. (Vitruvius, lib. I., cap. v.)

The modern rampart is surmounted by a parapet of earth, on the interior side of which, towards the town, is a nearly level space, varying in breadth from 35 to 40 feet, called the terreplein of the rampart; on this terreplein the artillery is placed: and in the rear of the guns there is room for the movements of the defenders and the conveyance of the ammunition. The exterior and interior sides of the rampart are formed with slopes making angles of about 45 degrees with the horizon: or they are retained by revetments, or walls of brick or stone, nearly upright, the exterior face of the rampart constituting the *escarp* of the ditch in front. The rampart immediately surrounding a place is divided, in the direction of its length, into parts making salient or re-entering angles with one another; and these parts constitute the faces and flanks of the bastions, and the curtains which connect the latter together. Not more than 30 feet are allowed for the breadth of the terrepleins of the ramparts of outworks, measured from the foot of the parapets, in order that the enemy may not be able to form batteries for artillery upon these terrepleins. The terrepleins of all ramparts should have a small slope down, towards the interior, in order that the rain-water may not lodge on them, and that the defenders near the interior edge of the rampart may be effectually covered by the parapet. The terreplein and the interior slope of a rampart, as well as the surface of the parapet, are generally covered with turf. A rampart whose exterior side is of earth, or without a revetment of brick or stone, might be easily ascended by an enemy at the time of an assault; and the palisades or fraizes which, in that case, would be planted in it for the purpose of impeding the progress of the enemy, might be easily destroyed by artillery, so that the place would be liable to be carried by a sudden assault.

The relief, or height, of a rampart is regulated by the occasional necessity of employing a fire of artillery from the rampart, and, at the same time, a fire of musketry made over the glacis by men stationed in the covered way beyond the ditch in front of the rampart: for this purpose a line of fire from the rampart should pass three or four feet above the crest of the glacis in its front, in order that the wind of the shot may not injure the defenders. The relief of a rampart with its parapet may, therefore, be thus determined:—On a drawing representing a vertical section of the works let a line be drawn from the foot of the glacis, through a point taken at 3 or 4 feet above the crest of that work, and let it be produced till it cuts the interior slope of the parapet on the rampart: this intersection will give a point in the axis of a gun placed on the rampart, or a point a few inches above the sole of the embrazure, that is, about 3½ feet above the terreplein of the rampart; and, because the artillery and the gunners are to be protected by the parapet, if 7½ feet be added to the height of the terreplein of the rampart, above the ground, the sum will be the required height of the crest of the parapet.

RAMPOOR, a town of Hindustan, in the district of Bareilly, province of Delhi, and presidency of Bengal, on the east bank of the Cosila river, in 28° 48′ N. lat., and 79° E. long., 105 miles E. by N. from Delhi, direct distance. The town, at the time of the death of Fyzoola Khan, a Rohilla chief to whom it had been secured by the peace of Lalldong in 1774, was four miles in circumference and the centre of a flourishing district, but has since been greatly reduced. The district was granted to the nawâb of Oude on the termination of the Rohilla war, and the town was ceded to the British in 1801, by whom it was transferred to the nawâb of Rampoor, together with a small territory.

Rampoor is chiefly remarkable for the curious kind of fortification by which it is surrounded, a high and thick hedge of bamboos faced on the outside by a prickly underwood of cactus and bâbool. The entrances are by narrow passages, defended by strong wooden barriers. It is said to be an extremely effective defence against irregular troops, since neither cavalry nor infantry can be brought to act against an enemy whom they cannot see, and who is firing at them from among the close stems of the bamboos, and under cover of the almost impenetrable cover on the outside.

(Hamilton's *East India Gazetteer*; Heber's *Narrative of a Journey through the Upper Provinces of India in* 1824 *and* 1825.)

RAMSAY, ANDREW MICHAEL, generally known as the Chevalier Ramsay, was born at Ayr, in Scotland, the year 1686. He was educated at Edinburgh, where chiefly devoted himself to the study of mathematics and theology; the distinction he obtained as a scholar procured for him the appointment of tutor to the son of the Earl of Wemys, at the University of St. Andrew's. Having entertained some doubts respecting the tenets of the Protestant faith, he went to Holland for the purpose of visiting a Protestant divine of the name of Poiret, who had obtained a certain celebrity as one of the leaders of the Quietist party. With him Ramsay entered into a religious controversy, the fruits of which were an increase of his doubts and even an inclination to general scepticism on the great doctrines of the Christian religion. In this state of mind he determined on having recourse to Fénélon, who was at that time residing in his diocese of Cambray. Ramsay was but twenty years of age when he formed the acquaintance of the Archbishop of Cambray, but his mind had already been sufficiently trained by study and meditation to enable him to appreciate the talents and to recognize the virtues of that eminent divine. Towards him Fénélon exercised his instructive talent as a moral teacher, and in short time made him a convert to the Roman faith. He soon became the disciple of Fénélon, not only in religious matters, but also in his literary taste and opinions. His writings were formed on the style and after the manner of his great master, whose examples and precepts he ever gratefully acknowledged. Ramsay rapidly acquired so perfect a knowledge of the French language as to become an excellent writer. Some of his earlier productions were the means of obtaining for him the situation of tutor to the Duke of Château Thierry and afterwards to the Prince of Turenne; he was also created a knight of the order of St. Lazarus. His reputation induced the Pretender, in 1724, to invite him to Rome, and to entrust him with the education of his children. He remained however only a year in that city, and left it in disgust with the petty intrigues which he found to form the principal occupation of the miniature court of the son of the exiled king. The next year he revisited Scotland, where he remained a considerable time, which he employed in literary labour. On visiting England, he obtained, through the influence of Dr. King, the degree of doctor of civil law in the University of Oxford; he was also admitted a member of the Royal Society of London. After his return to France he was appointed intendant to the Prince of Turenne, who afterwards became Duke of Bouillon; he held this situation till his death, which took place at St. Germain-en-Laye in the year 1743.

The writings of the Chevalier Ramsay are more remarkable for the purity of their style and the perfect knowledge which they manifest of the French language, than for their depth or originality of thought. As a theologian he was visionary in the extreme, and his orthodoxy, even according to the principles of the church he had adopted, is open to considerable suspicion. It is fortunate for his religious reputation that he did not live to publish some philosophical works which he was preparing, such as his answer to Spinosa, and a treatise on the Progress of Human Understanding, 'in which,' says Spence, 'there were several notions that would have made him be looked upon as a heretic in our church, as well as in his own.' (Spence's Anecdotes, p. 34.) The work by which he is best known, is his 'Voyages de Cyrus,' an imitation of the Telemachus of Fénélon, but, according to Voltaire, a very feeble one. The character of Zarina gave considerable offence to the Princess de Conti, one of the most learned ladies of the age, who imagined that she was pourtrayed in it. There is an excellent translation of that work, by Hooke, though said to have been accomplished in the short space of twenty days [HOOKE, NATHANIEL, P. C.]; it was for a long time mistaken for an original, the general belief respecting it being that Ramsay had written the Voyages of Cyrus in English as well as in French. The best edition of the French is that of 'Paris et Londres,' 1727, 2 vols. 8vo. The work, however, for which posterity is most indebted to him is that entitled 'L'Histoiro de la Vie de François de Salignac de la Motte Fénélon.' Hague, 1723; published also in London the same year. His great intimacy with Fénélon has made us acquainted with many interesting facts of his private life, and it contains a valuable record of his opinions. His other published writings are 1°. 'Discours sur le Poëme E'pique,' originally forming the preface of his edition of Telemachus, in 1717. 2°. 'Essai Philosophique sur le Gouvernement Civil.' London, 1721; it was afterwards reprinted under the title 'Essai de Politique.' 3°. 'Histoire de Turenne.' Paris, 1735, 2 vols. in 8vo. and 4 vols. 12mo. With some affectation in the style and a redundancy of reflections this history possesses much merit from the precision of its facts and the lively portraiture of its characters. 4°. 'Le Psychomètre, ou Reflexions sur les différens Caractères de l'Esprit, par un Mylord Anglais.' 5°. A posthumous work published at Glasgow in 1749, 2 vols. 12mo., in English, entitled 'Philosophical Principles of Natural and Revealed Religion explained and unfolded in a Geometrical Order.'

(*Dictionnaire Historique*, 4 vols., Amsterdam, 1766; *Dictionnaire Historique Classique*, Paris, 1826; Spence's *Anecdotes of Books and Men*, London, 1820. The details of his conversion to the Roman Church will be found in the life of Fénélon by le Père Querbeuf, appended to his edition of his works. Paris, 1787—1792.)

RAMSAY, ALLAN, an eminent portrait painter in his time, and the son of Allan Ramsay the poet, was born in 1713, in Edinburgh, the birth-place of his father also; the circumstance is alluded to by Churchill, in his satire of the 'Prophecy of Famine:'—

> 'Thence came the Ramsays, men of worthy note,
> Of which one painted, as the other wrote.'

'Ramsay,' says Edwards, 'may be called self-taught; but he studied a short time in Italy with Solimena, and F. Fernandi, called Imperiali. After practising a short time in Edinburgh, he settled in London, where he was introduced by Lord Bute to George III. when Prince of Wales. He painted two portraits of the Prince, which were engraved, one by Ryland, and the other by Woollett. At the death of Mr. Shakelton, in 1767, Ramsay succeeded him as principal painter to the king: he retained the place until his death, when he was succeeded by Sir Joshua Reynolds. He died at Dover in 1784, on his return from a fourth visit to Rome; he had a daughter, who was born in Rome. Ramsay, though not an excellent portrait painter, was superior to the generality of the painters of his time; he was Walpole's contemporary, and is noticed in somewhat flattering terms by that universal critic, considering with whom he is coupled: he says, 'Reynolds and Ramsay have wanted subjects, not genius.' Edwards says that Ramsay was not devoted to his art: he allowed literature to divide much of his time with it. He was acquainted with Latin, French, and Italian; and, in his latter days, like the elder Cato, acquired some knowledge of Greek. He was the author of some political papers. He was twice married; his second wife was a daughter of Sir David Lindsey. His son and daughter survived him: the son became a general in the British army, the daughter was married to Sir Archibald Campbell.

(Edwards, *Anecdotes of Painters;* Cunningham, *Lives of the British Painters*, &c.)

RANDIA (named after Isaac Rand, M.D., once a demonstrator of botany at the Chelsea botanic gardens), a genus of plants belonging to the natural order Rubiaceæ.

R. dumetorum, Bush-Randia, is a thorny branching small shrub or tree, with oval leaves, rather blunt, cuneate at the base and smooth. The flowers are very sweet-scented, sessile, solitary, mostly terminal. The calyx has oblong lobes, rather shorter than the villous corolla. The fruit is smooth, yellow, resembling a small crab-apple, firm and fleshy. The seeds are oval, numerous, and lying in mucus. The fruit when bruised and thrown into water intoxicates or even kills fish, having the same effect as the *Cocculus Indicus*, which is not, however, known in the East Indies, where this plant grows. In the form of powder it is a powerful emetic. An infusion of the bark of the root is employed to nauseate in bowel complaints.

R. uliginosa, Bog-Randia, has almost terminal opposite thorns, tetragonal branches, oblong leaves somewhat cuneated, glabrous; the flowers solitary, sessile, almost terminal. It is a native of the East Indies, in moist places. The flowers are large, white, and fragrant, and in twos or threes at the top of the branchlets. The berry is about the size of a pullet's egg, ash-coloured or olive-grey, and 2-celled. The seeds are flattish, nestling in the pulp. The flowers of this species render it deserving of a conspicuous place in the hothouse. The uncommon appearance of this plant is also in its favour. There are 39 species of *Randia*, none of which, however, are applied to any useful purpose. They are generally free flowerers. The soil best suited for them is a mixture of loam, peat, and sand. The stove species thrive best in a moist heat; and cuttings root readily if taken up when not too ripe, planted in a pot of sand, which should be plunged in a moist heat under a glass. They are very showy, usually bearing large white fragrant flowers, and are worth cultivating in every collection of stove-plants.

(Don, *Gardener's Dictionary;* Lindley, *Flora Medica.*)

RANG'ONE, a noble family of Modena, which became illustrious in the middle ages, not only for the part which it took in the political and military vicissitudes of Italy, but more particularly for the patronage which it gave to learning and to the learned. Count Nicolò Rangone, who lived in the latter part of the fifteenth century, was the father of eight sons and two daughters, whom he caused to be instructed with great care, and all of whom became distinguished for their love of science and literature. The learned Visdomini, who was preceptor to several of them, has left an interesting memorial of the care bestwed on their education in his Dialogues entitled 'Antonii Mariæ Visdomini de Ocio et Sybillis.' One of his pupils, Count Guido Rangone, figured as a distinguished general in the Venetian service, and afterwards in the service of King Francis I. Filelfo, in his book 'de Optima Hominum Felicitate,' which he addressed to Count Guido, enumerates the feats he had performed in his military career, and praises him likewise for the liberal encouragement which he afforded to the learned. Bernardo Tasso, father of the great poet, was for a long time secretary to Count Guido. Guido died at Venice in 1537. His brother, Cardinal Ercole Rangone, who died young during the pillage of Rome in 1527, is likewise extolled for his love of learning by Giglio Giraldi, and also by Vida in his second book 'de Arte Poetica.'

Costanza Rangone, sister of the preceding, took for her second husband Cesare Fregoso, a well-known Genoese emigrant in the service of Francis I., who was murdered in 1541 by the emissaries of the Marquis del Vasto, Governor of Milan for Charles V. She then retired to France together with Bandello, the celebrated novelist, who wrote many of his tales for her entertainment. Ginevra Rangone, sister of Costanza, married first a nobleman of the Correggio family, and afterwards Luigi Gonzaga, Marquis of Castiglione. She has been praised by Scaligero for her intellectual accomplishments. Her nephew, Count Fulvio Rangone, a pupil of Carlo Sigonio, was employed by Alfonso II. of Este in a diplomatic capacity, and his sister Claudia fixed her residence at Rome, where she enjoyed considerable interest at the Papal court, and was even consulted on matters of state. The love of learning and the patronage of the learned appear to have been hereditary in the family of Rangone. The Marquis Gherardo Rangone founded in 1783 a Scientific Academy in his palace at Modona, which awarded prizes for physiological and other studies and discoveries.

(Litta, *Famiglie celebri Italiane*; Tiraboschi, *Storia della Letteratura Italiana*; *Memorie intorno alla Vita del Marchese Gherardo Rangone*, Modena, 1818.)

RANUNCULUS (from *rana*, a frog, because many of the species inhabit humid places frequented by that reptile), a genus of plants, the type of the natural order Ranunculaceæ. It has 5 sepals, occasionally 10, with a nectariferous excavated scale at the base. The stamens and ovaries are numerous, the achenia ovate, somewhat compressed, mucronate, arranged on globose or cylindrical receptacles. The species are mostly acrid, and if applied when fresh to the skin will produce blisters: this quality is destroyed by drying or by heat.

R. aquatilis, Water-Crowfoot, has a floating stem and submersed leaves divided into numerous capillary segments spreading on all sides. The floating leaves are reniform, from 3- to 5-parted, the lobes wedge-shaped, toothed at the top, the petals obovate, larger than the calyx, the flowers white. It is native throughout Europe, Western Asia, North Africa, and also in America and England, in pools and stagnant waters. It is the Βατράχιον ἕτερον of Dioscorides, 2, 206. Sometimes it produces very large flowers, and makes a handsome show in ponds and ditches; the curious variety in the floating and immersed leaves adds greatly to its beauty. Dr. Pulteney contradicts the assertion of its deleterious qualities, and says that it is not merely harmless but nutritive to cattle, and tells us that on the borders of the Avon the cottagers support their cows and horses almost wholly on this plant. Hogs are also fed upon this plant, and appear to thrive on it, so that it seems we cannot class this species with others of the same genus as having poisonous qualities.

R. flammula, Flame-Crowfoot, is a smooth plant with a rooting decumbent stem, branched, leafy, and hollow, sometimes hairy near the top. The leaves are on flat channelled half-sheathing stalks, alternate, usually ovate, lanceolate, but varying much in breadth, often serrated. The flowers are terminal, opposite the leaves, and of a bright yellow colour. The leaves are vesicant. Dr. Withering recommends the distilled water as an instantaneous emetic in cases of poison. Lightfoot says the bruised leaves are used to raise blisters in the Isle of Skye and the Highlands of Scotland. It is native of Europe, Asia, North America, and Great Britain.

R. glacialis has stalked radical leaves, palmated and trifid, the lobes rather blunt and thick; the stem is generally one-flowered; the calyx very hairy, the carpels compressed and sharp-edged; the petals white. It is native of the higher Alps of Europe, among rocks, near the limits of perpetual snow, and of Lapland and Iceland. The mountaineers of Dauphiny call this 'Carlive' or 'Caralline,' and employ an infusion of it in hot water as a powerful sudorific in colds and rheumatism.

R. acris, Buttercup, has a fibrous root, the stem about two feet high, erect, round, hollow, leafy, clothed with close-pressed hairs, branched above and many flowered. The radical leaves are on long upright footstalks, in 3 or 5 deep lobes, the stem-leaves are nearly sessile, with fewer and narrower segments, the uppermost much smaller in 3 linear entire lobes, or sometimes simple and linear. The flowers are of a bright yellow, on round even stalks covered with close hairs and not furrowed. The calyx is hairy, spreading, and deciduous; the carpels smooth, lenticular, with a slightly curved point. This species is extremely acrid and dangerous. Mr. Curtis says that even pulling up the plant and carrying it to some little distance has produced inflammation in the hand. Cattle in general will not eat it, but sometimes when they have been turned hungry into a field they have fed upon it, and in consequence their mouths have become sore and blistered. According to Linnæus sheep and goats eat it, but cows, horses, and swine refuse it. When made into hay however, its noxious qualities are lost. It is commonly called *buttercup*, under a notion that the yellow colour of butter is owing to these plants. A double variety of this species is cultivated in gardens under the name of 'Bachelor's Button.'

R. sceleratus, Celery-leaved Crowfoot, has a fibrous root, the radical leaves with 3 stalked trifid and cut leaflets, furrowed peduncles and reflexed calyx, the heads of the fruit oblong, the carpels minute and wrinkled. The flowers very small and pale yellow, numerous, on solitary stalks, either terminal, axillary, or opposite the leaves. The bruised leaves raise blisters on the skin, which are not soon healed, and are said to be used by impostors to cause ulcers on their bodies, and thus excite compassion. It is one of the most virulent poisons of our native plants. The distilled water of this species is highly acrimonious, and when cold deposits crystals which are scarcely soluble, and are of an inflammable nature. The deleterious qualities are, however, dispelled in decoction, and accordingly the shepherds of Wallachia boil and eat it.

R. Thira has an extremely acrid and poisonous root, and is native of the Alps of Europe. It is said to yield the juice formerly used by the Swiss hunters to poison their darts; wounds so produced speedily become fatal.

R. ficaria, Pilewort, has a root with fasciculated tubers, cordate stalked leaves, angular, or crenate, or leafy; single flowered stem, usually three sepals, and smooth blunt carpels. The flowers are golden yellow, and it is native throughout the whole of Europe in meadows, bushy places, and about hedge-banks; it is plentiful in Britain. The young leaves of this plant, according to Linnæus, are used as greens in Sweden. A notion that the root is efficacious in the cure of piles gives it its common English name. We usually find the flower closed from five to nine in the evening, and in wet weather. It is the χελιδόνιον of Theophrastus, *Hist. Plant.* 7, 14, and the χελιδόνιον μικρόν of Dioscorides, 2. 212, and of Pliny, *Hist. Nat.* 258.

R. arvensis, Corn Crowfoot, has a fibrous root, the radical leaves 3-cleft, dentate, the stem-leaves once or twice ternate, with linear lanceolate segments, the calyx erecto-patent, the carpels margined, beaked, and spinous; the flowers are pale yellow. It is native throughout Europe, in North America and Great Britain. It is very acrid and dangerous to cattle, though they are said to eat it greedily.

M. Brugnon, who has given a particular account of its qualities, relates that three ounces of the juice killed a dog in four minutes. Several sheep were killed by eating this herb at Turin, which first led to an investigation of the matter.

R. bulbosus, like others of the genus, is extremely acrid, and raises blisters and produces extensive inflammation of the skin. Gilibert states that it vesicates with less pain than cantharides and without affecting the urinary passages.

R. asiaticus, common Garden Ranunculus, has ternate or riternate leaves, the segments toothed or deeply trifid, the stem erect, simple, or branched at the base, the calyx spreading, efterwards reflexed, the spikes of the carpels cylindrical. It is a native of the Levant, and is referred to by Dioscorides, 2. 206. Three varieties of this favourite plant in our gardens have been described, which some have regarded as species:—1. *R. a. vulgaris*, with the stem branched at the bottom, the leaves ternate, the segments trifid, cut, acute. The flowers of this variety are generally formed double, and heve all colours except blue. It is called the Persian Ranunculus. 2. *R. a. sanguineus*, with e simple stem, ternate leaves, aud obtuse toothed segments. The flowers are orange or yellow. This is called the Turkey Ranunculus. 3. *R. a. tenuilobus*, with e somewhat branched stem, end multifid leaves with linear ecute lobes. It is e native of the island of Cyprus, and has white or yellow or purple flowers.

The Garden Ranunculus is a florist's plant, and has been cultiveted with great care. The garden varieties of this species are very numerous, as no two plants produce flowers precisely alike. Maddock, who wrote on these plants, had e collection of 800 varieties, all with proper names. In judging of e Ranunculus the following qualities are desirable:—'The flowers should be of a hemispherical form, et least two inches in diameter, consisting of numerous petals, gradually diminishing in size to the centre, lying over cach other, so as neither to be too close nor too much separated, but having more of a perpendicular than a horizontal direction, in order to display the colours with better effect. The petals with entire well-rounded edges, their colours dark, cleer, rich, or brilliant, either of one colour or variously diversified on en ash, white, sulphur or fire-coloured ground, or else regularly striped, spotted or mottled in an elegant menner.' (Geo. Don.) In cultivation this plant prefers a rich losmy soil, which should be well manured, and it is customary when forming beds for it to place e layer of well-rotted cow-dung seven or eight inches below the surface. They are usually propagated by dividing the roots, which mey cither be planted in November or March. The former is the best time, but the roots should then be mulched. In order to obtain varieties, seeds should be obtained from the single or semidouble plants, and planted in August. The following year, when their leeves drop off, the roots should be taken up and dried in the same manner as the old roots, and planted with them in November.

The *R. lanuginosus* of Linnæus is the *βατράχιον ἕτερον χνοωδέστερον* of Dioscorides, loc. cit. The *R muricatus*, Linn. is the *βατράχιον τρίτον* of Discorides, loc. cit.

(Don, *Gardener's Dictionary*; Lindley, *Flora Medica*; Fraas, *Synopsis Floræ Classicæ Plantarum*; Burnett, *Outlines of Botany*.)

RAPHIOSAU'RUS, e genus of fossil Reptiles from the lower parts of the Cretaceous system. (Owen.)

RAPE. [Rape, P. C.; Law, Criminal, P. C. S.]

RASK, RASMUS CHRISTIAN, one of the most distinguished linguists of modern times, was born on the 2nd of November, 1787, at Brendekilde, near Odense, in the island of Fyen, or Funen, in the kingdom of Denmark. His parents were poor people, but the boy's talents and inclinations procured him friends who afforded him the means of prosecuting his favourite studies in the university of Copenhagen. He efterwards spent some time in Iceland, and also made journeys to Sweden, Finland, and Russia for the purpose of increasing his knowledge of languages, for which he had a very extraordinary talent. In 1808 he obtained e situation connected with the university library at Copenhagen, and he availed himself of the opportunity by making himself acquainted with the most ancient documents of northern history and literature. His knowledge of languages led him to devote himself to comparative philology, to search after the connecting links and trace them to their common origin; and in order to complete this branch of study, he undertook in 1817, with the support of the Danish government, a journey to Russia, whence he proceeded in 1819 to Persie. He made some stay at Teheran, Persepolis, and Shiras, and in 1820 went to Indie, from whence he returned in 1822 to his native country. In this expedition he had purchased for the Copenhagen library 113 encient and rare oriental manuscripts, among which those in the Pali language were the most valuable. Soon after his return he was invited to e professorship in the university of Edinburgh, but as he declined the offer, he was appointed professor of the history of literature in the university of Copenhagen. The king had promised him his support, if Rask would prosecute his oriental studies, but for some time he neglected them, and devoted his time to an analysis of the Danish language. In 1827, however, he returned to his oriental pursuits, and wrote on Egyptian and Hebrew chronology, and on the age and authenticity of the Zend a Vesta. In the meantime he had become president of the Icelandic society of literature, and of the society for the investigation of northern antiquities, and he took en active part in the management and editorship of the journals of these societies. At the same time he was engaged in the preparation of an Armenian Dictionary, an Italian, Low German, and English Grammar. In 1829 he was eppointed professor of oriental lenguages and chief librarian of the university library. Henceforth his ettention was engaged almost exclusively by the eastern languages, but his edition of Lokman's Fables, Copenhagen, 1832, shows thet his knowledge of Arabic was very deficient; and it may be said in general that, as far as the oriental languages are concerned, he had more skill in general comparisons and investigations of their grammatical structure than an exect knowledge of any particular language. His works show that there was scarcely a language worth studying of which he had not some knowledge: and all the civilized languages of Europe were almost as familiar to him as his own mother-tongue, and his knowledge of the northern languages is unrivelled. He died at Copenhagen on the 14th of November, 1832, and his numerous MSS. relating to philology were given up by his relatives to the king's library at Copenhagen.

The principal works of Rask are, 1. An Introdnction to the study of the Icelendic and antient Northern Languages, Copenhagen, 1811; 2. An Anglo-Saxon Grammer, Stockholm, 1817, one of his best works, has been translated into German end English; 3. Investigations concerning the Origin of the antient Northern or Icelandic Language, Copenhagen, 1814; 4. An edition of Björn Haldorsen's Icelandic Dictionary, Copenhagen, 1814; 5. A Spanish Grammar, Copenhagen, 1824; 6. A Frisian Grammar, Copenhagen, 1825; 7. An attempt to reduce the Orthogrsphy of the Danish Language to Principles, Copenhagen, 1826, is a strange work in which Rask attempted to introduce a complete reform in Daniah orthography. He did not succeed in his ettempt, but the work is full of the most extraordinary linguistic learning; 8. On the age end authenticity of the Zend a Vesta, Copenhagen, 1826, was transleted into German by F. H. von der Hagen, Berlin, 1826; 9. A small Grammar and Vocabulary of the Acra Language. In the last year of his life he finished e very complete Grammar of the Language of Lapland. A number of essays on linguistic subjects appeared in various journals, and in Vater's 'Vergleichungststfeln,' there is one on 'Die Thrakische Sprachclasse,' which is of great importance and interest. Comparative philology is greatly indebted to Rask, for he was the first who pointed out the connexion between the ancient northern and Gothic on the one hand, and of the Lithuanian, Sclavonic, Greek, and Latin on the other hand. (*Zeitgenossen*, third Series, No. xxxvii.)

RATIO, COMPOSITION OF. To the few worda which are said on this subject in Ratio, P. C., p. 309, it will be worth while to edd considerable development. The idea implied in composition of ratio is very imperfectly treated in Euclid: and yet upon the correct understanding of it depends whether the boasted victory over the difficultics of incommensurables which the fifth book gives is real or imaginary.

In every metter connected with elementary geometry, confusion mey and often does arise from mixing together criticisms of two different kinds; on Euclid as a writer, and on the subject as a matter of thought. To avoid such confusion in the present instance, we shall begin with the consideration of what we find in Euclid—not in Simson's Euclid, nor Pleyfair's Euclid—but in Euclid of Alexandria.

There is nothing on ratio compounded (*συγκειμένος*) of ratios in the fifth book; the word transleted composition (*σύνθεσις*) refers to such a process as the formation of the ratio of A+B to B from that of A to B. But the definitions of duplicate, triplicate, &c. ratio are laid down; which, as we shall see, are particular cases of compounded ratios. These definitions are as follows:—if A, B, C, D, &c., be in continued proportion, so thet as A to B, so B to C, C to D, and so on, then the ratio of A to C is called the duplicate ratio of that of A to B, the ratio of A to D is called the triplicete ratio of A to B, and so on.

In one proposition, and in one only, is the phrase composition of ratios used: in the 23rd of the sixth book, where it is said 'Equiangular parallelograms heve to one anoth r the *ratio compounded of the sides*.' There is no definition at least, it is now so supposed; here however we must refer to our next paragraph) given of the words in italics, and on looking into the demonstration of the proposition, we find we must assume, as a matter of phraseology merely, that of any three quantities of the same kind, K, L, M, we are to say the ratio of K to M is compounded of the ratios of K to L and of L to M. And further that if A be to B as K to L, and V to W as L to M, then the ratio of K to M is to be said to be the ratio compounded of the ratios of A to B and of V to W. If there be anything more than mere phraseology in this, it must be because Euclid makes a tacit reference to some arithmetical system current in his time.

It is true that there is found in a great preponderance of manuscripts (in all, we believe) a definition of compound ratio. It is among the definitions of the sixth book, and literally translated* is as follows:—'A ratio is said to be compounded of ratios, when the πηλικότητες of the ratios multiplied together make a certain [ratio].' On the word left untranslated (which, we believe, must be translated by *quantuplicities*), we refer to Ratio, P. C. This definition is admitted into the editions of Basle and Oxford, and into Briggs's edition of the six books. Peyrard has omitted it in the Paris edition, because, in his celebrated Vatican manuscript, it is not in the text, but has been added at the side. The Berlin editor admits it in parentheses as a disputable passage. Set a scholar to make the text of Euclid from the ordinary mode of weighing the evidence of manuscripts, and there is little doubt this definition must appear as a part of the elements. Set a geometrical reasoner to settle the question by the internal evidence of the passage, and its keeping with the rest of the book, and there is as little doubt that it would be rejected. The meaning of the passage is, apparently, that if two ratios be expressed numerically, as those of 7 to 4 and 6 to 11, the ratio compounded of those ratios is to be the ratio of 7×6 to 4×11; or possibly, that, expressing the above ratios as those of $\frac{7}{4}$ to 1, and $\frac{6}{11}$ to 1, the compounded ratio is that of $\frac{7}{4} \times \frac{6}{11}$ to 1.

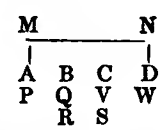
In the early translations from the Arabic, the definition is omitted, and reference is made in demonstrating vi. 23 to a note inserted among the definitions of the fifth book, which is very insufficient. But the phrase there is that the ratio of f to h is *produced* from those of f to g and g to h: and to the definitions of the seventh book several are added, one of which is, that in a series of numbers the ratio of the first to the last is produced from the successive ratios of each to the one following.

In many manuscripts there is a scholium preceding the sixth book, which August, the Berlin editor, though not admitting it into Euclid, thinks must be of high antiquity; in which we fully agree with him. It is to be found in the Basle edition, and in the notes to the Berlin. This scholium, while it gives confirmation to the preceding view (which hardly wants it), takes the same side on the meaning of the word πηλικότης as we have done. [Ratio, P. C.] And we find that Wallis was the person who suggested to Gregory *quantuplicitas* instead of *quantitas* as the translation. See his discussion of this point at length in his English Algebra (1684), ch. 19 and 20; revised in his Latin Algebra (Works, vol. ii. ch. 19, 20), and again at p. 665 of the same volume, where there is a defence of this definition against Henry Savile, who (*Prælect. in Eucl.*) had considered it as a great defect. To the text of Euclid we have only further to say, that this consent of Savile, Wallis, and Gregory, as to the genuineness of the definition in question, is of great weight. But with regard to the matter of the definition we agree entirely with Savile. The word πηλικότης needs definition quite as much as the term *composition of ratios* itself. This definition, it will be observed, either restricts the composition to ratios which are of commensurable magnitudes, or implies and assumes the multiplication of two interminable decimal fractions. An old scholiast on Euclid (cited from Dasypodius by Meibomius and Wallis) is of opinion that πηλικότης is used rather than the more natural word ποσότης, precisely that it may be understood in a wider sense, so as to include fractional and incommensurable ratios. That is, as Wallis expresses it, *how-much-fold* is used instead of *how-many-fold*, that *much* may suggest the idea of a part of a time (commensurable or not) where *many* would only suggest that of an integer. We cannot much admire this refinement; nor does it give any help: for the introduction of the idea of *incommensurability* numerically expressed, so as to be fit for arithmetical multiplication, would vitiate Euclid's whole system of proportion.

But the oldest testimony, both to the existence of the definition, and the meaning of the disputed word, is Eutocius, in his commentary on book ii. prop. 5 (of Torelli, 4 of preceding editors). He here cites, expressly from the elements, the definition as given; and adds, as the explanation of πηλικότης, that it is the number which, by multiplication, turns the consequent into the antecedent. This number, he says, gives name to the ratio, and he cites Nicomachus and Heron as understanding it in the same way. But, he goes on to say, the word is more properly taken when this number is an integer.

Leaving now out of view what Euclid really did write, we shall proceed to consider the subject of composition of ratios, so as to supply what, on any supposition, must be acknowledged to be wanted in the elements. The notion of a ratio is easily and almost necessarily connected with the idea of alteration *in that ratio*. We cannot express a ratio without two magnitudes, the first of which, altered in the ratio given, becomes the second. If we want to alter in the ratio of P to Q, this is easily done when the quantity to be altered is P; for then the process is only writing Q instead of P. But if the quantity be A, then B must be found, so that A and B shall have the same ratio as P and Q.

If it be a numerical ratio which we consider, say that of 3 to 5, alteration of any number in that ratio implies that we change all its *threes* into *fives*, and any remaining fraction of three into the same fraction of five. Alteration of any magnitude, say a length, in that ratio implies that, choosing any length as a measure, we alter every three such lengths which the given magnitude contains into five, and every fraction of three into the same fraction of five. This amounts to changing the number or magnitude into five-thirds of what it was; and generally, alteration in the ratio of a to b (numbers) is nothing but multiplication by $\frac{b}{a}$



Take a magnitude A, alter it in the ratio of P to Q; say that it then becomes B; that is, A is to B as P to Q. Take the magnitude we left off with, B, alter it in the ratio of R to S, making it C. Take C, alter it the ratio of V to W, making it D. Then at three processes, by three successive alterations dictated by given ratios, we have changed A into D, or have altered A in the ratio of A to D. Say that the ratio of A to D is simply expressed by that of M to N. Then, if we begin with A, and alter it at once in the ratio of M to N, we change it into D, producing the same effect as if we had successively altered in the ratios of P to Q, R to S, and V to W. Hence the ratio of M to N is properly said to be compounded of the ratios of P to Q, R to S, and V to W: it dictates the alteration which will produce at once the effect of the three alterations prescribed by the three other ratios. In like manner, we say in addition, that 10 is compounded of 6 and 4; for addition of 10 is equivalent to the addition of 6 and of 4. In multiplication we say that 24 is compounded of 6 and 4. And generally, the compound should be defined as that which produces the united effect of all the components, when both components and compound are used in the same way. Euclid, vi. 23, is now more than a mere addition to the phraseology of geometry. The parallelograms ABCD and EFGH [the reader may draw the figure for himself] being equiangular, it tells us that if we take any magnitude and alter it in the ratio of AC to EG, and then alter the result in the ratio of AB to EF, the change thus made at two steps might be made in one by altering the original magnitude in the ratio of the area ABCD to the area EFGH.

This process applies equally to commensurable and incommensurable ratios; but in the former case of course the arithmetical substitute for composition of ratios is easy. We want to compound the ratios of m to n and of a to b, all four

*Λόγος ἐκ λόγων συγκεῖσθαι λέγεται ὅταν αἱ τῶν λόγων πηλικότητες ἐφ' ἑαυτὰς πολλαπλασιασθεῖσαι ποιῶσί τινα. The Scholium presently cited gives it with λόγον for τινα in one place, and πηλικότητα λόγου in another.

being integer numbers: it being known that every commensurable ratio is expressible by the ratio of two integer numbers. Take any magnitude P, and alter it in the ratio of m to n: it becomes n-$m$ths of P. Alter this in the ratio of a to b: we have then b-$a$ths of n-$m$ths of P, or bn-amths of P, which would also be obtained by altering P in the ratio of $a \times m$ to $b \times n$. Hence composition of numerical ratios is performed by multiplication of the antecedents for an antecedent, and of the consequents for a consequent. The process then is merely equivalent to that of the multiplication of fractions. If $\frac{n}{m}$ and $\frac{b}{a}$ were called the quantuplicities (πηλικότητες) of the ratios, then the quantuplicity of the compound ratio is the product of the quantuplicities of the components, as in the definition (be it Euclid's or no) which is found in the manuscripts of the elements.

Duplicate ratio (διπλασίων λόγος) has been defined by Euclid in the manner hereinbefore given. But it is in fact the ratio arising from the composition of two equal ratios. Suppose we want to compound the ratio of P to Q with the ratio of P to Q. Take a magnitude to begin with, which may as well be P itself: alter it in the ratio of P to Q; it then becomes Q. Alter Q into R in the ratio of P to Q; that is, let R be a third proportional to P and Q. Then P is changed into R at these two steps, each involving an alteration in the ratio of P to Q: hence Euclid's duplicate ratio is the ratio compounded of two equal ratios; and, similarly, triplicate ratio (τριπλασίων) is that compounded of three equal ratios, and so on.

The subduplicate, subtriplicate, sesquiplicate, &c. ratios, which later geometers used, completed that language of multiplication and division applied to operations of powers and roots which finally suggested the idea of logarithms. [See also ADDITION OF RATIOS, P. C.]

The propositions requisite for the establishment of the direct use of compound ratio are contained in the fifth book. But in the inverse use there is a manifest hiatus in the converse part of vi. 22. It is supplied by a lemma added at the end of the proposition; which is found in almost all the manuscripts (even in the Vatican manuscript, and Peyrard admits it accordingly). This is a pretty sure sign that Euclid did not give the lemma; for he never refers to anything which is to come after what he has in hand. Robert Simson omits this lemma, and so leaves the proposition undemonstrated. What is wanted is the following:—It is impossible that the same ratio should be the duplicate ratio of two different ratios; or, if A be to B in the duplicate ratio of A to X, and also in the duplicate ratio of A to Y, then X and Y must be equal. If possible, let them be unequal; say that X is the greater:

A X B
A Y B

Then because X is greater than Y, the ratio of A to X is less than that of A to Y. But the ratio of A to X is that of X to B; and the ratio of A to Y is that of Y to B; therefore the ratio of X to B is less than that of Y to B. Therefore X is less than Y; but it is also greater, which is absurd. Consequently X and Y cannot be unequal, &c. By a continuation of this process it may easily be established that a given ratio can only be the triplicate of one ratio, only the quadruplicate of one, and so on.

It is unnecessary to say anything on the *decomposition* of ratios. Clear as it becomes in arithmetic, after a while, that every multiplication is a division and every division a multiplication, it is much clearer from the beginning, in this subject, that every composition is a decomposition, and every decomposition a composition. Suppose that P to Q is the ratio compounded of A to B and C to D, and we wish to return back again to the ratio of A to B. We must compound the ratio of P to Q with that of D to C; for it is easily made obvious that the ratios of C to D and D to C compounded give the ratio of a magnitude to itself, the ratio of equality, the use of which effects no alteration.

It is now easy to see that all the operations of algebra which spring from multiplication inclusive, must be represented in geometry by operations of composition, &c. Robert Simson, who, as we have seen, has left a demonstration of the sixth book absolutely unfinished, though "Theon or some unskilful commentator" had provided a lemma which supplied what was wanting, has thought it necessary to add some very complicated propositions on compound ratio at the end of the fifth book. If they were intended as illustrations of the great difficulty of rendering the commonest propositions of algebra into geometrical language (and what else could have been meant it is hard to imagine) the algebraical equivalents should have been introduced. Take the proposition K, for instance, which it may safely be asserted no beginner ever fathomed. The following is an arithmetical case of it. If

$$\frac{a}{b}\cdot\frac{c}{d}\cdot\frac{e}{f}\cdot\frac{g}{h} = \frac{i}{k}\cdot\frac{l}{m}\cdot\frac{n}{o}$$

$$\text{And } \frac{a}{b}\cdot\frac{c}{d} = \frac{i}{k}\cdot\frac{l}{m}$$

$$\text{Then } \frac{e}{f}\cdot\frac{g}{h} = \frac{n}{o}$$

REAUMURIACEÆ, a natural order of plants belonging to the Exogenous class. It has a 5-parted calyx, surrounded externally by imbricated bracts; 5 petals, hypogynous, unequal-sided, sometimes having a pair of membranous plates planted upon their middle; definite or indefinite hypogynous, monadelphous, or polyadelphous stamens, with or without a hypogynous disk; the anthers ovate, turned inwards, and bursting longitudinally; 2-4-5 carpels, partially separate from each other, surrounding a central placenta which passes into the base of each; 2 or 4 ascending anatropal ovules, with filiform or subulate styles; a capsular fruit with 2 to 5 valves and as many cells, unless the number is diminished by abortion; shaggy definite erect seeds, with a straight embryo surrounded by a small quantity of mealy albumen, and the radicle next the hilum. The species of this order are small shrubs, with fleshy scale-like leaves, which are alternate and have no stipules, and are overspread by resinous sunk glands.

This little order consists of three genera, Reaumuria, Hololachna, and Eichwaldia, which were formerly referred to Tamaricaceæ; they have, however, but little affinity with that order. Their true affinities seem to be with Hypericaceæ, near to which Lindley has placed them. The species are generally natives of the coast of the Mediterranean, and of salt plains in the milder parts of northern Asia.

The genus *Reaumuria* was named by Haselquist in honour of René Antoine Ferchault de Reaumur. [REAUMUR, P. C.] It has a 5-parted involucred calyx; 5 petals, permanent, furnished at the base on each side with a ciliated appendage; numerous pentadelphous stamens; 5-6 stigmas; a 5-valved 5-celled capsule, with valves easily separating from the septa, and shaggy seeds.

R. vermiculata has subulate semiterete imbricated leaves, crowded on the branches. It is a native of Sicily, Bombay, and Egypt. This plant resembles Salsola fruticosa. It is used at Alexandria as a remedy for the itch, being bruised and applied externally, and a decoction taken internally.

R. hypericoides has lanceolate flat rather remote leaves. It is a native of Syria and Persia. These plants are elegant little shrubs of easy culture, which thrive well in a mixture of sandy loam and peat; and young cuttings will grow freely in sand under a hand-glass.

Hololachna (from ὅλος, 'entire,' and λάχνη, 'wool,' or 'thick hair') has a 4-5 parted calyx; 4-5 petals; 8-10 hypogynous monadelphous stamens inserted into an hypogynous gland; 2-4 short subulate styles; the capsule 2-4 angled, 2-4 valved, 2-4 celled; the seeds few, large, surface shaggy. The only species is *H. Songarica*, found by Ehrenberg in the Soongarian desert of Siberia. In cultivation this plant requires to be watered with salt-water. All the plants of this order abound in saline matter in their tissues.

(Lindley, *Vegetable Kingdom*; Don, *Gardener's Dictionary*; Lindley, *Flora Medica*.)

REBATE is the old English word for DISCOUNT [P. C.]. The discounting of a sum of money, or the paying something less for it before it becomes due, is now always done by striking off a certain per centage from the sum. Thus, if a sum be due a year hence, say 100*l*., discounting at five per cent. means paying 95*l*. now in lieu of 100*l*. a year hence.

There are one or two old difficulties connected with discount, which we intended, and omitted, to notice under other heads. The first is that of the *equation of payments*. Were it not for the difficulty, and its principle, this would not be worth notice. It was at one time the custom of the works on arithmetic to point out, when sums of money are due at different times, at what time the total amount is to be paid at once, in such manner that the receiver may gain, by the sums which are prepaid, what he loses by those which are overdue.

To take a simple case, say it is nnderstood that money makes five per cent. simple interest, that 100*l.* is due in three years, and 300*l.* more in seven years. The first rule that was given leads, as the reader knows, to the payment of the whole 400*l.* in six years; by which the interest on 300*l.* paid a year before its time balances that on 100*l.* paid threo years after its time. But this, it is said, was not fair; for not interest, but discount, should be allowed for the sum paid before it is due. That is, the 400*l.* paid at the intermediate time should yield 100*l.* due + interest on it since it was due + a sum which pnt out to interest will mako the 300*l.* at the end of the seven years. The rule for this case gives a result 5·9615574 years, instead of six years; which will be found to satisfy the conditions.

In truth, however, it depends entirely upon what the notion of fairness is, whether one rule is better than the other, or whether either will do. And it must be remembered that *simple interest* is a fiction in real business. A creditor cannot demand more than simple interest by law; but it does not therefore follow that because certain money is paid under the name of interest, the receiver will let it lie barren in a bag. But what we say is this: keep to the fiction on which both rules are constructed, let all interest-money remain barren, and the two rules will come to the same thing in the end. And it is not fair to construct rules on the supposition of simple interest, and then to complain of the inaptitude of these rules to represent the results of real business. Remaining by simple interest, let us see how tho receiver will stand at the end of the seven years, upon the different suppositions:—

1. If no equation of payments be made, he will have 100*l.* + four years' interest + 300*l.* just received, 420*l.* in all, with which he is to go on making interest on 400*l.* only.

2. If he receive by the first rule 400*l.* at the end of six years, he will at the end of the seventh year have 420*l.*, of which 400*l.* is to go on at interest as before.

3. If he receive by the second rule he will have at the end of the seventh year (100*l.* + 2·961... years' interest) which he received + 1·038... years' interest which he makes on the 100*l.* (the other part not making interest) + the sum which will in 1·038... years yield 300*l.* (285·19*l.*...) + the interest on this. That is, 420*l.* altogether, of which 20*l.* is interest only: for the last-mentioned item, though gained in the manner of interest, is discount intended to make up a *principal.* Or, if any one will not admit this last distinction, then the most approved rule puts the receiver in a worse position than the old rule.

The fact is, that if equation of payments were ever made, it ought to be supposed that all money, principal and interest, becomes productive money to the receiver from the moment it is received: or compound interest should be supposed. This puts the parties into a state of eqnity at all times, both during the longest term of debt and after. To show this, suppose that A is due at the end of a years and B at the end of b years, interest being r per pound. To satisfy this debt by a sum A+B paid at x years from this time, the equation to determine x is

$$A+B=A(1+r)^{x-a}+\frac{B}{(1+r)^{b-x}}$$

and the receiver of the equated sum, m years after its receipt, or $x+m$ years from the present time, will have $(A+B)(1+r)^{m}$ which is

$$A(1+r)^{x+m-a}+B\frac{(1+r)^{m}}{(1+r)^{b-x}}$$

Or

$$A(1+r)^{x+m-a}+B(1+r)^{x+m-b}$$

And this is precisely what he would have had from the payments themselves. And the accumulations or present value of the equated sum are at all times equal to the accumulations or present values of the payments.

There is another remarkable case of the same kind, in which discount at simple interest is compared with notions derived from compound interest, and a rule is consequently said to be false which is, upon its own hypothesis, perfectly true. The value of an interminable annuity, calculated at simple interest, comes out infinitely great: or no sum is large enough to pay t. Now it is clear that 20*l.* will pay an annuity of 1*l.* a year at five per cent. for ever. And this may even be called simple interest, for at the end of a year the interest of the 20*l.* is paid away, and the original principal only remains: so that there is no interest upon interest. But the truth is, that in the construction of all rules at simple interest, the money is arbitrarily divided into two parts, productive and unproductive, and a rule which expressly requires payment to be made from time to time out of the productive part, may produce very different results from another in which the unproductive part is paid away first. Now take the case of an annuity for three years, of 1*l.*, money making r per pound. The ordinary rule gives

$$(1+r)^{-1}+(1+2r)^{-1}+(1+3r)^{-1}$$

At the end of a year, this becomes

$$1+\frac{1+r}{1+2r}+\frac{1+r}{1+3r}$$

The first term 1 is partly principal, partly interest: and 1*l.* of annuity has become due. But the manner in which the rule was framed does not allow us to pay away the $r(1+2r)^{-1}$ and $r(1+3r)^{-1}$, which are never to make interest again, in part of the first year's annuity, but requires that the 1, part of which will make interest, should all be so paid. And, when the productive money is broken in upon before the unproductive is all gone, it is perfectly true that no sum is large enough to pay a perpetual annuity: and, if this be done, not only may the rule for a perpetual annuity be objected to, but with as much justice that for a finite term of years. For instance, at 10 per cent., an annuity of 1*l.* for five years, is worth, according to the usual simple-interest suppositions, 3·89261*l.* A year's interest is ·389261*l.*; let this all be paid away, and the balance of 1*l.* made up out of the principal, and so on, and it will be found that there is a sum in hand at the end of the ten years: in fact 3·79079*l.* will in this way be enough to meet all demands. But the manner in which the rule is constructed supposes the annual demands to be made up out of principal and interest in the following way, the sums before the lines showing how the pound yearly accruing due is raised, partly out of principal, partly out of interest:—

	Principal.		Interest.	
	3·89261		·38926	
Pay	·90909	+	·09091	= £1.
	2·98352		·29835	
			·29835	
Pay	·83333	+	·16667	= £1.
	2·15019		·43003	
			·21502	
Pay	·76923	+	·23077	= £1.
	1·38096		·41428	
			·13810	
Pay	·71429	+	·28571	= £1.
	·66667		·26667	
			·06667	
Pay	·66667	+	·33333	= £1.
	·00000		·00001	

While if interest were made to go as far as it could, we should have

3·89261		
·38926		
3·28187	after paying £1.	
·32819		
2·61006	do.	do.
·26101		
1·87107	do.	do.
·18711		
1·05818	do.	do.
·10582		
·16400	do.	do.

So that there would remain ·164*l.*

The truth is, that the rule for annuities by discounting at simple interest *is* wrong except upon the condition that principal and interest are to be rated in a specified way (which those who understand the formula will easily collect) to meet the accruing demands. And moreover, when interest is to be all disposed of first, before any principal is touched, *the rules for simple and compound interest are identical.*

RECEPTACULITES, a genus of fossils proposed by Defrance, synonymous with Ischadites of Murchison.

RECORD. [Pleading, P. C.]

REFINING is a term applied to various processes in the useful arts, and especially in metallurgy, whereby the substances acted upon are purified by the chemical separation of dross and impurities, and of such foreign matters as may be in combination with them. The refining of metals generally is treated of under Assaying, P. C., p. 495; and further particulars respecting the refining of the more important metals are given under Copper, P. C., p. 502; Iron, P. C., p. 34; Lead, P. C., p. 371; Silver, P. C., p. 23; and Tin, P. C., p. 472. Some writers apply the name of refining to the preparation of cast-steel, noticed under Steel, P. C., p. 3; a process which is certainly analogous, in many respects, to the processes to which that name is more usually limited. The term is applied to the purification of sugar, of which process an account is given under Sugar, P. C., p. 231.

REFLECTION. [Light, P. C.; Optics, P. C.]

REFRACTION, DOUBLE. [Polarization of Light, P. C.]

REFUGE, HARBOURS OF. In the year 1840 a Commission was appointed 'to visit the coast between the mouth of the Thames and Selsea Bill; to examine the ports with reference to their being available as places of shelter for vessels passing through the Channel in cases of distress from weather, and also as places of refuge for merchant vessels from enemies' cruisers in time of war, and more especially as to their being made stations for armed steamers employed for the protection of our trade in the narrow parts of the Channel.' The Commission made a Report, but no measures appear to have been taken in consequence.

A Select Committee of the House of Commons on Shipwrecks, in a Report presented in 1843, recommended the formation of Harbours of Refuge in the British Channel, at the same time stating that they refrained from pointing out any particular situations for such harbours, from a conviction that such situations would be best decided on by a body of scientific and experienced persons whose attention should be specially and exclusively directed to the subject.

On the 2nd of April, 1844, the Lords of the Treasury, on the suggestion of Sir Robert Peel, then First Lord of the Treasury, apppointed a commission consisting of twelve experienced naval and military officers and civil engineers to inquire into the most eligible situations for a Harbour or Harbours of Refuge in the Channel.

The Report of the Commissioners is dated August 7, 1844, and was presented to the House of Commons pursuant to an address dated March 6, 1845. The Treasury Minute under which the Commissioners acted assigned three principal objects of investigation:—1, the selection or formation of Harbours of Refuge for the safety and convenience of vessels navigating the Channel; 2, that in times of war, such harbours might become stations for ships of war; 3, the expense of constructing new works, as compared with the public advantages likely to result from such works. The Commissioners express their unanimous conviction that additional means of protection for the south-eastern coast of England are absolutely necessary. The harbours between Portsmouth and the Thames are only tidal harbours, and none of them is at present accessible to large steamers. The Report recommends certain ports and positions as Harbours of Refuge and Roadsteads, and certain breakwaters and military defences in connexion with them, so as not only to afford shelter to merchant ships, but by means of which, with the advantages of steam by sea, and railroads and telegraphic communication by land, the naval and military force of the country may be thrown on any point of the south-eastern coast in a few hours.

The following harbours and positions were especially examined:—Foreness, near the North Foreland; Ramsgate; the Brake, or Small Downs; Dover; Dungeness; Beachy Head, East Bourne, and Seaford; Newhaven; Portland and Weymouth; Harwich Harbour. Of these places four are selected, Dover, Seaford, Portland, and Harwich, of which the Commissioners estimate the expense required for the construction of the works which they recommend as follows:—Dover, 2,500,000*l.*; Seaford, 1,250,000*l.*; Portland, 500,000*l.*; Harwich, 50,000*l.* It is recommended that Dover Bay should be converted into a large harbour by means of breakwaters, with an area of 520 acres up to low-water mark, and an entrance 700 feet wide on the south front and another 150 feet wide at the east end. Its situation, four miles and a half from the Goodwin Sands and standing out favourably to protect the navigation of the narrow seas, is peculiarly suitable as a station for a squadron of ships of war. It is recommended to construct a breakwater in Seaford Road, for the protection of trade and as a station for armed vessels. Portland, as the boundary of the narrow part of the Channel, and with reference to the Channel Islands, is recommended as another station for a squadron. The construction of a breakwater there, it is stated, would be easy, cheap, and expeditious, as a large part of the island facing the bay is crown property, and contains abundance of stone: the holding-ground is exceedingly good, and the island has abundance of water for the supply of ships. The island has great natural advantages for defence, and for the formation of a naval and military depôt during war to any extent that may be required. Harwich Harbour, formed by the junction of the rivers Stour and Orwell, is stated to have sufficient depth of water and good holding-ground over an extent capable of containing many hundred ships. By the construction of a breakwater and dredging to get rid of certain shoals, the Commissioners consider that it might be converted into one of the finest and most useful harbours in the kingdom.

The military members of the Commission recommend that casemated batteries be constructed on the breakwaters themselves, supported by defences on the shore flanking the approaches to the breakwaters and harbours.

At the end of the Report, W. Symonds, Surveyor of the Navy, says, 'I dissent from this Report, because I consider the mass of evidence to be in favour of Dungeness, and because I cannot recommend a large close harbour at Dover, where the pilots consider the holding-ground generally indifferent, and the engineers say it will silt up.' With respect to Dungeness, the Commissioners say that it is remarkable for its good holding-ground, and that 300 sail have been well sheltered in the East Bay at one time, and that more than 100 vessels were at anchor in the West Bay a few days before the Commission arrived there. As however it has not the advantage of an inner harbour like Dover, Seaford, and Portland, the commissioners do not recommend any breakwater to be constructed, but prefer leaving it as it is, to be used as a roadstead for merchant-ships and ships of war. The holding-ground in Dover Bay was tested by Captain Washington in the steam-vessel Blazer of 500 tons burthen and 150 horse-power, and the results were satisfactory. As to the probability of silting, samples of the water, taken up at different times of tide and different depths, were examined by Mr. Phillips, of the Museum of Economic Geology, as to the quantity of matter held in suspension. The impurity of the sea-water, as compared with the water of the Thames taken up at Brentford, Hammersmith, and Chelsea, was, taking the mean of the experiments on each side, as 16 to 5. The Commissioners recommend further experiments as to the probability of silting in Dover Bay before anything is determined on.

The Commission of 1840 recommended three places as suitable for Harbours of Refuge—Dover, as first in importance; Beachy-Head, as second; and Foreness, as third.

(*Report of the Commissioners upon the Subject of Harbours of Refuge*, 1845.)

REGISTRATION OF BIRTHS, DEATHS, AND MARRIAGES. Parish registers were not kept in England till after the dissolution of the monasteries. The 12th article of the injunctions issued by Cromwell, Henry the Eighth's secretary, in 1538, directs that every clergyman shall, for every church, keep a book wherein he shall register weekly every marriage, christening, and death, any neglect being made penal. In the first year of the reign of Edward VI. (1547) ecclesiastical visitors were sent through the different dioceses in order to enforce various injunctions, and, among others, that of Cromwell with respect to parish registers. In the beginning of Elizabeth's reign this injunction was repeated, when the clergy were required to make a protestation in which, among other things, they promised to keep the register-book in a proper and regular manner. In 1694 an Act (6 & 7 Wm. III. c. 6) for a general registration of marriages, births, and deaths, was passed merely for purposes of revenue: it is entitled 'An Act for granting to his Majesty certain rates and duties upon Marriages, Births, and Burials, and upon bachelors and widowers, for the term of five years, for carrying on the war against France with vigour.' It is a very long Act, in which the duties are minutely set down. A supplementary Act was passed (9 Wm. III. c. 32), entitled 'An Act for preventing frauds and abuses in the charging, collecting, and paying the duties upon marriages, births, burials, bachelors, and widowers.' The 52 Geo. III. c. 146 (28 July, 1812) entitled 'An Act for the better regulating and preserving parish and other registers of births, baptisms, marriages, and burials, in England,' made some alteration in the law, chiefly with reference to having the books made of parchment or strong paper, and to their being kept in dry and well-painted iron chests.

The Registration Act (6 & 7 Wm. IV. c. 86: 17 Aug., 1836), entitled 'An Act for registering Births, Deaths, and Marriages, in England,' came into operation July 1, 1837. By the 44th section of the 6 & 7 Wm. IV. c. 85, entitled 'An Act for Marriages in England,' the provisions of this Registration Act are extended to the Marriage Act.

The most important provisions of this Registration Act are the following:—A general registry-office is to be provided in London and Westminster (§ 2). Lord Treasurer and Lords Commissioners of his Majesty's Treasury to appoint officers, and fix salaries, to be paid out of the consolidated fund (§§ 3 and 4). Regulations for conduct of officers to be framed under direction of the Secretary of State (§ 5). Annual abstract of registers to be laid before parliament (§ 6). The guardians of the poor of a union or parish shall, on the 1st of October, 1836, if the board is established at the passing of the Act, or, if not, within three months after its establishment, divide the union or parish into districts as directed by the registrar-general, and appoint registrars and superintendent registrar, if the clerk of the guardians will not or cannot execute that office (§ 7). Register-offices to be provided in each union by the guardians, and to be under the care of the superintendent-registrar (§ 9). Temporary registrars and superintendent-registrars to be appointed, for parishes not having guardians under the Poor-law Act, by the Poor-law Commissioners; but in case of subsequent unions, previous appointments to be vacated (§§ 10 and 11). Deputy-registrars may be appointed by the registrars (§ 12). All books, &c. to be transferred on removal of registrar or superintendent, under a penalty of committal to gaol (§ 15). Registrar and deputy to dwell in the district, and their names and additions to be put on their dwelling-houses (§ 16). Register-books to be provided by the registrar-general, for making entries of all births, deaths, and marriages of his majesty's subjects in England, according to the forms of schedules (A, B, C) annexed to the Act (§ 17). Registrars authorised and required to inform themselves carefully of every birth and death which shall happen within their district after the first day of March, 1837, and to learn and register as soon after the event as conveniently may be done, without fee or reward, save as hereinafter mentioned, in one of the said books, the particulars required to be registered according to the forms of the said schedules (A and B) respectively, touching every such birth or every such death not already registered (§ 18). After March 1, 1837, parents and occupiers may within forty-two days after birth and five after death, give notice thereof to registrar; and owners and coroners must do so forthwith in cases of foundlings and exposed dead bodies (§ 19). Parents and occupiers, on being required by the registrar, within forty-two days, must give all the particulars required to be registered respecting birth (§ 20). Children born at sea must be registered by the captain (§ 21). After the expiration of forty-two days from the birth of the child, it can only be registered within six months, on the solemn declaration of the particulars before the superintendent-registrar, who is to sign the entry, and to receive 2s. 6d. and registrar 5s., extra fee; and no registration, after forty-two days, shall be made otherwise than as above, under a penalty of 50l. (§ 22). Births not to be registered after six months, under a penalty not exceeding 50l., and no registration after that date shall be evidence (§ 23). Name given in baptism may be registered within six months after registration of birth, on production of a certificate by the minister (§ 24). Some person present at death, or occupier of house, required to give particulars of death, on application by registrar, within eight days; registrar to make entry of finding of jury upon coroner's inquests (§ 25). Registry of persons dying at sea, containing particulars, to be kept by the captain (§ 26). Registrar to give certificate of death to undertaker, who shall deliver the same to the minister or officiating person, and unless such certificate is delivered the minister must give notice to the registrar; but the coroner may order body to be buried, and give certificate thereof; and if any dead body shall be buried without certificate of registry or of inquest, and no notice given to the registrar within seven days, the party shall forfeit 10l. (§ 27). Every register must be signed by the informant (§ 28). Registrars to make out accounts quarterly, to be verified by the superintendent, and are to be paid by the guardians, as directed (§ 29). Marriage register books to be provided by the registrar general for ministers (§ 30). Marriage registers to be kept in duplicate, containing the several particulars of schedule C; and every entry shall be signed by the clergyman, or the registering officer, or secretary of Quakers and Jews, and by persons married, and by two witnesses (§ 31). Certified copies of registers of births and deaths to be sent quarterly, and the register-books when filled, to the superintendent-registrar (§ 32). Duplicates and certified copies of registers of marriages to be sent to superintendent-registrar (§ 33). Superintendent-registrars to send certified copies of registers to the general register-office (§ 34). Searches may be made and certificates given by the persons keeping the registers, on payment of the fees prescribed (§ 35). Indexes to be made at the superintendent-registrar's office, searches allowed, and certified copies given (§ 36). Indexes to be kept at general register-office, searches allowed, and certified copies given (§ 37). Certified copies given at general register-office to be sealed, and shall then be evidence without farther proof (§ 38). Ministers, &c. may ask parties married the particulars required to be registered; and wilfully giving false information is perjury (§§ 40 and 41). Penalty for not duly registering births, deaths, and marriages, or for losing or injuring the registers, not exceeding 50l. Penalty for destroying or falsifying register-books, or entries therein, or giving false certificates, is felony (§ 43). Accidental errors may be corrected, within one month, in the presence of the parties (§ 44). Modes of recovering penalties and of making appeals are provided for by §§ 45 and 46. Registers of baptism and burials may be kept as heretofore (§ 49). Registrar-general to furnish notices to guardians of unions, &c. specifying acts required to be done by parties registering, and which are to be published in conspicuous places of the unions or parishes (§ 50).

Another act was passed (1 Vict. c. 22—June 30, 1837), entitled 'An Act to explain and amend two Acts passed in the last session of Parliament, for Marriages, and for registering Births, Deaths, and Marriages, in England.' This act consists chiefly of arrangements necessary to extend and improve the provisions of the Registration Act.

Previous to the Registration Act coming into operation it was necessary to divide the country into districts of convenient size for equalizing the labours of the registrars by contracting the area where the population was dense and extending it where the population was thin. The Registrar-general issued a circular letter in September 1836, to the boards of guardians throughout the country, on whom devolved the duty of forming each poor-law union into registration districts, and as the unions differed much from each other in population, ranging from 2000 to 80,000, the Registrar-general left the arrangement to the guardians, simply referring them to certain principles for their guidance. Parishes and townships not under the Poor-law Commissioners were formed into temporary districts, or, where more convenient, were annexed to a district already comprised in a poor-law union. To each district a registrar of births and deaths is appointed, and also a registrar of marriages; and in each union there is a superintendent-registrar. The registrar of births and deaths is appointed by the guardians, and is always a resident in the district in which he acts. The registrar of marriages is appointed by the superintendent-registrar, subject to the approval of the guardians.

The total number of registrars of births and deaths at the end of September, 1838, was 2193, of whom 1021 were officers in poor-law unions. At the end of December 1838, the number of superintendent-registrars was 618, of whom 56 were superintendent-registrars of temporary districts; at the same period the number of registrars of marriages was 817, of whom 419 were also registrars of births and deaths. In the first year, under the new Act, there were registered in England and Wales—

Births	399,712
Deaths	335,956
Marriages	111,814

Mr. Finlaison, in an estimate of the number of births, deaths, and marriages, which might require to be registered in the first year, calculated the number of births at 550,085; of deaths at 335,968; and of marriages at 114,947. The approximation as to deaths is remarkable, and not less so the deficiency in the births and in some degree in the marriages. The imperfection in the registration of births, which seems to have arisen partly from the opposition of interested persons, partly from the erroneous notions of the ignorant, and partly from mere negligence, has since been in some degree remedled, but is still imperfect.

The registrar-general, in his 6th Report, dated August 10, 1844, states, that four inspectors had been appointed to visit every district into which England has been divided, in order to examine into the mode in which the registrars perform their duties. These inspectors, among other important directions given to them, are required to see 'that the places of birth or death are accurately recorded; that the ages and professions of those who die are duly registered; that exertions are used to impress upon persons giving information of deaths the importance of producing a certificate of cause of death, in the hand-writing of the medical men who attended the deceased in their last illness,' &c.

By the end of 1839 about 350 new register-offices had been built, and the use of temporary offices had been sanctioned in many places. The ordnance-office supplied iron boxes for holding the register-books of each district. By the end of September, 1838, register-books of births and deaths, and forms for certified copies thereof, had been provided by the registrar-general for 2193 registrars of births and deaths; and marriage register-books, and forms for certified copies, had been supplied to 11,694 clergymen of the established church, to 817 registrars of marriages, to 90 registering offices of the Society of Friends, and to 36 secretaries of Jewish synagogues. They are each required to transmit certified copies on paper having a peculiar water-mark as a safeguard against the substitution of false entries, every three months, to the superintendent-registrar of each district, who transmits, once a quarter, to the registrar-general the certified copies of all the births, deaths, and marriages, which have occurred within the district during the preceding three months. These certified copies, having been deposited in the register-office in London, are there examined and arranged; and alphabetical indexes are then formed, and abstracts of them are compiled. In a few years millions of entries will have been made, and yet, for legal or other purposes, it will be as easy to find out the name of any individual from among so great a number as it is to find out a word in a dictionary or a cyclopædia.

The registration for 1839 was

Births	480,540
Deaths	331,007
Marriages	121,083

The improvement in the registration of births, as compared with that for 1838, is sufficiently obvious.

The registrations for 1839-40 and 1840-41 are as follows:—

	1839-40.	1840-4.
Births	501,589	504,543
Deaths	350,101	355,622
Marriages	124,329	122,482

The number of births not registered still amounts to some thousands annually, and the registrar-general is of opinion that 'the registration of births will not be complete until it is enacted by law that the father or mother, or some other qualified informant, shall give notice within a fixed period, of a birth having taken place.'

In 1841 and 1842 the number of marriages celebrated according to the rites of the Established Church were:—

	1841.	1842.
By special licence	13	9
Licence	15,792	14,935
Banns	78,015	75,744
By registrar's certificates	972	944
Form not stated	19,579	18,415
Total	114,371	110,047

Other marriages not celebrated according to the forms of the Established Church:—

	1841.	1842.
In registered places of worship	5882	6200
In registrar's offices	2064	2357
Between Jews	66	58
Between Quakers	113	168
	8125	8778

In each of the four years from 30th June, 1837, to July 1st, 1841, the marriages celebrated in registered places of worship and in registrars' offices were as under:—

	In Registered Places of Worship.	In Registrar's Offices.
1837-38	2976	1093
1838-39	4654	1564
1839-40	5140	1938
1840-41	5816	2036

The proportion of marriages at registered places of worship and at the registrars' offices has slowly increased, and in 1842 the number of marriages so performed represented a population of about 1,160,000. The number of buildings registered in England and Wales for the solemnization of marriages was 2232 on the 30th of June, 1844. They belonged to the following denominations:—

Presbyterians	186
Independents or Congregationalists	903
Baptists	539
Methodists (Arminian)	204
Methodists (Calvinistic)	69
Roman Catholics	284
Foreign Churches	5
Miscellaneous	42

A parliamentary paper gives the number of marriages, births, and deaths, registered in 1839, 1840, 1841, and 1842, as follows:—

	1839:	1840:	1841:	1842:
Marriages	123,166	122,665	122,496	118,825
Births	492,574	502,303	512,518	517,739
Deaths	338,979	359,634	343,847	349,519

REGISTRATION. (*Scotland.*) The registration of documents in Scotland is a great and important system intimately connected with the titles of real or heritable property, and with the execution of the law. It is thus divided into two distinct departments, which may be considered separately—Registration for Preservation, and Registration for Execution.

Registration for Preservation, in its simplest form, is merely the preserving of an attested transcript of any deed in a public register, that thus an authentic copy may be had recourse to in case the original should be lost. Besides the regular statutory records of particular deeds, there are books attached to the several courts of civil jurisdiction, in which parties may for their own convenience register such documents as do not require by any special obligatory law to be recorded. It is a general rule that extracts from any such records may stand in the place of the originals when these are not forthcoming, but that a party is not to found on an extract if he have the original deed in his possession and can produce it. In the case of sasines, however, and other deeds, of which, as will be seen below, it is not the deed itself, but its registration, that makes the completed title, an extract from the register is the proper document to be produced. There is a certain class of actions, however, to meet which the original must be produced if it be accessible. These are called Actions of Reduction-Improbation. Such an action is raised against the party favoured by the deed, by some other party, and its object is the annulling the deed on some legal ground. As a matter of form, in commencing such an action, the pursuer states, along with whatever other grounds of objection he may have, that the deed is forged, and he desires the original to be produced, that it may be judicially examined. The rule for production of the original is subject to modifications, where the ground of the action is extrinsic of anything peculiar to the original document; and if the original be lost without being intentionally destroyed, the inquiry must proceed on the extract and the other circumstances that can be adduced. It is usual to speak of registration for preservation, as being also for publication; and in this sense, when a deed is of such a character that to make it effectual in the grantee's favour it must have been delivered to him by the grantor, such registration is in the general case equivalent to the delivery. It will operate in this respect in adjusting questions of competing right, as where a father makes over to one child the property that, in case of his dying intestate, would go to another, and registers the deed. It is questioned however if the mere registration would be in all cases that complete transference of property which is necessary to bar the claims of creditors under the statutes against alienations to their prejudice by insolvents. The registration of ordinary documents for preservation was sanctioned by the Act 1698, c. 4, which generally extends to registration 'in any authentic public register that is competent.' Besides the central register attached to the supreme court, there are others connected with the Sheriff and Corporation Courts; but it does not appear to be distinctly settled what may be, with reference to various descriptions of documents in each case, a 'competent' register.

By far the most remarkable of the registers for preservation is that of the 'Sasines *and* Reversions,' the former word expressing the Act by which an estate is created or transferred in heritable (*i.e.* real) property, the latter the attestation of the extinction of a burden, *i.e.* of the devolution of a temporary estate on the person entitled to the remainder. This system has been gradually formed. In its present state its main operative principle is, that when a title to land appears on the register, no latent title derived from the same authority can compete with it, and that registered titles rank according to their priority; so that if A first sell his property to B and execute the proper conveyance, and subsequently sell the same property to C, if C get this title first recorded it cannot be questioned by B, who has only his pecuniary recourse against A. In pursuance of this system, in transactions regarding land, the public records are relied on as affording the means of ascertaining the character and title, and after they have searched for the period of prescription, or examined over a period of forty years [PRESCRIPTION, P. C. S.], parties can trust that there are no latent rights, and may safely deal with the person who professes to dispose of any right connected with it. The origin of this system may be traced to the commencement of the sixteenth century, when the notaries were required to record their proceedings in their protocols, and the other officers connected with the feudal transference of land were bound to make returns of their official acts. In 1599 an Act was passed in which an effort was made to produce regularity in these registers, by penalties. It was by the Act 1617, c. 16, that the system was founded on its right principle. The preamble of that statute bears 'considering the great hurt sustained by his Majesty's lieges by the fraudulent dealing of parties who having annallied [alienated] their lands, and received great summes of money therefore, yet by their unjust concealing of some private right formerly made by them, render the subsequent alienation done for great summes of money altogether unprofitable; which cannot be avoided unless the said private rights be made public and patent to her Majesty's lieges.' The Act then appoints the sasines, reversions, &c., to be registered within threescore days after execution, otherwise they are 'to make no faith in judgment, by way of action or exception, in prejudice of a third party, who hath acquired a perfect and lawful right to the said lands and heritages: But prejudice alwayes to them to use the said writs against the party maker thereof, his heirs, and successors.' By the other clauses of the Act the superintendence of the system is given to the Clerk-Register, and the country is divided into Registration Districts. There is one defective provision in this Act, which is still in force. Parties are allowed to register their titles either in the particular register of their district or in the general register at Edinburgh. It is unusual to adopt the latter alternative, and when it is followed, it is generally for the purpose of concealing instead of publishing the transaction. There was another material defect in the old Act. A person might have his title immediately registered, but was liable to have it superseded by any other person able to register a title on a warrant previously obtained. This was remedied by the Act 1693, c. 13, which gave the registerable titles priority not according to the date of their execution, but to that of their registration. To prevent injustice by the accumulation of unregistered deeds at the office, a minute-book was, by a contemporary Act, appointed to be kept, in which the keeper enters an outline of each document as it is presented to him. By the present practice, when a sasine or other writing belonging to this register is presented to the keeper, he marks in the minute-book the day and hour of presentation. This is indorsed on the deed itself, and marks the date of registration. When the deed is engrossed at length in the register, a certificate to that effect is endorsed on the deed, mentioning the pages of the register in which it is to be found, and the deed is then returned. Registration volumes, with minute-books accompanying them, are from time to time issued from the General Register-house to the district registrars, so systematically marked and certified, as to prevent them from being tampered with without either interpolation or mutilation being easily perceptible. When a volume is finished, it is returned with the corresponding minute-book to the General Register-house, the keeper of the District Register retaining a copy of the minute-book for general reference. The real titles of all the heritable property in Scotland are thus preserved in a seriatim and indexed collection, in the General Register-house at Edinburgh. When property is offered for sale or mortgage, a 'search' generally forms part of the titles offered for inspection to the parties treating for it. This is a certificate by the proper officer, describing all registered documents regarding that particular piece of land which have been recorded during forty years. The documents that require to be registered have lately been much simplified and abbreviated by the act 8 & 9 Vict. c. 35. It has to be kept in view that the execution of the real title which may be registered within the sixty days only gives a *preferable* title. It is not necessary to create a title; and if the receiver of a conveyance have an absolute reliance on the integrity of the granter and all from whom that person may have derived his title, he may defer completing and recording it, and may encounter the risk of some other person obtaining a title and getting on the register before him. The simplification of the documents to be registered tends to lessen the temptation to delay their completion and registration. It is remarkable that the enlightened mind of Cromwell appears to have comprehended the utility of this system, and that he made an effort to introduce it into England. We are told by Ludlow (Memoirs, I. p. 436), 'In the meantime the reformation of the law went on but slowly, it being the interest of the lawyers to preserve the lives, liberties, and estates of the whole nation in their own hands, so that upon the debate of registering deeds in each county, for want of which within a certain time fixed after the sales, such sales should be void, and being so registered that land should not be subject to any incumbrance, this word incumbrance was so managed by the lawyers, that it took up three months' time before it could be ascertained by the committee.'

Registration for Execution is another peculiarity of the law of Scotland, although the system of warrants to confess judgment in England in some measure resembles it. The party to a solemn deed incorporates with it a clause of registration, by which, on the deed being registered in the books of a court competent to put the deed in force, the decision of the court shall be held as pronounced in terms of the deed, and execution may proceed against the party on an extract, as if it were the decree of a court. The engagement on which such execution may issue must be very distinctly set forth. Thus, if it be for payment of money, it must be for a sum named in the deed, and not for the balance that may be due on an account arising out of the transactions to which the deed refers. This method of execution was by statute (1681, c. 20) made applicable to bills and promissory notes without their containing any clause of registration. To entitle it to this privilege, the bill or note must be apparently without flaw, must bear the appearance of due negotiation, and must have been protested. The operation of this system was much widened by the Act 1 & 2 Vict. c. 114, which extended registration for execution to the Sheriff Courts.

REGISTRY OF SHIPS. [SHIPS, P. C.]

REGNARD, JEAN FRANCOIS, was born at Paris, according to most accounts, in 1647, though in a short biography prefixed to an edition of his works (Paris, 1818, 4 vols. 18mo.), he is said to have been born in 1656. An only son and heir to considerable wealth, he received an education qualified to fit him for the position in life he was likely to occupy. The death of his father soon after he had completed his studies enabled him to gratify his desire for travelling. The first country that he visited was Italy, where he spent the year 1676, a date which, connected with other circumstances, renders it probable that 1656 was the real year of his birth. He revisited Italy a second time in 1678, on which occasion he formed an intimacy with the Eloise, whose memory he has consecrated in his pleasing little novel entitled 'La Provençale,' a work published after his death. This lady and her husband were induced by him to visit France, and for that purpose they all sailed from Civita Vecchia in an English vessel bound for Toulon. On the voyage, however, the vessel was captured by Algerine pirates, and Regnard and his companions were taken captives to Algiers. The adventures of their captivity form the basis of the novel above mentioned, and they are sufficiently interesting and romantic in themselves without the colouring of fiction. The only talent of Regnard which became serviceable to him on that occasion, was one which his love for good fare had excited, and his wealth had enabled him to gratify, the skilful preparation of comestibles according to the most improved principles of Parisian cookery. His culinary abilities secured for him the good will of his master and the favour of the ladies of his household. During his captivity he was taken to Constantinople, where he remained two years. On his return to Algiers he was ransomed for a considerable sum by the French consul; a ransom which came most opportunely, as he was about to suffer the last penalty for an intrigue in which he had been detected. He took with him to France the chain he had worn as a captive, which he carefully preserved. His love of travelling, however, had not been abated by his unlucky adventures, and, on the 26th of April, 1681, he set out from Paris on a journey over the north of Europe. On arriving at Stockholm, he was induced by the King of Sweden to visit Lapland. He journeyed thither by way of Tornea, ascended the river of that name, and reached the borders of the Frozen Ocean. On one of the rocks of the mountain of Metewara, the limit of his excursion, he engraved the following Latin verses.

> 'Gallia nos genuit; vidit nos Africa; Gangem
> Hausimus, Europamque oculis lustravimus omnem,
> Casibus et variis acti terrâque marique,
> Hic tandem stetimus nobis ubi defuit orbis.'—
> (Anno 1681, die 22 Augusti).

On his return from Lapland he made a short sojourn at the Court of Sweden, and, after having travelled over Poland, Hungary, and Germany, came to Paris on the 4th of December, 1683, where, satiated with the wandering life he had led, he determined upon settling. Having purchased some lucrative situations under government, he there devoted a part of his time to literary pursuits, but spent the greater part of it in the society of his friends, and in the enjoyment of the capital; the summer he was in the habit of passing on an estate which he had purchased near Paris. He has given us ample details of his manner of life, in his 5th epistle and his 'Mariage de la folie.' His devotion to gaiety and pleasure, as it was the means of lessening his utility and reputation as a writer, was the cause of his untimely death, which occurred on the 5th of September, 1710.

As a dramatic writer, the reputation of Regnard stands deservedly high; in comedy he is generally considered second only to Molière; and Voltaire has remarked that 'no one can appreciate that great dramatist who feels no pleasure in reading Regnard.' His finest and most perfect production is the comedy of 'le Joueur,' written in 1696; some scenes in it, more especially the thirteenth scene of the fourth act, are equal to anything written by Molière. Himself a gambler, he has given a dark but faithful colouring to the portraiture of a vice which had embittered his life, and he has translated his own sad sentiments on the subject into the language of the most beautiful and energetic poetry. His next best piece is 'le Légataire Universel,' in five acts, in which the humour and the versification are alike deserving of admiration. (P. C. vol. ix. 421.) Had Regnard produced many comedies of similar merit to the two which we have mentioned, he would have relieved French literature of the reproach which has often been made to it of having had no worthy successor to Molière. The fault into which he has fallen is that, like Piron, Gresset, and Marivaux, he has rather delineated an exaggerated representation of some particular vice or folly, than, like his great original, human nature in its every-day proportions. This fault however is still more conspicuous in the French dramatists who succeeded him, whose portraits are, in most instances, only coarsely drawn caricatures of nature.

The other dramatic writings of Regnard, in five acts, are,—1, 'Le Distrait,' which appeared in 1697, and is taken from one of the characters of La Bruyère. This piece failed on its first representation, but was afterwards, in 1731, reproduced on the French stage with considerable success. 2, 'Démocrite' (1700). 3, 'Les Ménechmes' (1705); a comedy dedicated by the author to Boileau on a reconciliation with him which his friends had effected; between these two poets there had been a long literary warfare [Boileau, P. C.]; it is rather an imitation of the Ménechmes of Rotrou than of the antient comedy of Plautus. His shorter pieces are mostly in prose; the principal of them are—1, 'Le Divorce,' in three acts (1688). 2, 'La Descente de Mezetin aux Enfers' (1689); 3, 'L'Homme à bonnes Fortunes' (1690); Regnard has also written a criticism on this comedy in a small piece of one act which was represented in the same year. 4, 'Les Filles Errantes' (1690). 5, 'La Coquette' (1691); all in three acts. 6, 'Les Chinois' (1692), four acts, and several one-act pieces, such as 'La Sérénade,' 'La Foire de St. Germain,' &c. He also wrote an opera entitled 'Le Carnaval de Venice' (1699), the music of which is by Campra, and a tragedy called 'Sapor,' which has not been represented. His other writings are some Epistles and two Satires, one of them directed against Boileau, another against husbands, which have been much admired, besides several shorter poems. In prose he has composed a relation of his various travels, and the Provençale already alluded to.

The best editions of his works are those by Lequien, published in 1820, 6 vols. 8vo., and by Crapelet in 1822 and 1823, 6 vols. 8vo.

REGULATORS OF MOTION. Fly wheels are the means usually employed to render the movements of machines as nearly as possible uniform; and the nature as well as the applications of these have been described under Wheels, (P. C. p. 316, col. 2), and under Steam-Engine (P. C., p. 447, col. 1). Pendulums, as regulators of motion for clock-work, are described under Pendulum (P. C.); and the *Governor*, by which the supply of steam is regulated, has been described under Steam-Engine (P. C., p. 415, col. 1). Some account of air-vessels for regulating motion in the tread-wheels, which are employed in prisons, has been given under Air-Vessel (P. C. S.), and it may be added that a particular kind of fly has been occasionally used for the like purpose. This consists of a vertical rod or shaft about 20 feet high, carrying at its upper extremity, on opposite sides, a long rectangular frame, which is provided with shutters turning on hinges; by the revolution of the shaft these frames turn round horizontally; and the shutters being connected with two governor-balls by means of wheel-work, when the motion of the tread-wheel becomes too rapid, the diverging balls cause the shutters to close, and thus the resistance of the air diminishes the velocity. Should the movement of the tread-wheel become too slow, the balls collapsing allow the shutters to open, when the resistance of the air is diminished and the velocity of revolution increases.

REICHA, ANTOINE-JOSEPH, a musical composer and theorist, was born at Prague in 1770, and having in his infancy lost his father, was educated first by his uncle, and finally at the university of Bonn, where he very successfully completed his studies. His relation having been appointed *maître de chapelle* to the Elector of Cologne, placed his nephew in the same service. On the French invasion in 1794 Reicha sought refuge in Hamburg, and there composed an opera, 'Ohalda, ou les Français en Egypte,' but it was not represented. He then repaired to Paris, in 1798, but failed in his endeavour to obtain a hearing for his work, on account of the feebleness of the drama. However he there produced a grand symphony which met with applause. In 1802 he proceeded to Vienna, and resided six years in that capital, enjoying the friendship of Haydn and Beethoven. During that period he published an Oratorio, and a collection of fugues. On the invitation of Prince Louis Ferdinand of Prussia, who was a superior performer on the piano-forte, and who desired instructions in composition from Reicha, he prepared to visit Berlin; but the death of that accomplished and amiable prince obliged him to change his intention. In 1808 he returned to Paris, and gave a course of lectures on composition, which were well attended; and some quintets for wind-instruments which he there produced, were much admired. But an opera, 'Cagliostro,' which he gave in 1810 at the Opéra Comique, was allowed only a single representation, and that a stormy one. In 1816 he produced, at the Académie Royale de Musique, 'Nathalie, ou la Famille Suisse;' and in 1822 'Sappho.' But this able theorist and learned harmonist had not the talent for creating melody, which genius alone can produce; and he might with propriety have said to his élèves, 'follow my precepts, but not my examples.' He then prudently renounced the composition of operas; and having been named professor at the Conservatoire de Musique, on the death of Mehul, in 1818, he there attracted a numerous class of pupils, many of whom, crowned by the Institut, have since become highly esteemed masters. He originated a method of instruction more clear and precise than any that had been in use; and the publication of his didactic works, which soon made them known in most parts of Europe, has in no inconsiderable degree improved the study and advanced the knowledge of music. These opened to him the doors of the Institut de France, in May, 1835. Unfortunately for the science, he enjoyed this high honour but a very short time, his death taking place in May, 1836. His chief works on the theory of music are—1, 'Traité de Melodie,' &c. 4to. 1814; 2, 'Cours de Composition Musicale,' 4to., 1818; 3, 'Traité do Haute Composition,' 4to., 1824; 4, 'Petit Traité d'Harmonic Pratique à deux Parties,' 4to.; 5, 'Art du Compositeur

Dramatique,' 4to., 1833; and many articles on music in 'l'Encyclopédie des Gens du Monde.' (*Biographie Universelle.*)

RELEASE REMAINDER. [RELEASE and REMAINDER, P. C., and TRANSFER OF REAL PROPERTY, P. C. S.]

REMOPLEU'RIDES, a singular fossil genus of Trilobites found in the Silurian strata of Tyrone by Portlock, who describes it in his Geological Report on Tyrone.

RENAISSANCE. Perpetually as they are occurring, neither this nor the term *Cinque-cento* have found their way into any of our architectural dictionaries and glossaries. The term Renaissance indicates the period of the *Revival*, when the classic began to be re-introduced after the mediæval styles. But this is not the case with the term *Cinque-cento*, which literally means five hundred, whereas it is used as equivalent to mille cinque-cento, the *mille* being understood though not expressed, therefore it stands for fifteen hundred, and in its technical sense among artists signifies the style of architecture and general decoration in vogue during the 16th century, or rather the earlier part of it; nor is it so restricted, for without exact reference to date, it also applied to what belongs to the style so denoted though it may happen to be *before* the year 1500, which period may be taken as the equator-line laid down by the historians of art. Both terms, however, are now generally used as synonymous, that of cinque-cento therefore very loosely and arbitrarily.

Although all were derived from that of Italy, each country had its peculiar Renaissance, described accordingly as French, German, English Renaissance [ELIZABETHAN ARCHITECTURE, P. C. S.], preserving a general family likeness, but exhibiting traits exclusively its own. It is therefore rather singular that no one should have taken up so fertile a subject, and have treated of it expressly and at due length, instead of merely touching upon it hurriedly. The Renaissance in general is usually spoken of as if it were nothing more than a direct but unskilful imitation of the antique, previously to the orders being so well understood as they were afterwards when studied through the text of Vitruvius, and reduced to a methodical system of 'bookish rules,' by Palladio and Vignola. But in the first place it was founded only upon the *Roman* antique, and in the next, not upon the temple style of the Romans, but their triumphal arches, baths, and other edifices. It was not either the portico, or the continuous colonnade, where columniation displays itself in all its purity, that was taken as a model, but rather such structures as the Colosseum [AMPHITHEATRE, P. C.], where several small orders—that is, small in proportion to the general mass—are introduced for little more than decoration to it. And in the Renaissance and Cinque-cento styles, entire orders are used only as embellishment, and avowedly so. Where columns are employed for actual support, as in open loggie, it is only in combination with arches springing from them, the columns performing the office of piers to the latter; which is regarded by some as a most indefensible heresy and utter violation of good taste, though for no better argument than that columns were never so employed in the classical style, but were originally intended to support a horizontal entablature: in other words, *trabeation* is essential to them. Essential it certainly is to the completion of an entire 'order,' but it cannot be a whit more contrary to either good taste or good sense to employ columns as actual pillars or supports to arches resting upon them than it is to employ the *trabeation* or entablature without columns, as decoration in astylar buildings. [ASTYLAR, P. C. S.] In fact, a great deal of Italian Renaissance is astylar, with either a full entablature, or a cornicione crowning and proportioned to the entire mass. This large and simple mode of treatment was greatly affected by the Florentine and Roman architects of the period of the revival, and contrasts very strikingly with the Transalpine Renaissance in France and other countries, which is characterized by multiplicity of parts, and numerous divisions and breaks. It contrasts also with the contemporary practice of the Italian architects themselves when they employed the orders, in doing which they made their compositions *microstylar*, applying a separate small order to each floor or horizontal division of a façade, above the ground floor; and they further reduced the height of the columns by giving a considerable proportion of each order to high pedestals beneath the columns. In Transalpine Renaissance such application of the orders was greatly exaggerated, they being employed for the ground floor as well as the others, and the spaces between the columns being filled in, either entirely or nearly so, with large windows, so that the columns or pilasters between them show only as accessories to the windows themselves, and as narrow piers between them. Fenestration completely predominates, both as to the quantity of surface the openings occupy, and the architectural character occasioned by it. One of the earliest importations of the Renaissance into this country, Longleat House, Wilts, erected by John of Padua, 1567, and extolled for 'the singular purity of taste' displayed in it, is an instance of such mode of composition, and shows how greatly the borrowed style was transformed in its general physiognomy, even when treated faithfully with regard to details, among which may be reckoned the orders themselves, which amount in fact, when so applied, to no more than such.

One deviation from Italian practice was the frequent employment of coupled columns or pilasters, which was in some cases (as at Wollaton Hall) caused by the necessity for wider piers between the windows, at the same time that the intercolumns were completely occupied by the windows, which last, it should be observed, retained their Tudor or English character, being very spacious and divided by mullions and transoms.

In much of the Italian cinque-cento, especially in that for which purity and correctness were affected, the character of the detail is somewhat dry and meagre, and there is very little of ornamentation, even the entablatures to Corinthian columns consisting of only plain mouldings. Florid Renaissance, as it may for distinction's sake be called—seems, on the contrary, to have been most in favour both in France and in our country, probably in consequence of the taste for luxuriant enrichment which had been indulged during that period of Gothic architecture which the new style was beginning to replace. Besides which, it was there adopted as a 'peregrine' and exotic fashion, owing to which and to its being at first employed for palatial and sumptuous structures, it was displayed in all its luxuriance. This florid species of the style and period is marked by a profusion of enrichment and carvings in mouldings and pannels, by arabesque foliage and medallions, with which surfaces of considerable extent are oftentimes covered. Even the shafts of columns are frequently damasked or broidered, if not for their entire height, for a considerable portion of it, and generally the lower one, with foliage and other chasing; besides which they are further enriched by one or more bands embossed in similar manner. The faces both of pilasters and pedestals are also highly decorated by being pannelled, and filled up with arabesque work or other sculptures. Niches, too, are frequent features in composition, and within, their heads are generally carved to resemble a shell. Escutcheons and armorial bearings are not spared; neither are devices, mottos, and other inscriptions. This profusion of minute ornament is eminently characteristic of the Renaissance taste in building, furniture, and decoration generally; and though it was then carried to excess, and the combinations themselves were often very uncouth, grotesque, and what is understood by the term quaint (oddly picturesque but not beautiful), much of the ornament is, taken separately, marked by elegance as well as fancy; therefore it would not be difficult to refine upon the style by employing it more discreetly—by selecting all its better qualities and elements, and combining them with better taste,—more sparingly, instead of cramming a bit of everything into the same composition. But architects have not distinguished between the mere copying of a former style and the free artistic imitation of it by selecting what is valuable in it, and leaving its dross, or by borrowing ideas from it and working them out afresh.

French Renaissance is truly cinque-cento, since it may be dated almost with chronological precision from the year 1500, in the reign of Louis XII., who employed Italian artists, and among others the architect Giocondo [GIOCONDO, P. C. S.,] who erected for Cardinal d'Amboise, the minister of that monarch, the celebrated Château Gaillon. Though that edifice—at least what remained of it, was taken down some years ago, it is known from the representations of it, and also from such fragments of it as have been preserved by being reconstructed at the Ecole des Beaux Arts, Paris, to have been an exceedingly sumptuous pile. The buildings towards the court were almost entirely incrusted over—some would call it 'tatooed'—with pannelled pilasters, arabesques, medallions, and other sculpture. The Château de Blois, the birthplace of Louis XII., and restored and decorated by him, was another distinguished work of that period, and probably one of those on which Giocondo was employed. In the reign of Francis I., the culminating point of French Renaissance, the palaces erected by that sumptuous prince and his nobles attested tho magnificence if not the refinement of that age. As a retreat for himself in tho immediate vicinity of his capital, Francis built (about 1530) the Château de Madrid in the Bois de Boulogne, whose façades were decorated with coloured glazed bricks or enamelled tiles, constituting a species of polychromic decoration. Of that building nothing now remains, it having been taken down at the end of the last century; but another architectural specimen of the same period, the house or casino of Francis I., erected at Moret, near Fontainebleau, has been preserved by being removed to Paris, where it was re-erected in its primitive state, in the Bois de Boulogne, by the architect Biet, in 1823. Of this interesting monument of the Renaissance, which has also some polychromic *fayence* decoration, plans, elevations, and sections, are given in Normand's Paris Moderne, but being only in outline, a great deal of the effect is lost in them. The palace of Fontainebleau itself, in its interior at least (now restored by Louis Philippe), records the magnificence of Francis, his taste for splendour, and his liberal encouragement of arts.

In Germany, the castle or rather palace of Heidelberg would, if completed, have been a most gorgeous pile in the Renaissance style, as it showed itself in that country; and though now a ruin, tho principal portion of tho exterior is in sufficiently good preservation to admit of faithful restoration in a series of architectural engravings—and it is infinitely worthier of being so recorded than are the mere shapeless fragments of buildings—a few blocks of stono and columns which are regarded as interesting and curious only because discovered where they were not before known to exist.

The architecture of Spain at various periods is as yet so imperfectly illustrated that very little is here known of its Renaissance edifices; but from the views of some of them in the 'España Artistica,' that country would appear to contain several interesting and striking specimens of the kind; and among them may be mentioned, as deserving of particular notice for the elegant taste it displays, the upper gallery of the cloister of the Convent of Huerta.

We may conclude this imperfect sketch by observing that the Renaissance is well worth studying, if only because such study will enable us to avoid what was faulty in it, and to catch some of its freedom and spirit without falling into the licentiousness for which it may justly be censured.

REPEAL OF STATUTES. [Statutes, P. C.]

REPRESENTATION. [Descent, P. C.]

REPTON, HUMPHRY, tho celebrated practitioner and writer upon his art, who first assumed professionally the title of Landscape Gardener, was born at Bury St. Edmund's, where his father held the lucrative situation of collector of Excise, May 2nd, 1752. After being placed first at the grammar-school at Bury, and then at that of Norwich, he was sent by his father, who intended to make a man of business of him, to Gorkum in Holland, in the summer of 1764; a suitable place enough for tho future merchant or manufacturer who was to be intent upon thrift—which seems, according to a remark of Repton's own, to have been his father's chief ambition for him—but almost the very worst for the future landscape gardener, Dutch gardening being the very reverse of nature and picturesque landscape. At the age of sixteen he returned to England, and was placed in a merchant's counting-house at Norwich, but all his leisure was devoted to poetry, music, and drawing. At the age of twenty-one he married, and was set up in business as a general merchant by his father, and for a while affairs prospered with him; but after a few years took an unfavourable turn, owing to losses of vessels at sea, and other circumstances in trade; wherefore having lost both his parents, he determined upon following his own inclination. He accordingly settled at Sustead, near Aylsham, in Norfolk, where his sister resided in a house left them by their father. The change was to him a delightful one, and there he passed five years of almost uninterrupted happiness, occupying himself with farming experiments, gardening, and the study of rural scenery. An event however occurred in 1783, which promised to open a widely different career from that in which he afterwards distinguished himself; for in that year his friend and neighbour Mr. Wyndham of Felbrigg was appointed secretary to the Lord-Lieutenant of Ireland, and Repton, feeling that as the opportunity offered he ought exert himself for the sake of an increasing family, agreed to accompany him as his confidential secretary. The flattering expectations thus suddenly raised, were as suddenly blighted; for his patron gave up his post almost immediately; and Repton returned to Sustead and domestic privacy. There however he did not long remain, for, compelled to retrench, he took a small house at Harestreet, Essex, to which ho became so much attached as ever after to reside there. Just at this time (1784) he became acquainted with Mr. Palmer, who introduced the mail-coach system, and whose project he aided not only by his advice and personal exertions, but by advancing a considerable portion of his small remaining capital. Yet though the scheme prospered, Repton received no recompense: on the contrary, he had to put up with pecuniary loss. Thus every successive speculation and enterprise of his seem doomed to prove a failure; yet had it not been so, he might never have been heard of unless it had been as an author, and by such productions as his 'Odd Whims.' Fortunately though easy ho was not indolent, neither was he of a desponding temper, and he resolved to try whether he could not extricate himself from his embarrassments by gratifying his own tastes at the samo time, and accordingly announced to his friends his intention of practising as a 'Landscape Gardener:' the field was open, for Brown had been dead some years [Brown, P. C. S.], and there was no one besides of any note. With what success this last scheme was crowned, needs hardly be said, for business soon began to pour in upon him, and he was consulted by the owners of 'places' in almost every part of the kingdom. The list of his *Red Books* alone—as he called his Reports on the seats whose grounds he was employed to lay out or improve, testifies to the great extent of his professional labours —or rather his professional enjoyments—enhanced by intercourse with polished society, in which his accomplishments and good because unaffectedly amiable manners and address enabled him to sustain a proper part. Nothing proves the real worth of his character more strongly than his not being corrupted by sudden good fortune, or by being lifted into a higher sphere: home and domestic tranquillity were still dearer to him; and few had greater cause to be attached to a domestic circle, whose happiness was marred only by the loss of so many of its members, for out of sixteen children, only seven attained the age of manhood, and only five, together with their mother, survived him, a daughter and four sons. The eldest of them is John Adey Repton, who follows his father's profession, but is better known as a very able architectural antiquary; the fourth, George Stanley, who just before his father's death, married a daughter of Lord Chancellor Eldon, was brought up as an architect.

Among the blessings which fell to Repton's lot, was that of an excellent constitution and uninterrupted good health up to January 29th, 1811, when being upset in his carriage, he received a severe injury in the spine, which rendered him a long while an invalid, and he was some time afterwards attacked with *angina pectoris*, which caused him at intervals great suffering during the remainder of his life, and carried him off quite suddenly as he was entering his breakfast-room on the morning of the 24th March, 1818, apparently in his usual health.

His professional publications consist of 'Sketches and Hints on Landscape Gardening,' 4to., 1795: 'Observation on tho Theory and Practice of Landscape Gardening,' 4to., 1803; 'Inquiry into the changes of Taste in Landscape Gardening,' 8vo., 1806; 'Designs for the Pavilion at Brighton,' folio, 1808; (though these designs are said to have met the approbation of the Prince of Wales, and were, like the building afterwards erected by Nash, in a fancy Oriental style, they were not adopted); and 'Fragments on the Theory, &c. of Landscape Gardening,' 4to., 1816, in which he was assisted by his eldest son. These different publications on his art, which at their original price cost collectively 20*l*. 2*s*. 6*d*., were reprinted in 1840, by the late Mr. Loudon [Loudon, P. C. S.], in a single octavo volume, accompanied with a portrait and memoir of the author from autograph memoranda (which has here been made use of). Though this compressed and economic edition has not the attractions of the larger coloured plates, the same subjects being shown in small woodcuts, it is far more convenient as a volume for perusal and study, and moreover contains several notes and remarks by the editor.

REPUBLICATION. [Will and Testament, P. C.]

RESEDA'CEÆ, a natural order of plants belonging to the class of Exogens. It has a many-parted calyx; the petals unequal, of broad fleshy plates having lacerated appendages at the back; an hypogynous one-sided glandular disk; definite stamens inserted into the disk, the filaments erect, the anthers 2-celled, opening longitudinally; a 3-lobed 1-celled many-seeded sessile ovary, scarcely closed, usually with 3-6 parietal placentæ, sometimes surrounding a free central ovule-bearing body; 3 glandular sessile stigmas; campulitropal or amphitropal ovules; the fruit dry and membranous or succulent, opening at the apex, or apocarpous, with empty carpels surrounding a central placenta, or even hooded and 1-seeded; the seeds several, reniform, with a taper arcuate embryo without albumen, and a radicle next the hilum. The species of this order are soft herbaceous plants, or in a few instances small shrubs with alternate entire or pinnately divided leaves, and minute gland-like stipules. The flowers in racemes or spikes. They are natives of Europe, the adjoining parts of Asia, the basin of the Mediterranean, and the adjacent islands. A few species occur in the north of India, the Cape of Good Hope, and California.

This order embraces the genera Reseda, Ochradenus, Oligomeris, Holopetalum, Astrocarpus, and Caylusea.

None of the species possess very active properties. *Reseda luteola* is the Woold, Woad, or Weld, that is used in dyeing. [Woold, P. C.] *R. odorata* is the common Mignonette. It has lanceolate bluntish entire or trifid leaves, a 6-parted calyx equal in length to the petals, which are finely cleft into many club-shaped divisions, the two lowest simple, the capsules 3-toothed. It is a native of the North of Africa and Egypt, but its delicious fragrance has caused it to be cultivated all over the world. It is naturally a herb, but when trained in the greenhouse it becomes shrubby. This plant is in great demand in the London markets, and is very extensively cultivated. The seeds should be sown in pots or transplanted into pots 4 or 6 plants to a pot 4 inches in diameter. 'To obtain plants for flowering from December to February, a sowing should be made in July, in the open ground, and the plants potted in September. The crop for March, April, and May should be sown in pots not later than the 25th of August; the plants from this sowing will not suffer from exposure to rain whilst they are young; they must however be protected from early frosts like the winter-crop; they are to be thinned in November, leaving not more than 8 or 10 plants in a pot; and at the same time the pots should be sunk 3 or 4 inches in some old tan or coal-ashes and should be covered with a frame, which it is best to place fronting the west, for then the lights may be left open in the evening, to catch the sun whenever it sets clear. The third or spring crop should be sown in pots not later than the 25th of February. These must be placed in a frame on a gentle heat; and as the heat declines, the pots must be let down three or four inches into the dung-bed, which will keep the roots moist, and prevent their leaves turning brown from the heat of the sun in April and May. The plants thus obtained will be in perfection by the end of May and be ready to succeed those raised by the autumnal sowing.' ('Hort. Trans.,' vol. 2.)

The arborescent plant is often called Tree-Mignonette. It may be propagated by seeds or by cuttings, which readily strike root. The young plants should be potted singly, and brought forward by heat. As they grow they should be tied to a stick, and all side shoots should be pinched off. As the plants attain a greater size they should be shifted progressively into larger pots.

R. phyteuma has lanceolate spatulate leaves, the upper ones sometimes a little divided; the calyx 5-parted, spatulate, ciliated, much longer than the petals. It is a native of France, Austria, Italy, Switzerland, and the Levant. This plant is the φύτευμα of Dioscorides, 4. 128.

R. undata, a native of the south of Europe, with pinnatifid leaves and linear-lanceolate segments, trifid petals and 3-4-horned capsules, is the σησαμοειδὲς μέγα of Dioscorides, 4. 150. It grows at the present day on the way-sides in Attica and Corinth.

R. lutea and *R. fruticulosa* are British species as well as *R. luteola*. The first has 6 very unequal petals and 3-cleft or pinnatifid leaves. It grows in waste places in chalky and limestone districts. The second has 5 nearly equal petals, with pinnatifid leaves, and grows in waste sandy places near the sea.

(Babington, *Manual of British Botany*; Don, *Gardener's Dictionary*; Burnett, *Outlines of Botany*; Lindley, *Vegetable Kingdom*.)

RESULTING TRUSTS. [Trust and Trustee, P. C.]

RHAM, WILLIAM LEWIS, was born at Utrecht, in the Netherlands, in 1778; and of this country his father was, we believe, a native, but his mother was of Swiss birth. Mr. Rham came to England in early life. He studied for some time at Edinburgh, with a view to the medical profession, but eventually the church became his destination, and he entered at Trinity College, Cambridge. In 1806, being then in his twenty-eighth year, he took his degree, and his name appears on the Tripos as tenth wrangler. In 1808 Mr. Rham was presented by the dean and chapter of Salisbury to the living of Winkfield, Berkshire; and a few years afterwards the Nassau family presented him to that of Fersfield, in Norfolk. He died unmarried at Winkfield, after a short illness, on the 31st of October, 1843.

The life of Mr. Rham was characterized by active and unremitting usefulness as a parochial clergyman. He was the friend of the poor in the best sense of the term. He looked beyond the wants of the moment, and sought the means to improve and elevate as well as temporarily to benefit the objects of his benevolence. At the Winkfield School of Industry, which, under his fostering care, became a model for all similar institutions in country parishes, the young were taught not only the elements of knowledge, but were instructed in useful arts, and trained to habits of industry. Such were the means by which he endeavoured to promote the best interests of his parishioners.

The school which Mr. Rham founded at Winkfield is thus described by Mr. Tremenheere, in his Report to the Council of Education in March, 1843:—'This school was established in 1835 for 50 boys and 50 girls. The building consists of a house for the master and mistress, two schoolrooms, a workshop, shed, &c. It is surrounded by two acres of garden, to which two more acres have been lately added, to be also cultivated, by the master and the boys, with the various agricultural crops, according to the most approved method and rotations. The industrial work originally projected for the boys was—gardening, the use of carpenters' and joiners' tools, basket and mat making; for the girls, the usual needle-work, washing, ironing, cooking, and the common household employments, under the direction of the mistress. The manual instruction of the boys in the workshop has been hitherto of a limited kind; but the garden presented very satisfactory evidences of their skill and industry. It is cultivated in common, with the exception of small plots about twelve feet square, which belong to the boys, and of the produce of which they keep a debtor and creditor account. The produce of the rest is sold to persons who take it off to market, and the proceeds are carried to the general account of the establishment. The crops were abundant, and more varied than it is usual to see in common gardens. Something was found to fill up every space, and to suit every spot—either one of the ordinary garden crops, or some of the useful herbs, or some kind of plant or flower; and thus a lesson of considerable use to a cottager is early communicated, in the habit of making the most of even the smallest portion of ground, however apparently unpromising. The practical instruction, and the valuable example, of which the pupils here have the benefit in their garden-work, will be greatly extended when the agricultural operations commence in the field just added to the establishment. They will then enjoy the further advantage of pursuing all the details of the most skilful husbandry, under the same good guidance, namely that of the benevolent originator of this institution, the Rev. W. L. Rham, so well known as an accomplished agriculturist. The school will, indeed, from that period be able to offer to the children of the agricultural labourer a course of practical training in garden and farm management of no ordinary excellence.'

But it is as a scientific agriculturist that Mr. Rham's name is most widely known; and, until recently, it was perhaps better known in other countries than in England. His early connection with the Continent, which was kept up in after-life, afforded scope for observation of the husbandry of different countries; and his thorough knowledge of several living languages gave him access to the works of scientific writers on foreign agriculture. In the next place, his chemical studies at Edinburgh, while preparing for the medical profession, were of eminent service to him; and scarcely less so was the proficiency in mathematics which he attained at Cambridge. It may safely be asserted that no other writer on agriculture ever enjoyed in so great a degree such a combination of advantages; and to his knowledge of the chemical and mechanical departments of agriculture there was united a thorough acquaintance with its routine details. We would simply refer to the article Plough, P. C., as an example of this combination of science with practical knowledge. On his farm at Winkfield he engaged in his favourite pursuit, with a practical perception of its details, and a scientific knowledge of its processes, which has probably never before been possessed by one person. Thus, above all other writers of the present day on the subject of agriculture, Mr. Rham was eminently fitted, by his excellent judgment and sound sense, to be useful to the country in the existing state of its husbandry and rural economy, when, probably, we are on the eve of great improvements in every department of these important branches of industry. He was an active member of the council and upon the committees of the Royal Society of Agriculture, from its formation in 1838. A volume entitled 'The Dictionary of the Farm,' which contains his views on all the principal subjects of interest to the agriculturist, has been published by C. Knight and Co. It is compiled, without alteration, from the articles which he wrote in the 'Penny Cyclopædia,' the first article [AFTER-MATH, P. C.] being contributed by him in 1833, and the last [YORKSHIRE AGRICULTURE, P. C.] in 1843, only a few weeks before his death. He was also the author of 'Flemish Husbandry,' a small work written for the 'Farmers' Series of the Library of Useful Knowledge.' This work was founded on a pedestrian tour in Flanders, in which, for many weeks, he walked from farm to farm, enjoying the rough hospitality of an industrious population, speaking their language readily, and entering into their pursuits with the zeal of a skilful and sympathizing friend. The Essay on the Analysis of Soils, for which he obtained the prize offered by the Royal Society of Agriculture, is published in the Society's 'Journal,' which also contains some other valuable contributions from his pen. Not long before his death he had also commenced a series of papers on agriculture and rural economy in the 'Gardeners' Chronicle,' edited by Dr. Lindley.

Mr. Rham's correspondence on agricultural subjects, both in this country and on the Continent, was extensive; and he gave his opinion with the utmost readiness. Nor did he stop here, or remain content with having acquitted himself with extreme urbanity and courtesy, but not unfrequently pressed his hospitality upon those who had consulted him. Great as was the respect paid to his opinions, he gave them without the least dogmatism. In one of his last communications to a valued friend (Joshua Rodwell, Esq., of Alderton Hall, Suffolk), there is a passage at once characteristic of his unassuming disposition and of his deference to humble practical experience, which men who have acquired a scientific knowledge of any art are usually too apt to despise. 'Whatever,' he remarks, 'great chemists may say about the component parts of soils, I am persuaded they can never decide as to the aptitude of any soil to produce a crop till experience has shown it. I believe we have all overlooked some electromagnetic qualities which we have not yet instruments to measure.' It was this reliance upon experience, in connection with a bold but searching investigation of theory, which renders Mr. Rham's writings so well adapted for the present time. In the eagerness for improvement, a writer is best calculated ultimately to benefit his country who unites scientific attainments of a high character with a rational degree of respect for the practice of ages.

RHAMNUS. [ATTICA, P. C.]

RHAPSODY (ῥαψῳδία) is a poem sung by a rhapsodist, and is generally applied to detached parts of the Homeric poems, the Iliad and the Odyssey, which were sung or recited by rhapsodists. But the word rhapsodist properly signifies one who sews or fastens things together; and it was specially applied to those who arranged or are supposed to have arranged the parts of the Homeric poems and of other old poems, so as to make one entire work of them, and who went about from place to place to sing and recite these poems.

RHEOMETER. From the Greek words ῥέω, *flow*, and μέτρον, a *measure*, is an instrument by which the force of an electric, galvanic, or magnetic current may be measured. The word was first proposed by M. Peclet as a synonym for galvanometer; and it has since been employed by Professor Wheatstone in a general sense, together with *Rheoscope*, denoting an instrument by which the existence of an electric, &c. current may be ascertained; and *Rheomotor*, expressing any apparatus, as an electrical or galvanic battery, by which a current of that kind is originated.

The rheometer or galvanometer employed by Mr. Wheatstone is a glass cylinder resting on a stand, and containing within it a magnetized needle, which is suspended from the cover. A graduated circle serves to show the deviations of the needle from the zero of the graduations, and the amount of deviation is read by means of a microscope. For forces or resistances which are considerable, there are placed below the circle numerous coils of fine wire; but for small forces a thick plate or wire making but one coil is used.

From the poles of the battery, or rheomotor, proceed the two conducting wires to the rheometer, one directly, and the other through the intervention of a slender brass-wire wound in numerous coils round two cylinders, one of wood and the other of brass, each about 1½ inch diameter. On the former the wire is coiled in spiral grooves, like those of a screw, so that the several coils are isolated from one another; and the brass cylinder is provided with a handle for the purpose of turning it on its axis, in order to permit more or less of the wire on the wooden cylinder to be uncoiled from it and wound about the other; by which means a variable quantity of the wire, forming part of the *circuit*, may remain on that cylinder; this apparatus is called a *rheostat*.

In employing the instrument, an object whose resistance to the passage of the electric, galvanic, or magnetic fluid is to be ascertained, is placed so as to form part of the circuit, and the point at which the needle in the rheometer stands is to be observed; then, removing the object, and turning the cylinders till such a quantity of wire is coiled on the wooden cylinder as will bring the needle to the same point, that quantity of wire, which can be measured by a scale on the instrument, will serve to indicate the resistance caused by the presence of the object which had been interposed. A copper wire one foot long and 0·71 inch in diameter being taken to denote the unit of resistance.

The Bakerian Lecture for 1843, by Professor Wheatstone, which is published in the 'Philosophical Transactions' for that year, contains a description of the apparatus above mentioned, with an account of the processes for determining the constants of a voltaic circuit.

The advantage of the rheostat, in enabling the operator to keep the needle of a galvanometer at the same point during the continuance of an experiment, will be found to be great when, as in volatyping, electro-gilding, &c., it is necessary to maintain a constant degree of energy in the current.

RHINACANTHUS (from ῥίν, a snout, and ἄκανθα, a thorn), a genus of plants belonging to the natural order Acanthaceæ. It has a regularly 5-parted calyx with small subulate bracts and bractlets: a hypocrateriform 2-lipped corolla, with a long slender tube, the upper lip narrow, the lower trifid, with equal segments; 2 stamens inserted in the throat of the corolla, the anthers 2-celled, awnless, with 1 cell placed above the other almost in a line; a clavate capsule much compressed at the base, with the commissure of the valves in contact and seedless; the upper part 4-seeded, or by abortion 2-seeded; the dissepiment complete, adnate; the seeds ovate, biconvex, augmented with hooks which are concave and obtuse.

R. communis is a native of the continent of India, with opposite stalked broad-lanceolate obtuse leaves, above smooth, below a little downy, entire, from 2 to 4 inches long and from 1 to 2 broad, and a fleshy ring surrounding the base of the ovary. The roots of this plant are boiled in milk, and are reckoned by the natives of India an aphrodisiac. In conjunction with lime-juice and pepper they are used as an external application for ringworm.

(Lindley, *Flora Medica.*)

RHINANTHUS (from ῥίν, a snout, and ἄνθος, a flower), a genus of plants belonging to the natural order Scrophulariaceæ of Jussieu, and the type of the order Rhinanthaceæ of De Candolle. It has a compressed membranous inflated 4-toothed calyx; the superior lip of the corolla galeate, compressed, bidentate at the apex, the lower one spreading, 3-lobed; the anthers bipartite, mutic, villous; the capsule 2-celled, obtuse, compressed; the seeds compressed, marginate, or girded by a membranous wing. The species are annual plants, inhabiting marshes and confined in their geographical distribution to Europe.

R. crista galli, Cockscomb, or common Yellow Rattle, has oblong-lanceolate serrate leaves; the flowers in lax spikes, the calyx glabrous, the lobes of the upper lip of the corolla short, roundish, the bracts ovate inciso-serrate, the seeds with a broad membranous border. This plant has the name of Yellow Rattle from the colour of its flowers, and the rattling noise made by the seeds in the capsule when ripe. On this account the fruits are called rattle-boxes in Ireland. In some parts of England this plant is known by the name of Pennygrass, and in Yorkshire it is called Henpenny, from the seed-vessels resembling in shape and size a silver penny. The term Cockscomb has been applied to this plant from the fringed appearance of the bracts which surround the flowers. The seeds of a species of Rhinanthus were at one time used in infusion for destroying vermin in bedsteads and furniture.

R. major has linear-lanceolate serrate leaves; the flowers in crowded spikes, the calyx glabrous, the lobes of the upper lip of the corolla oblong, the bracts inciso serrate, with an attenuated point, the seeds with a very narrow membranous border. This is the plant of British botanists, but the *R. major* of Koch and Reichenbach has a broad membranous margin to the seed, and the central part of the upper lip of the corolla as prominent as the lateral lobes. This plant is found in meadows and corn-fields in the North of England, and also in Scotland.

Several other species of this genus have been described. Koch, in his 'Flora Germanica,' has five,—*R. minor*, the *R. crista galli* above described, *R. major*, *R. alectorolophus*, *R. angustifolius*, and *R. alpinus*.

(Don, *Gardener's Dictionary*; Babington, *Manual of British Botany*.)

RHI'ZODUS, a genus of fossil fishes from the carboniferous strata of Scotland. (Owen.)

RHO'DEA, a genus of fossil Ferns proposed by Presl. The species belong chiefly to the Coal formation.

RHYNCHOSAU'RUS, a fossil genus of Reptiles. It was found in the new red-sandstone of Grinsill in Warwickshire. (Owen.)

RHYNCO'SPORA, a genus of plants belonging to the natural order Cyperaceæ. It has few-flowered spikelets, 6 or 7 glumes, the lower ones empty or smaller; about 6 bristles; the nut compressed, convex on both sides, crowned with the dilated base of the style. There are two British species; *R. alba*, not uncommon on turfy bogs, and *R. fusca*, a rare species found in the south-west of England and in Ireland.

(Babington, *Manual of British Botany*.)

RIBALTA, FRANCISCO, a distinguished Spanish painter of the school of Valencia, was born at Castellon do la Plana in 1551. When very young he fell in love with his master's daughter, but the father (his name is not mentioned) would not consent to a marriage, on the plea that Ribalta was not sufficiently advanced in his profession. Upon this he determined to go to Rome, and his mistress plighted her faith to him. At Rome he studied the works of Raphael, and particularly Sebastian del Piombo, and, according to Cean Bermudez, those of the Carracci also, but this is an error; none of the Carracci were in Rome before 1600, some years therefore after Ribalta must have left it.

Upon his return to Valencia after an absence of three or four years he immediately repaired to the house of his master, who was absent; but upon an easel in his study was standing an unfinished sketch, which the young painter as rapidly as possible completed in the presence of his still faithful mistress, and immediately retired. The father was much surprised at what he saw, and asked his daughter who had been there, at the same time observing, 'If this were your lover, willingly should you marry him, but not the poor Ribalta.' 'Ribalta himself has done it,' said his daughter, and of course the marriage of the lovers soon followed.

Ribalta soon obtained great reputation. His first public work was the Last Supper, ordered by archbishop Don Juan de Ribera for the grand altar of the college of Corpus Christi, at Valencia. He painted the portrait of a venerable friar of the place Pedro Muñoz as St. Andrew; and as Judas, a shoemaker of the name of Pradas, whose vicinity was a nuisance to him. He died in 1628, and was buried in the church of San Juan del Mercado, in Valencia.

Ribalta's design was correct and vigorous; he was a good anatomist; and his compositions are often grand. In colouring also he was generally good, much resembling Sebastiano and Titian, though occasionally dry; but the works of some of his principal scholars, as Castañed and Bausa, are sometimes attributed to him. His works are or were very numerous in Valencia, and there are several at Castellon de la Plana, and Madrid; and some at San Ildefonso, Toledo, Zaragoza, Andilla, Algemesi, Torrente, Portaceli, Morella, and Carcaxente.

The 'Entombment' by Ribalta, in the cathedral of Valencia, is an excellent work, and there are also many admirable pictures by him in private collections in Valencia, as those of the Conde de Parcent, and the Marques del Rafol. The Corpus Christi College is, according to Mr. Ford, a complete museum of Ribaltas. It was founded by Ribalta's patron, the Archbishop Juan de Ribera, commonly called 'El Santo Ribera.' He was canonized in 1797. Ribalta is to be seen to greatest advantage in the church of this college, which contains some of his greatest works, as 'San Vicente de Ferrer visited on his sick Bed by our Saviour and Saints;' the 'Last Supper,' already mentioned; and a 'Holy Family.' In other parts of the same building are 'Christ in the Garden of Olives;' 'Christ at the Column,' and a saint or *Beata* in a brown habit. There are also some works by Ribalta in the Museo (the former *Carmen*) of Valencia. The pictures of the church of the small hamlet of Andilla are also among the best works of Ribalta. At Segorbe, in the church of San Martin de las Monjas, is also a noble picture by Ribalta of Christ descending into Hades. In the church of his native place Castellon de la Plana there is still a 'Purgatory' by him; other fine works that were in this place have been allowed to perish. The picture of 'Christ bearing his Cross' in Magdalen College, Oxford, of which there is a print by Sherwin, and which is ascribed to Guido, Lodovico Carracci, and to Moralez el Divino, is, according to Mr. Ford, certainly a picture by Ribalta. It is the chapel altar-piece, and was presented to the college by William Freeman, of Hamels, in Hertfordshire; it was originally brought from Spain by the last duke of Ormond from Vigo in 1702.

Juan de Ribalta, an able painter, and of great promise, was the son and pupil of Francisco, but he died in the same year as his father, aged only 31; he was born in 1597. Ribera also, or Spagnoletto, is said to have been the pupil of Ribalta.

(Cean Bermudez, *Diccionario Historico de los mas illustres Profesores, &c.*; Ford, *Handbook for Travellers in Spain, &c.*; *English Connoisseur*; *Oxford Guide*.)

RIBGRASS. [PLANTAGINACEÆ, P.C.]

RICCIO, DOME'NICO, called il Brusasorci, a celebrated Venetian painter, was born at Verona in 1494. He was the pupil of Giolfino, and is supposed also to have studied under Titian, in Venice, where he at least studied his works and those of Giorgione. He is called the Titian of the Veronese painters. His name of Brusa Sorci (rat-burner) was acquired from his father Giacomo Riccio, who invented a rat-trap, and had what he caught in his own house burnt, whence he was commonly called by his neighbours Brusasorci, a name which descended to his children and grandchildren. Among Domenico's first and principal works in Verona were the frescoes of the Palazzo de' Murari, near the Ponte Nuovo, which he decorated exteriorly in chiaroscuro with scenes from the fable of Cupid and Psyche, and the marriage festival of Benacus (the Lago di Garda) with the nymph Charis represented by Garda; he painted numerous nymphs, with Hymen, as he is described by Catullus (Carmen 61-2), and all the characteristics of rural and sylvan life, poetical and real; and also in distinct compartments extensive groups of marine deities, and other corresponding mythic creations, for all of which he received only forty ducats. In the Palazzo Ridolfi he painted the celebrated cavalcade of Clement VII. and Charles V., at Bologna, on the consecration of the emperor, in which he introduced many portraits; these frescoes are still in preservation. Riccio painted also many excellent works in oil, including several large altar-pieces for some of the principal churches in and near Verona, and other works in the ducal palace in Mantua. Venuses and nymphs were also favourite subjects with him; and such pictures frequently occur in picture galleries. He died in 1567.

Felice Riccio, or Brusasorci, his son, was also a distinguished painter; but having studied under Ligozzi at Florence, he painted in a different style from his father: more delicate, but with less power; he was a good portrait painter. He died in 1605, aged 65. His sister Cecilia Brusasorci was also an excellent painter of portraits. Giovanni Battista Brusasorci, another son of Domenico, was painter to one of the German emperors, and died in Germany.

(Ridolfi, *Vite de' Pittori Veneti*, &c.; Dal Pozzo, *Vite de' Pittori Veronesi*; Lanzi, *Storia Pittorica*, &c.)

RICHARDSON, WILLIAM, the son of a parish clergyman in Perthshire, was born in 1743. He was educated for the church in the university of Glasgow, became tutor to the sons of Earl Cathcart, and spent two years with these youths at Eton. Afterwards, when their father became ambassador extraordinary to Russia, he accompanied the family to St. Petersburg, where he acted for four years as the earl's private secretary. In 1773 he was appointed professor of Humanity in the university of Glasgow, and discharged the duties of this office till his death, which took place in 1814. Professor Richardson was a highly popular and successful teacher, and also published several literary works of some merit. He was a contributor to the Mirror and Lounger, and the author of two dramas, of 'Anecdotes of the Russian Empire,' and of a series of periodical essays called 'The

Philanthrope.' He was best known however for a series of Essays on the principal Characters of Shakspere, which appeared in three successive volumes beginning in 1775, and were in 1797 collected into one volume, which became very popular and has been reprinted several times. These essays show considerable critical talent, and some eloquence in writing: their chief fault is the depreciatory spirit in which they treat the great poet, and which has exposed them to severe censure from Mr. Knight and some other recent critics.

RICKMAN, THOMAS, a distinguished writer on Gothic architecture, whose work has become a standard authority in this country, and in whose personal history there is something remarkable; for though neither his education nor his first pursuits in life were calculated to direct his attention to the study of architecture, while the religious tenets in which he was brought up by his parents (those of the Society of Friends) were ill fitted to inspire a taste for that particular branch of the art which he especially cultivated, he not only made it his study, but when he had reached the meridian of life, took up architecture as his profession, and obtained extensive practice.

He was born at Maidenhead June 8th, 1776, and brought up by his father, who was a surgeon and apothecary in that town, to the same profession. He went in 1797 to London, where he became for a while assistant, first to Mr. Stringer, chemist to the royal family, and next to Mr. Atkinson, in Jermyn-street; but disliking the confinement, he changed not his situation only but his vocation also, and entered into the employment of Messrs. Day and Green, extensive grocers, at Saffron Walden. His residence at Saffron-Walden was not, however, of very long continuance, for in compliance with the wishes of his father, who was anxious that he should complete his medical education, he went again to London, and 'walked the hospitals:' after which he returned, in 1801, to his father, who was then settled at Lewes, but did not remain with him above two years, when he repaired again to the metropolis, and engaged himself as clerk to a corn-factor,—a stop likely to lead him further from than bring him at all nearer to his ultimate destination. Nevertheless it proved a stepping-stone to him, so far that he became a partner in the business. In 1808, about the time of the death of his first wife (his cousin Lucy Rickman, to whom he had not been married above a year), he removed to Liverpool, where he made another change, for he took a situation in the counting-house of one of the principal insurance-brokers there. Uncongenial and unpromising as it apparently was in itself, this new situation proved the making of his fortune and fame; for as the attention to business it required occupied him only a few hours in the day, he devoted his leisure to the study of architecture. But here there is evidently a gap in this most important and interesting phase of his history, for we are left altogether in uncertainty as to the influence or impulse which directed him to a pursuit so remote from his habits and employments.

However, having once taken up the study he pursued it zealously; examined ancient buildings with diligence—in a word, educated himself; and perhaps saw all the clearer because he was not tramelled in his inquiries by the prejudices and conventionalities of a professional education. He was also industrious with his pencil, and carefully noted all those distinctions in the different modes of the pointed style on which he founded his valuable system of classification for it. About this period he married his second wife, Christiana Horner, sister to Thomas Horner, the artist who painted the large panorama of London, in the 'Coloseum,' in the Regent's-Park.

On the grant of a million for additional churches being made by Parliament, Rickman, who had previously made attempts at original design, became a competitor, and a design sent in by him being accepted, he determined to establish himself as an architect: he quitted Liverpool and removed to Birmingham, as being in his opinion a likelier situation for obtaining practice from various quarters. Having no practical experience at that time himself, and being unacquainted with the business routine of the profession, he engaged Mr. Henry Hutchinson as his managing assistant in all matters of business, and after his death (1830) entered into partnership with Mr. Hussey.

In 1835 he married his third wife, Elizabeth Miller, of Edinburgh, by whom he had a son, and who survived him. Some years previous to his decease he had had an apoplectic tack, but his naturally strong constitution prevailed against its effects, and he continued to exercise his profession up to the time of his death, which happened March 4th, 1841.

Had Rickman been known only as a writer, his 'Attempt to discriminate the Styles of Architecture in England' (originally written for a publication called 'Smith's Panorama of Science and Art,' but greatly extended as a separate work, and improved in each fresh edition), it would have obtained for him celebrity, for it has become a standard book, and one almost indispensable to the student. Nevertheless it is omitted among those on the subject of Gothic architecture, of which a list is given in Gwilt's Encyclopædia. The work itself, however, recommended him to all lovers of Gothic architecture, opened the road to extensive practice, and procured him patronage in very influential quarters, where as a sectarian he could hardly look for direct countenance and employment. It is to be observed however that 'latterly'—by which it no doubt is to be understood when his profession brought him into contact with the clergy—he withdrew from the Society of Friends. In all probability he had already done so when he was employed at Cambridge and at Rose Castle, the palace of the Bishop of Carlisle, which was restored by him. At Cambridge he executed the new court and buildings (begun in 1827) of St. John's College. Perhaps hardly any individual in the profession was ever employed upon so many churches as Rickman, and a list of them and of other buildings by him is given in the 4th edition of his book; but, long as it is, that list is incomplete, because it does not come down later than 1835. It is also to be regretted that it is a mere list, without so much as any dates. This it is to be hoped will still be done, and the list itself completed in the next edition of the work, which we understand has been long in preparation by his surviving partner, Mr. Hussey. Perhaps a full memoir of Rickman will then be given; and one very desirable improvement it would be were a descriptive catalogue of his buildings to be illustrated by wood-cuts of them—if not of all, of the best among them.

RIDOLFI. [VENETIAN SCHOOL, P. C.]

RIGIDITY OF ROPES. In estimating the powers of machines, it is frequently necessary to take into consideration the effects arising from the rigidity or stiffness of the ropes which pass over the pulleys or the axles of the wheels; and, in order to understand how this condition affects the relation between the moving power and the resistance, let it be observed that when a stiff rope is bent over the upper part of a wheel or pulley in a vertical plane, for example, the weights or powers applied at its extremities may not be sufficient to draw the descending portions into the positions of two vertical lines. Now, if one of the parts of the rope should take such a direction that a vertical line drawn through the weight attached to that part, cuts the horizontal diameter of the wheel or pulley at a point between the centre and one extremity of the diameter; and if, at the same time, the other part should take such a direction that a vertical line drawn through the attached weight cuts the horizontal diameter at a point beyond the extremity of the latter, the distances of these vertical lines from the extremities of the diameter being represented by x and x' respectively, the corresponding weights by W and W′ and the radius of the wheel by R; the conditions of equilibrium instead of being $W = W'$ will be

$$W\,(R-x) = W'\,(R+x')$$

But, if W be the weight which by descending raises up the other, the value of x is generally so small that it may be disregarded, so that we have, in the case of equilibrium,

$$WR = W'(R+x') \text{ or } (W-W')R = W'x',$$

$$\text{or again, } W - W' = W'\frac{x'}{R};$$

that is, in order to put the system in a state of equilibrium, the excess of W above W′ should be equal to $W'\frac{x'}{R}$.

The formula given by Coulomb to express the force necessary for overcoming the rigidity of a rope, or the equivalent of $W'\frac{x'}{R}$, is

$$\frac{r^m}{R}\,(a+bW');$$

r being the semi-diameter of the rope, a the force arising from the warping or twisting of the rope, and b that which depends on the tension arising from the weight W; the values of m, a and b may be determined by experiments made with cords of different diameters; and thus x' may be found. M. Coulomb ascertained that for slender string, $m=1$, and that for stiff cordage the value of m varied from 1·5 to 2; also, from some experiments made with ropes consisting of 30 threads and $2\frac{1}{2}$ inches in circumference, he found that the weights requisite to overcome the rigidity, when the ropes passed over a pulley four inches diameter, and were strained by weights equal to 25 lbs., 125 lbs., and 425 lbs., were 5 lbs., $8\frac{1}{2}$ lbs., and 23 lbs. respectively.

Unfortunately ropes of equal dimensions differ much in rigidity, so that little dependence can be placed on the results of general formulæ in estimating its value. White ropes when wet are more stiff than those which are dry, and the rigidity of ropes is greatly increased by tarring them. In general the weights necessary to overcome the resistance of tarred ropes is proportional to the number of the threads of which they are composed.

RINCON, ANTONIO DEL, court painter to Ferdinand and Isabella, and the first good Spanish painter, was born in Guadalaxara in the middle of the fifteenth century, or probably as early as 1446. From the largeness of his style compared with the generally then prevailing Gothic design, not only in Spain but in the greater part of Italy, he is supposed to have studied in Florence, and probably with Andrea del Castagno, or Domenico Ghirlandajo. Most of Rincon's works have already perished, but there is still an altar-piece, consisting of seventeen pictures from the life of the Virgin by him in the church of Robledo de Chavela, on the road from Madrid to Avila, near the Escorial, which display many excellent qualities of art. In 1483 he executed some works in the old sacristy of the cathedral of Toledo; he was employed by Ferdinand and Isabella in several of the royal palaces of Spain, but both pictures and palaces have long since perished by fire, and otherwise. Rincon was decorated with the order of Santiago; he died at Seville in 1500. Antonio's son, Fernando del Rincon, was a good fresco painter.

(Cean Bermudez, *Diccionario Historico*, &c.)

RIZI, DON FRANCISCO, a distinguished Spanish painter, was born at Madrid in 1608. He was the pupil of Vincenzo Carduccio, and had an extraordinary readiness of invention and execution, but was at the same time, as is usual in such cases, superficial and incorrect: still his readiness to design and facility to execute ensured him a brilliant career. It was not till 1656, however, that he was appointed principal painter to Philip IV.; and he held the same place under Charles II., who gave him the additional place of deputy keeper of the royal keys. He was appointed in 1653 painter to the cathedral of Toledo, a post often in Spain more important than that of painter to the king, for he has the charge of all existing works in the cathedral, and generally the execution of all new works undertaken in his time, which in Spanish cathedrals were at one time numerous and important. Francisco Rizi is, however, one of those painters to whom the decline of painting in Spain is attributed, through the mere superficial attractions of his works; and he is said also, by his capricious decorations of the theatre of Buenretiro, to have done equal injury to the architectural taste of the period. Rizi's last work was a sketch for the great altar-piece of the *Retablo de la Santa Forma* in the Sacristy of the Escorial, which Charles II. ordered for the veil of the magnificent tabernacle and altar, which Rizi had also assisted in making, to contain the Host (La Santa Forma). The subject was the ceremony of the Collocation of the Host by Charles II. in 1684; but Rizi died the following year at the Escorial, having only executed the sketch; the picture was painted by Coello from a sketch of his own, and it is one of the finest pictures in Spain. [Coello, Claudio, P. C. S.]

This Host, or Santa Forma Incorrupta, is the miraculous wafer which bled at Gorkum in 1525 when trampled on by the followers of Zwingli. Rudolf II., Emperor of Germany, gave it to Philip II. of Spain, whither it was transported in 1592, and in 1684 Charles II. constructed the present gorgeous altar and tabernacle for its reception, and the present altarpiece is the ceremony of its collocation. The altar is inscribed—'En magni operis miraculum, intra miraculum mundi, coeli miraculum consecratum.' When the *Forma* is exhibited for adoration, the picture, which forms a veil, is let down, and is accordingly much injured. The French, under La Houssaye, who pillaged the Escorial in 1808, carried off all the gold and silver of this altar: the monks hid the *wafer* in a cellar, and it was restored with great pomp by Ferdinand VII. in 1814.

The pictures, both frescoes and in oil by Rizi, are very numerous; there are several in the Museo of the Prado at Madrid, and many in the churches of Madrid and Toledo, especially in the cathedral of Toledo. Fray Juan Rizi, Francisco's elder brother, born at Madrid in 1595, was also an eminent painter. His principal works are in the Benedictine Monastery of San Martin at Madrid. His design was more correct than his brother's, and his pictures are distinguished for force of light and shade. He retired to Rome and joined the Benedictines of Monte Casino. He was, while in Italy, made an archbishop, in 1675, by the pope Clement X., but he died in the same year at Monte Casino before entering upon the duties of his office.

(Cean Bermudez, *Diccionario Historico*, &c.; Ford, *Guide for Travellers in Spain*, &c.)

ROADS. In Scotland the public highways used for purposes of general transit throughout the country, and suited for the use of vehicles, are under three separate kinds of management. The country in general, with the exception of some Highland districts, is penetrated by turnpike-roads managed by district trusts in terms of local statutes. These are interpreted along with the Act 1 & 2 Wm. IV. c. 43, for the general regulation of turnpike-roads. According to returns of the rents of the various bars, 'the smallness of the sum at which tolls are occasionally farmed is conspicuous. There are some instances where the rent does not exceed 10*l.* Thirty-six bars bear to have been let for sums not exceeding 20*l.* each, and the number let at sums between 20*l.* and 100*l.* is 338.' ('Local Taxes of the United Kingdom,' published by direction of the Poor Law Commissioners, p. 203.) It is obvious that in such a system the rent of the bars, which is the sum available for expenditure on the roads, must be small in proportion to the sum paid by the public, as the lessee who pays 10*l.* or 20*l.* a year must collect an additional sum sufficient for his own support. The highways throughout the country, which are neither turnpikes nor part of the system to be presently noticed, are called 'commutation' or 'statute-labour' roads. They were to a comparatively late period kept up by an allotment of labour on the individual householders and other persons within their respective districts. The liabilities of the individuals came, especially with reference to the richer classes, to be commuted into a proportional annual tax; and from this circumstance the highways so supported are called 'commutation roads.' The management of these roads is settled by local Acts referring to the several counties. From various reports made to parliament, it appears that the counties are divided into small districts, generally corresponding with the parochial division, and that the sums collected throughout the counties are distributed among these districts, and subjected to management and disbursement by petty local boards, more apt to consider the convenience of the roads in reference to their own property and habitations than to consult the general advantage of the public. A third system of roads is under commissioners appointed in terms of statute (59 Geo. III. c. 135), called the Commissioners of Highland Roads and Bridges. A fourth of the expense of this system of transit is paid from the exchequer, and the other three-fourths are assessed on the proprietors of land in the several Highland counties. The commissioners make an annual report to parliament. By the 4 Geo. IV. c. 56, provision was made for the landed proprietors and the commissioners of supply of any of the counties, agreeing to relieve the parliamentary commissioners of the burden of any of these Highland roads, and supporting them by the produce of tolls.

The law as to footpaths and other roads which do not belong to any of the above three systems, is not in a very clear state in Scotland. The right of transit in such cases is founded on the Roman system of servitudes (servitutes); and even where the public enjoy it, it generally rests on the title of the occupants of some districts of land having a right of pathway through some adjoining place. Sometimes the right is of a purely private character, and is confined to the proprietor or tenant of some tenement. At other times it is in the possession of a community, as a village or parish; and in such a case it is not lawful to stop any person who may use the path, on the ground that he is not a member of the privileged community. Such paths are virtually public; but there is no such principle applicable to them as that which stamps the publicity of a highway in England by rendering the parish liable to repair it.

ROASTING is that culinary process by which meat is brought from a raw to a cooked state more directly by the action of fire than by any other means except that of *broiling*.

By the latter, the heat is applied immediately and suddenly to the surface, by which it is hardened, so that the juices of the meat are greatly retained, evaporation being thereby prevented; while by the former the heat is applied gradually, the watery portion is evaporated, as well as the fat melted out to a considerable extent, till the progressive browning and hardening of the surface prevent the further escape of the juices. The loss of weight in roasting meat is much greater than by boiling: 'By this latter process, mutton loses one-fifth, and beef one-fourth; but by roasting, these meats lose about one-third of their weight. In roasting, the loss arises from the melting out of the fat, and the evaporation of the water; but the nutritious matter remains condensed in the cooked solid; whereas, in boiling the gelatine is partly abstracted. Roasted are therefore more nutritive than boiled meats.' (Paris *On Diet.*) The digestibility is also increased, especially in young meats, which are deficient in osmazome, to which the sapidity is mainly owing, and which during boiling passes into the water employed, while in roasting it is powerfully developed and almost entirely retained. 'Young and viscid food, therefore, such as veal, chickens, &c., are more wholesome when roasted than when boiled, and are more easily digested.' The best and most tender meat may, however, be rendered hard and indigestible by a careless or ignorant cook. 'Everybody knows the advantage of *slow boiling*—*slow roasting* is equally important,' See Dr. Kitchener's Cook's Oracle, in which the most sensible and racy instructions on this head are given.

The digestibility is increased by the meat being well done, rather than under-done; 'for though in this latter state it may contain most nutriment, yet it will be less digestible on account of the density of its texture.' This is of importance to remember when it is intended for the diet of convalescents, for whom broiled and roast meats are preferable to boiled.

ROATAN, or Rattan, is an island in the Caribbean Sea, opposite the coast of Honduras, one of the states of Central America. It lies between 10° 5′ and 10° 10′ N. lat., and between 86° 5′ and 86° 25′ W. long., and extends from east-north-east to west-south-west about twenty miles, or somewhat more; the width in no part exceeds five miles, which is about its breadth for the greater part of its extent. The area hardly exceeds 100 square miles. This island is one mass of rocks, but covered with a deep soil, which, united to a moist and warm climate, produces an unusual activity of vegetation. It is overgrown with high trees, except at the western end, where there are some savannahs, on which formerly mules and other cattle were raised. The highest part of the rock is 800 feet above the sea-level. The woods abound in deer, wild hogs, gibeonites, pigeons, parrots, and other birds, many of which afford excellent food. The whole coast swarms with fish and turtle. On the southern shores are three small harbours, Port Royal, Dixon's Cove, and Cozen's Cove. This island was discovered by Columbus on his fourth voyage, in 1502. The English formed a settlement on it in 1742, when they had numerous settlements on the Mosquito Shore, but it was abandoned in 1783, when the English withdrew their garrisons from the Mosquito Shore. In 1794, when the Caribbees on the Island of St. Vincent had rebelled against the English and were compelled to submit, nearly all the prisoners with their families were transported to Roatan. But they soon abandoned the island, and passed over to the continent of America, where they settled near Truxillo, in which town their descendants still form the bulk of the population. When Orlando Roberts visited Roatan (1822), it was uninhabited. But it appears that more recently some families have again settled there, under the protection of the government of Belize, especially for the purpose of fishing and taking turtles.

(Henderson, *Account of the British Settlement of Honduras*, &c.; Orlando Roberts, *Narrative of Voyages and Excursions on the East Coast and in the Interior of Central America.*)

ROEBUCK, JOHN, M.D., the son of a Sheffield manufacturer, was born in 1718, received a liberal education at Northampton under Dr. Doddridge, and subsequently in the university of Leyden, and settled in Birmingham as a physician. Pursuing an early taste for chemistry, he introduced some improvements in the processes of refining gold and silver, and established, in connection with Mr. Samuel Garbet, an extensive refinery and chemical manufactory at Birmingham. He there effected such improvements in the manufacture of sulphuric acid (formerly called vitriolic acid, or oil of vitriol), by the use of leaden instead of glass vessels, and by other modifications of the process, as enabled him to reduce its price from sixteen-pence to four-pence per lb., and thus to render it available for many new and important purposes in connection with manufactures; and, in conjunction with Garbet, he established, in 1749, vitriol-works at Prestonpans for the purpose of bringing these improvements into practice, thereby rendering a great service to our rising manufactures, and securing to himself and his partner a handsome return. He is said to have tried bleaching with sulphuric acid, but the subsequent introduction of this valuable process does not appear to be traceable to his experiments. Abandoning his medical practice, Roebuck henceforward resided chiefly in Scotland, where he perfected improved methods of smelting and manufacturing iron with pit-coal instead of charcoal, and founded the great iron-works at Carron [CARRON, P. C., p. 319], for which he chiefly designed the furnaces and machinery, calling in the aid of Smeaton, and subsequently of Watt. The first furnace at this great establishment, the formation of which constitutes an era in the history of British manufactures, was blown on the 1st of January, 1760. Unfortunately for himself, Roebuck subsequently became the lessee of extensive coal and salt-works at Borrowstounness, belonging to the Duke of Hamilton. For the carrying on of these works, on which he employed nearly a thousand persons, he was obliged to withdraw his capital successively from his other undertakings, and he nevertheless became so involved as to derive only a bare subsistence from the collieries, although his improved modes of working were highly beneficial to the country. While engaged in this speculation he became connected, as stated under WATT, P. C., p. 138, with some of the early experiments of the author of the modern steam-engine, in the first patent for which he had a share. He died on the 17th of July, 1794. In a copious memoir in the fourth volume of the 'Transactions of the Royal Society of Edinburgh,' of which he was a fellow, he is stated to have been the author of a few papers read before that and the Royal Society of London, and to have published two political pamphlets.

ROE'LAS, JUAN DE LAS, one of the most distinguished of the Spanish painters, commonly known among Andalucian artists as el Clerigo Roelas, was born at Seville, of a distinguished family, about the years 1558 and 1560: his father, Pedro de las Ruélas, was a Spanish admiral, and died in 1566. Roelas is styled in documents and in books 'el licenciado Juan,' which signifies, probably, merely that he was a graduate of the University of Seville. Little is known about his education: he is supposed to have studied in Italy, and, from his style, with some of the scholars of Titian in Venice. In 1603 he painted four pictures for the college of Olivares. From 1607 until 1624, he lived chiefly at Seville and Madrid; and in 1616, after the death of F. Castello, he was a competitor for the place of cabinet painter to the king, Philip III.; notwithstanding the 'many years' service of Roelas's father,' however, Bartolomé Gonzalez succeeded Castello. Roélas settled in Olivares in 1624, when he was appointed one of the canons of the college, but he died there in the following year, April 23rd, 1625. Francisco Zurbaran was the scholar of Roélas.

The works of Roélas are very numerous in Seville; and there are still many in the College of Olivares, and there are some at Madrid. His master-piece is the death or 'el Transito' of San Isidoro, in the church of that saint at Seville; this is a large majestic composition, in two compartments, similar to the communion of St. Jerome by Domenichino, and other Italian pictures, but on a larger scale. In the lower part is the archbishop in a church in the attitude of prayer and about to die, supported and surrounded by his numerous clergy, among which are some magnificent heads; in the upper part of the picture is our Saviour on his throne, with the Madonna by his side, and surrounded by angels; the attention of all is directed to the dying saint. This picture, it appears, has never been engraved; indeed, very few good Spanish pictures have been engraved, and it is owing to this circumstance that the great painters of Spain are so little known out of their own provinces. One of his best works also is the Sant Iago, in the Capilla de Santiago, in the Cathedral of Seville: the saint is riding over Moors; it was painted in 1609: Bermudez speaks of it as full of fire, majesty, and decorum. According to Mr. Ford (*Handbook of Spain*), it is surpassed by the picture of the Conception, by Roélas, in the academy; and by three in the chapel of the University of Seville—a Holy Family, with Jesuits; a Nativity; and an Adoration. 'No one,' says this writer, 'ever painted the sleek grimalkin Jesuit like Roélas.' Pacheco, who was censor of pictures in Seville [PACHECO, P. C. S.], reproached Roélas with want of decorum in a picture, in the Merced Calzada, of St. Anne teaching the Virgin to read, for representing some sweetmeats and some articles of common domestic life upon a table in the picture; and also for painting a sheet, intended to wrap the infant Saviour in, who is naked, in the picture of the Nativity, in the chapel of the university.

Roélas is compared with Tintoretto and the Carracci; he is the best of the Andalucian painters in design and composition, and displays frequently a grandeur of form and majesty of character which belong only to the greatest masters: in colouring also he may be compared with the Venetians. His last picture is apparently the Nativity, at Olivares. Palomino's account of this painter is almost wholly incorrect; he calls him Doctor Pablo de las Roélas.

(Cean Bermudez, *Diccionario Historico*, &c.)

ROEMERIA (named after Dr. John James Römer, professor of botany at Landshut; he was author of several botanical works, and died in 1820), a genus of plants belonging to the natural order Papaveraceæ. It has 4 petals, numerous stamens, 2-4 sessile stigmas, an elongated 2-4-valved 1-celled capsule with distinct placentas. The species are annual herbs yielding a yellow juice, with violet flowers.

R. hybrida, Hybrid Roemeria, has a 3-valved erect pod with a few rigid leaves at its extremity. This plant is a native of Europe and the north of Africa, in cultivated fields and vineyards, especially on the coasts of the Mediterranean. It is also found in England in chalky corn-fields in Cambridgeshire and Norfolk. Although now having the appearance of a native, this plant has been probably introduced into this country. Two other species, *R. refracta* and *R. bivalvis*, have been described, the first a native of Tauria, the second of Syria.

(Don, *Gardener's Dictionary*; Babington, *Manual of British Botany*.)

ROMAN ARCHITECTURE. [CIVIL ARCHITECTURE, P. C.]

ROMAN CATHOLICS AND JEWS.* An act was passed on the 18th August, 1846, 9 & 10 Vict. c. 59, intituled 'An Act to relieve Her Majesty's Subjects from certain Penalties and Disabilities in regard to Religious Opinions.'

This act repeals the statutes or ordinances and the several acts herein-after mentioned, or so much and such parts of any of the said acts as are herein-after specified, that is to say:—

The statute or ordinance of the fifty-fourth and fifty-fifth years of the reign of King Henry III., and the statute or ordinance commonly called Statutum (de) Judæismo. [The effect of the repeal of these statutes may be understood by referring to the article JEWS, P. C. The Statutum de Judæismo was made in the third year of Edward I.]

Also so much of an act passed in the fifth and sixth years of the reign of King Edward VI., c. 1, intituled 'An Act for the Uniformity of Service and Administration of Sacraments throughout the Realm,' as enacts 'that from and after the feast of All Saints next coming all and every person and persons inhabiting within this realm, or any other the king's majesty's dominions, shall diligently and faithfully, having no lawful or reasonable excuse to be absent, endeavour themselves to resort to their parish church or chapel accustomed, or, upon reasonable let thereof, to some usual place where common prayer and such service of God shall be used in such time of let, upon every Sunday, and other days ordained and used to be kept as holy days, and then and there to abide orderly and soberly during the time of common prayer, preachings, or other service of God there to be used and ministered, upon pain of punishment by the censures of the church,' so far as the same affects persons dissenting from the worship or doctrines of the United Church of England and Ireland, and usually attending some place of worship other than the Established Church: provided always, that no pecuniary penalty shall be imposed upon any person by reason of his so absenting himself as aforesaid. [Members of the United Church of England and Ireland are still liable to the censures of the church, if they do not attend the services; those who dissent from the church are exempt from these censures if they usually attend some other place of worship. Members of the United Church of England and Ireland are however protected by this act against pecuniary penalties for non-attendance at church.]

Also so much of the said act as enacts, 'that if any manner of person or persons inhabiting and being within this realm, or any other the king's majesty's dominions, shall, after the said feast of All Saints, willingly and wittingly hear and be present at any other manner or form of common prayer, of administration of the sacraments, of making of ministers in the churches, or of any other rites contained in the book annexed to this act, than is mentioned and set forth in the said book, or that is contrary to the form of sundry provisions and exceptions contained in the aforesaid former statute, and shall be thereof convicted according to the laws of this realm, before the justices of assize, justices of oyer and determiner, justices of peace in their sessions, or any of them, by the verdict of twelve men, or by his or their own confession, or otherwise, shall, for the first offence suffer imprisonment for six months, without bail or mainprize; and for the second offence, being likewise convicted as is abovesaid, imprisonment for one whole year; and for the third offence, in like manner, imprisonment during his or their lives.'

Also so much of the said act as enacts, 'that for the more knowledge to be given hereof, and better observation of this law, all and singular curates shall, upon one Sunday every quarter of the year, during one whole year next following the foresaid feast of All Saints next coming, read this present act in the church at the time of the most assembly, and likewise once in every year following, at the same time declaring unto the people, by the authority of the Scripture, how the mercy and goodness of God hath in all ages been shown to his people in their necessities and extremities, by means of hearty and faithful prayers made to Almighty God, especially where people be gathered together with one faith and mind to offer up their hearts by prayer as the best sacrifices that Christian men can yield.'

Also so much of any act or acts of the parliament of Ireland as may have extended to Ireland the provisions of the said act of the fifth and sixth years of the reign of King Edward the Sixth, so far as the same is hereby repealed.

Also so much of an act passed in the first year of the reign of Queen Elizabeth (1 Eliz. c. 1), intituled 'An Act to restore to the Crown the ancient Jurisdiction over the Estate Ecclesiastical and Spiritual, and abolishing all Foreign Powers repugnant to the same,' and of an act of the Parliament of Ireland passed in the second year of the same queen's reign, (2 Eliz. c. 1, [I.]) intituled 'An Act restoring to the Crown the ancient Jurisdiction of the State Ecclesiasticall and Spirituall, and abolishing all Forreinne Power repugnant to the same,' as makes it punishable to affirm, hold, stand with, set forth, maintain, or defend, as therein is mentioned, the authority, pre-eminence, power, or jurisdiction, spiritual or ecclesiastical, of any foreign prince, prelate, person, state, or potentate theretofore claimed, used, or usurped within this realm, or any dominion or country being within or under the power, dominion, or obeisance of her highness, or to put in ure or execute anything for the extolling, advancement, setting forth, maintenance, or defence of any such pretended or usurped jurisdiction, power, pre-eminence, and authority, or any part thereof, or to abet, aid, procure, or counsel any person so offending: provided always, and be it declared, that nothing in this enactment contained shall authorize or render it lawful for any person or persons to affirm, hold, stand with, set forth, maintain, or defend any such foreign power, pre-eminence, jurisdiction, or authority; nor shall the same extend further than to the repeal of the particular penalties and punishments therein referred to, but in all other respects the law shall continue the same as if this enactment had not been made: provided further, that if any person in holy orders according to the rites and ceremonies of the United Church of England and Ireland shall affirm, hold, stand with, set forth, maintain, or defend any such foreign power, pre-eminence, jurisdiction, or authority, such person shall be incapable of holding any ecclesiastical promotion, and, if in possession of any such promotion, may be deprived thereof by due course of law, in the same manner as for any other cause of deprivation.

Also so much of another act passed in the first year of the same queen's reign (1 Eliz. c. 2) intituled 'An Act for the Uniformity of Common Prayer and Service in the Church, and Administration of the Sacraments,' and of another act of the parliament of Ireland passed in the second year of the same queen's reign (2 Eliz. c. 2 [I.]), intituled 'An Act for the Uniformity of Common Prayer and Service in the Church, and the Administration of the Sacraments' as relates to a person's resorting to his parish church or chapel accustomed, or, upon reasonable let thereof, to some usual place where

* This act was passed too late to be noticed under the title of RELIGIOUS OPINIONS, and therefore it has been placed under this head in order that a notice of it might be given.

common prayer and such service of God as in such acts are mentioned are used in such time of let, upon Sundays and other days ordained and used to be kept as holy days, and to his then and there abiding orderly and soberly during the time of the common prayer, preaching, or other service of God there used and ministered: [The penalties from which persons are hereby relieved will appear by referring to LAW, CRIMINAL, P. C. S., p. 179; RECUSANTS, P. C.]

Also an act passed in the fifth year of the same queen's reign (5 Eliz. c. 1), intituled 'An Act for the Assurance of the Queen's Royal Power over all Estates and Subjects within Her Dominions.'

Also an act passed in the thirteenth year of the same queen's reign (13 Eliz. c. 2), intituled 'An Act against the bringing in and putting in execution of Bulls, Writings, or Instruments, and other superstitious Things from the See of Rome,' so far only as the same imposes the penalties or punishments therein mentioned; but it is hereby declared that nothing in this enactment contained shall authorize or render it lawful for any person or persons to import, bring in, or put in execution within this realm any such bulls, writings, or instruments, and that in all respects, save as to the said penalties or punishments, the law shall continue the same as if this enactment had not been made.

Also an act passed in the twenty-ninth year of the same queen's reign (29 Eliz. c. 6), intituled 'An Act for the more speedy and due Execution of certain Branches of the Statute made in the Twenty-third Year of the Queen's Majesty's Reign, intituled "An Act to retain the Queen's Majesty's Subjects in their due Obedience."' [LAW, CRIMINAL, P. C. S., p. 179.]

Also an act passed in the first year of the reign of King James the First (1 Jac. I. c. 4), intituled 'An Act for the due Execution of the Statutes against Jesuits, Seminary Priests, Recusants,' &c. [PARENT AND CHILD, P. C.]

Also so much of an act passed in the third year of the reign of the said King James the First (3 Jac. I. c. 1, § 2 in part), intituled 'An Act for a public Thanksgiving to Almighty God every Year on the Fifth Day of November,' as enacts 'that all and every person and persons inhabiting this realm of England and the dominions of the same shall always upon that day diligently and faithfully resort to the parish church or chapel accustomed, or to some usual church or chapel where the said morning prayer, preaching, or other service of God shall be used, and then and there to abide orderly and soberly during the time of the said prayers, preaching, or other service of God there to be used and ministered.'

Also an act passed in the said third year of the said King James's reign (3 Jac. I. c. 4), intituled 'An act for the better discovering and repressing of Popish Recusants.' [LAW, CRIMINAL, P. C. S., p. 179.]

Also an act passed in the seventh year of the same king's reign (7 Jac. I. c. 6), intituled 'An Act for administering the Oath of Allegiance, and Reformation of married Women Recusants.'

Also so much of an act passed in the thirteenth and fourteenth years of the reign of King Charles the Second (13 & 14 Car. II. c. 4, § 11), intituled 'An Act for the Uniformity of Public Prayers, and Administration of Sacraments, and other Rites and Ceremonies, and for establishing the Form of making, ordaining, and consecrating Bishops, Priests, and Deacons in the Church of England,' as makes any schoolmaster or other person instructing or teaching youth in any private house or family as a tutor or schoolmaster punishable for instructing or teaching any youth as a tutor or schoolmaster before licence obtained from his respective archbishop, bishop, or ordinary of the diocese, according to the laws and statutes of this realm, and before such subscription and acknowledgment made as in the said act is mentioned.

Also so much of the last-mentioned act whereby any act or part of any act herein-before repealed has been confirmed or kept in force. [LAW, CRIMINAL, P. C. S., p. 179.] [This statute against teaching in a private house or family has long since fallen into disuse, but the formal repeal of it is an admission of the freedom of teaching. There still remains the 77th canon of the Church [CONSTITUTIONS AND CANONS, ECCLESIASTICAL, P. C. S.], which goes further than the statute of Charles II., but this canon may be safely neglected by any man who shall choose to teach in 'public school or private house.' The canon forbids only men from teaching without licence or subscription. At that time of day women probably did not teach.]

And also so much of any act or acts of parliament whereby the said parts of the said act of the thirteenth and fourteenth years of the reign of King Charles the Second herein-before repealed have been confirmed or incorporated in any other act or acts of parliament.

Also so much of an act of the parliament of Ireland passed in the seventeenth and eighteenth years of the reign of the said King Charles (17 & 18 Car. II. c. 6, § 6, [I.]), as requires that schoolmasters or other persons instructing or teaching youth in private houses or families as tutors or schoolmasters should take the oath of allegiance and supremacy, and as makes such schoolmasters or other persons punishable for so instructing or teaching youth before licence obtained from their respective archbishop, bishop, or ordinary of the diocese, and before such subscription and acknowledgment made as in the said act is mentioned.

Also so much of an act passed in the thirtieth year of the reign of the said King Charles (30 Car. II. st. 2, § 5 in part), intituled 'An Act for the more effectual preserving the King's Person and Government by disabling Papists from sitting in either House of Parliament,' as enacts that 'every person now or hereafter convicted of Popish recusancy who hereafter shall, at any time after the said first day of December, come advisedly into or remain in the presence of the king's majesty or queen's majesty, or shall come into the court or house where they or any of them reside, as well during the reign of his present majesty (whose life God long preserve) as during the reigns of any of his royal successors, kings or queens of England, shall incur and suffer all the pains, penalties, forfeitures, and disabilities in this act mentioned or contained.'

Also an act of the parliament of Scotland passed in the eighth and ninth session of the first parliament of King William the Third (8 & 9 W. III. c. 3, S.), intituled 'An Act for preventing the growth of Popery,' and all laws, statutes, and acts of parliament revived, ratified, and perpetually confirmed by the said act of King William's first parliament, except as to the form of the formula in such last-mentioned act contained.

Also an act passed in the eleventh and twelfth years of the reign of the said King William the Third (11 & 12 W. III. c. 4), intituled 'An Act for further preventing the growth of Popery:' [LAW, CRIMINAL, P. C. S., p. 179; PARENT AND CHILD, P. C.]

Also an act passed in the first year of the reign of Queen Anne (1 Anne, st. 1, c. 30), intituled 'An Act to oblige Jews to maintain and provide for their Protestant children:

[This statute empowered the Lord Chancellor, on complaint being made to him, to order a Jewish parent to allow his Protestant children a maintenance suitable to the fortune of the parent. [PARENT AND CHILD, P. C.]

Also so much of an act of the parliament of Ireland passed in the second year of the reign of the said Queen Anne (2 Anne, c. 6, s. 1, I.), intituled 'An Act to prevent the further growth of Popery,' as enacts 'that if any person or persons shall seduce, persuade, or pervert any person or persons professing or that shall profess the Protestant religion, to renounce, forsake, or abjure the same, and to profess the Popish religion, or reconcile him or them to the Church of Rome, then and in such case every such person and persons so seducing, as also every such Protestant and Protestants who shall be so seduced, perverted, and reconciled to Popery, shall for the said offences, being thereof lawfully convicted, incur the danger and penalty of præmunire mentioned in the statute of præmunire made in England in the sixteenth year of the reign of King Richard the Second.'

Also so much of the said last-mentioned act of Queen Anne (s. 3) as empowers the Court of Chancery to make such order for the maintenance of Protestant children not maintained by their Popish parents, suitable to the degree and ability of such parents and to the age of such child, and also for the portions of Protestant children to be paid at the decease of their Popish parents as that court shall adjudge fit, suitable to the degree and ability of such parents, and as empowers the said court to make such order for the educating in the Protestant religion the children of Papists, where either the father or mother of such children shall be Protestants, till the age of eighteen years of such children, as to that court shall seem meet, and in order thereto to limit and appoint where and in what manner, and by whom, such children shall be educated (s. 4); and as enacts that the father of such children shall pay the charges of such education as shall be directed by the said court.

And an act passed in the eleventh year of the reign of King George the Second (2 Geo. II. c. 17), intituled 'An

Act for securing the Estates of Papists conforming to the Protestant Religion against Disabilities created by several Acts of Parliament relating to Papists; and for rendering more effectual the several Acts of Parliament made for investing in the two Universities in that Part of Great Britain called England the Presentation of Benefices belonging to Papists,' except so much of the said act as relates to any advowson, or right of presentation, collation, nomination, or donation of or to any benefice, prebend, or ecclesiastical living, school, hospital, or donative, or any grant or avoidance thereof, or any admission, institution, or induction to be made thereupon, but so as that the repeal of the said act shall not in anywise affect or prejudice the right, title, or interest of any person in or to any lands, tenements, or hereditaments under and by virtue of the provisions of the said act at the time of such repeal.

Also so much of an act of the parliament of Ireland passed in the seventeenth and eighteenth years of the reign of King George the Third (17 & 18 Geo. III. c. 49, s. 5 [I.]), intituled 'An Act for the Relief of His Majesty's Subjects of this Kingdom professing the Popish Religion,' as enacts 'that no maintenance or portion shall be granted to any child of a Popish parent, upon a bill filed against such parent pursuant to the aforesaid act of the second of Queen Anne, out of the personal property of such Papists, except out of such leases which they may hereafter take under the powers granted in this act.'

Also so much of an act passed in the eighteenth year of the reign of the said King George the Third (18 Geo. III. c. 60, s. 5), intituled 'An Act for relieving His Majesty's Subjects professing the Popish Religion from certain Penalties and Disabilities imposed on them by an Act made in the eleventh and twelfth Years of the Reign of King William the Third, intituled "An Act for the further preventing the Growth of Popery,"' as enacts 'that nothing in this act contained shall extend or be construed to extend to any Popish bishop, priest, Jesuit, or schoolmaster who shall not have taken and subscribed the above oath in the above words before he shall have been apprehended, or any prosecution commenced against him.'

Also so much of an act of the parliament of Ireland passed in the twenty-third and twenty-fourth years of the reign of the said King George the Third (23 & 24 Geo. III. c. 38 [I.]), intituled 'An Act for extending the Provisions of an Act passed in this Kingdom in the nineteenth and twentieth Years of His Majesty's Reign, intituled "An Act for naturalizing such foreign Merchants, Traders, Artificers, Artizans, Manufacturers, Workmen, Seamen, Farmers, and others, as shall settle in this Kingdom,"' as excepts out of the benefit of that act persons professing the Jewish religion.

Also so much of an act passed in the thirty-first year of the reign of the said King George the Third (31 Geo. III. c. 32), intituled 'An Act to relieve, upon Conditions and under Restrictions, the Persons therein described from certain Penalties and Disabilities to which Papists or Persons professing the Popish Religion are by Law subject,' as enacts (s. 12) 'that nothing herein contained shall be construed to give any ease, benefit, or advantage to any person who shall, by preaching, teaching, or writing, deny or gainsay the oath of allegiance, abjuration, and declaration herein-before mentioned and appointed to be taken as aforesaid, or the declarations or doctrines therein contained, or any of them.'

Also so much of the said last-mentioned act (s. 15) as provides and enacts, 'that no schoolmaster professing the Roman Catholic religion shall receive into his school for education the child of any Protestant father.' [LAW, CRIMINAL, P. C. S., p. 180.]

Also so much of the said last-mentioned act (s. 16) as provides and enacts, 'that no person professing the Roman Catholic religion shall be permitted to keep a school for the education of youth until his or her name and description as a Roman Catholic schoolmaster or schoolmistress shall have been recorded at the quarter or general session of the peace for the county or other division or place where such school shall be situated, by the clerk of the peace of the said court, who is hereby required to record such name and description accordingly upon demand by such person, and to give a certificate thereof to such person as shall at any time demand the same, and no person offending in the premises shall receive any benefit of this act.

Also so much of an act of the parliament of Ireland passed in the thirty-third year of the reign of the said King George the Third (33 Geo. III. c. 21, s. 14 [I.]), intituled 'An Act for the Relief of His Majesty's Popish or Roman Catholic Subjects of Ireland,' as provides 'that no Papist or Roman Catholic, or person professing the Roman Catholic or Popish religion, shall take any benefit by or under this act, unless he shall have first taken and subscribed the oath and declaration in this act contained and set forth, and also the said oath appointed by the said act passed in the thirteenth and fourteenth years of his majesty's reign, intituled 'An Act to enable His Majesty's Subjects, of whatever Persuasion, to testify their Allegiance to him in some one of His Majesty's four Courts in Dublin, or at the General Sessions of the Peace, or at any Adjournment thereof, to be holden for the County, City, or Borough wherein such Papist or Roman Catholic, or Person professing the Roman Catholic or Popish Religion, doth inhabit or dwell, or before the going Judge or Judges of Assize in the County wherein such Papist or Roman Catholic, or person professing the Roman Catholic or Popish Religion, doth inhabit and dwell, in open Court.'

Also an act passed in the said thirty-third year of the reign of the said King George the Third (33 Geo. III. c. 44), intituled 'An Act for requiring a certain Form of Oath of Abjuration and Declaration from His Majesty's Subjects professing the Roman Catholic Religion in that Part of Great Britain called Scotland.'

II. And be it enacted, that from and after the commencement of this act her majesty's subjects professing the Jewish religion, in respect to their schools, places for religious worship, education, and charitable purposes, and the property held therewith, shall be subject to the same laws as her Majesty's Protestant subjects dissenting from the Church of England are subject to, and not further or otherwise. [This section makes a considerable change by placing Jews on the same footing as to the things enumerated as Protestant Dissenters; and it will enable any person to leave a legacy for the instruction of Jews in their religion, which up to the passing of this act could not be done.] [JEWS, P. C., p. 123.]

III. Provided, that nothing in this act contained shall affect any action or suit actually pending or commenced, or any property now in litigation, discussion, or dispute, in any of her majesty's courts of law or equity.

IV. That from and after the commencement of this act all laws now in force against the wilfully and maliciously or contemptuously disquieting or disturbing any meeting, assembly, or congregation of persons assembled for religious worship, permitted or authorized by any former act or acts of parliament, or the disturbing, molesting, or misusing any preacher, teacher, or person officiating at such meeting, assembly, or congregation, or any person or persons there assembled, shall apply respectively to all meetings, assemblies, or congregations whatsoever of persons lawfully assembled for religious worship, and the preachers, teachers, or persons officiating at such last-mentioned meeting, assemblies, or congregations, and the persons there assembled.

ROMAN EMPIRE, EASTERN DIVISION OF—frequently designated the EASTERN EMPIRE, GREEK EMPIRE, BYZANTINE EMPIRE, or LOWER EMPIRE. The actual separation of the Roman Empire into two parts occurred at an earlier period than the epoch usually fixed, viz. the death of Theodosius the Great; and was the result of causes which had been long at work. The warlike pre-eminence of Italy had enabled the Romans to achieve the conquest of the various and distant provinces which constituted the Roman empire, and the vigour of their central government, and the practical wisdom which usually guided it, enabled them to consolidate these provinces under an effective control. The reality and unity of the Roman government for the first three centuries of the empire, form a remarkable contrast to the disorderly independence of the satrapies of the Persian empire; and its permanence contrasts in an equally striking degree with the immediate dissolution of the Macedonian empire, consequent upon the death of Alexander the Great. Dissensions and civil wars did indeed repeatedly agitate the Roman empire during the period mentioned, but they did not arise from attempts at separation or local independence, but from competition for the possession of the whole. Dismemberment was not thought of.

These contests however shook the whole framework of the empire: and as Italy lost its pre-eminence in warlike energy and political skill; and the emperors, on whose personal qualities, from the despotic character of the government, the condition and spirit of the empire depended, arose from provincial rather than Italian families; the sentiment of unity was weakened, and Rome was no longer felt to be the real capital of the empire. Had the empire, however, been assailed by any one hostile power capable of affecting the safety of the whole, a sense of the common danger might have supplied a principle of cohesion; but each part had its peculiar enemies to contend with, and apprehended little injury from those who assailed the other portions of the empire. The Germanic confederations of the Alemanni and Franks [ALEMANNI, P.C.; FRANCE, P. C.] might threaten the Rhenish and upper Danubian frontiers, but neither Greece, Syria, Egypt, nor even the lower Danubian provinces were endangered by them: the Goths [GOTHS, P. C.] might overrun Maesia and Thrace, but were little thought of on the Asiatic side of the Hellespont; while the revived Persian kingdom, under the dynasty of the Sassanidae [PERSIA, P. C.], which threatened the subjugation of the East, was little regarded in Gaul or Africa. This mutual independence of the assailing nations tended to promote the dissolution of the empire by fixing the attention of its several parts on the enemies immediately opposed to them, and allowed neither leisure to attend to nor sympathy to feel for others.

The direction in which the fracture was likely to take place was indicated by the geographical and other circumstances of the empire. The principal extension of the empire was from east to west: and the Romans were not enough of a naval people to avail themselves fully of the facilities which the Mediterranean Sea afforded for keeping up the connection between their more distant provinces. The military communications were maintained by land, except where this was impracticable, rather than by water. Had the Hellespont and the Bosporus been wider, the separation would perhaps have been made there; but the narrowness of those straits, and the maritime tendencies of the adjacent Greek population, so closely united the opposite shores, that the separation of the European and Asiatic continents was of little practical moment: and tho place of the fracture was determined to that part of the empire where the communication by land, narrowed between the shores of the Adriatic and the nearest part of the Danubian frontier, was impeded by the difficulties of traversing the Illyrian offshoots of the great Alpine mountain system. South of the Mediterranean, the place of fracture was determined by the great Libyan desert west of Egypt and of Cyrenaica.

Another circumstance which tended to determine the point of separation was difference of language. Before the Roman arms had crossed the Adriatic the Greek language had become the language of literature and education in the countries to the east of that sea, and formed an important bond of union. The native languages of the East remained in use as spoken languages, and after the diffusion of Christianity some of them (*e. g.* the Syriac and Coptic and Armenian) came into use again as written languages; but the profane, and, to a large extent, the sacred literature of Asia Minor, Syria, and Egypt was Greek. West of the Adriatic the Latin tongue acquired a similar or even a greater supremacy; for it superseded, though probably in a corrupt form, the antient languages of Gaul and Spain and Italy in popular use, as well as for literary purposes, and forms the basis of the modern languages of those countries.

Had the African provinces west of the Libyan desert possessed the warlike resources of the other parts of the empire it is not unlikely that they would have formed a separate portion, and thus havo led to a threefold division. But neither did their internal resources allow this, nor was the frontier of the Atlas pressed by any foe so formidable as to require the presence of an emperor in that part. The Moorish tribes of the desert, however formidable as marauders, were impotent for conquest. The feeble attempts of provincial governors, *e. g.* Julius in the time of Diocletian, and Firmus and Heraclian in the reign of Honorius, to acquire independence in Africa were soon put down: and the African provinces, until their subjugation by the Vandals, remained in subjection, except during a few brief intervals, to the sovereigns of the West.

(A.D. 286.) The first emperor of the Eastern part of the empire, as separate from the West, was DIOCLETIANUS, who, on appointing Maximian as his colleague, retained to himself the government of the Eastern portion, which he held till his abdication, A.D. 305. [DIOCLETIANUS, CAIUS VALERIUS, P. C.; MAXIMIANUS, MARCUS VALERIUS, P. C.]

(305.) VALERIUS MAXIMIANUS GALERIUS, usually known as GALERIUS, who had, under Diocletian, governed the Danubian Provinces, with the subordinate rank of Caesar, succeeded that prince as Augustus or Emperor in the East, and reigned till A.D. 311. [MAXIMIANUS GALERIUS, VALERIUS, P. C.]

(311.) FLAVIUS VALERIUS LICINIUS and MAXIMINUS DAIA or DAZA succeeded Galerius. Maximin, who was nephew of that emperor, or was otherwise related to him, was appointed Caesar shortly after the abdication of Diocletian. Licinius was appointed Augustus by Galerius, apparently without passing through the subordinate rank of Caesar, A.D. 307; and Maximin, offended at the elevation of another to a rank superior to himself, assumed the title of Augustus also. Both however appear to have conceded a sort of precedence to Galerius during his life. After his death they divided the East between them, Maximin having the Asiatic provinces, and Licinius the European. The West was meanwhile (A.D. 312) reduced under the sole dominion of Constantine. In A.D. 313 Licinius and Maximin quarrelled; and the latter, after being defeated by his rival, poisoned himself at Tarsus. In A.D. 315 war broke out between Licinius, now sole Emperor of the East, and Constantine, which ended in the defeat of the former, who ceded nearly the whole of his European provinces to the conqueror. After an interval of eight years, war was renewed between them; and the defeat and capture of Licinius (A.D. 323) reunited the whole empire under Constantine. [MAXIMINUS DAIA, P. C.; CONSTANTINUS, FLAVIUS VALERIUS, P. C.]

Family of Constantine.

(323.) CONSTANTINUS I. MAGNUS, who reigned till his death, A.D. 337. [CONSTANTINUS, FLAVIUS VALERIUS, P. C.] From him succeeding emperors seem to have taken in almost every case the name of Flavius.

(337.) CONSTANTIUS II. In the division of the dominions of Constantine the Great among his three sons, Constantius, the second son, had the East. He is known as Constantius II., his grandfather, who was emperor of the West [CONSTANTIUS I. CHLORUS, P. C.] being known as Constantius I. On the defeat of Magnentius, A.D. 353 [MAGNENTIUS, P. C.], the whole empire was reunited under Constantius II., who died A.D. 361. [CONSTANTIUS II., FLAVIUS JULIUS, P. C.]

(361.) JULIANUS, FLAVIUS CLAUDIUS, commonly known as JULIAN THE APOSTATE, nephew of Constantine the Great by his half-brother Constantius, ruled the whole empire for two years after Constantius. [JULIANUS, FLAVIUS CLAUDIUS, P. C.] With Julian the family of Constantine ends.

(363.) JOVIANUS held the whole empire only three months. [JOVIANUS, FLAVIUS CLAUDIUS, P. C.]

Family of Valentinian.

(364.) VALENTINIANUS I., almost immediately on his appointment to the empire, resigned the east to his brother Valens. [VALENTINIAN I., FLAVIUS, P. C.]

(364.) VALENS governed the East till his death in the Gothic War, A.D. 378. [VALENS, FLAVIUS, P. C.]

(378.) GRATIANUS, son of Valentinian I., succeeded Valens in the East, but almost immediately resigned it to Theodosius the Great, retaining the West, which he had held from his father's death in A.D. 375. [GRATIANUS AUGUSTUS, P. C.]

Theodosian Family.

(379.) THEODOSIUS I., the GREAT, ruled the East during the remainder of his life, during the last year of which he acquired the West also, thus for the last time uniting the whole empire under one supreme ruler. [THEODOSIUS I., FLAVIUS, P. C.]

(395.) ARCADIUS, the elder son of Theodosius, succeeded his father in the East, and Honorius, the younger son, in the West. [ARCADIUS, P. C.]

(408.) THEODOSIUS II., or the YOUNGER, son of Arcadius, succeeded his father while yet in his childhood. He died A.D. 450. His government was principally directed by his sister Pulcheria and his wife Eudocia. [THEODOSIUS II., P. C.; EUDOCIA, daughter of Leontius, P. C.]

(450.) PULCHERIA, daughter of Arcadius, succeeded her brother Theodosius: she had devoted herself to a life of religious celibacy, but upon her brother's death she chose as her associate in the empire Marcian, a Thracian, whose merit had raised him from an humble station to high rank. She married him under an agreement that she was to remain a virgin. She died before her husband.

(450.) MARCIANUS may be classed with tho Theodosian family, his connection with which raised him to the empire. [MARCIANUS, P. C.] He died A.D. 457.

The history of the East during the eventful period (about 170 years) from the first division of the empire under Diocletian to the death of Marcian has to be gathered from many authorities. For the first part of it, comprehending the reign of Constantine and the preceding Augusti, we have as contemporaries Lactantius [LACTANTIUS, P. C.], or the author, whoever he was, of the book *De Mortibus Persecutorum*, and Eusebius in his *Life of Constantine*. [EUSEBIUS PAMPHILI, P. C.] The *Ecclesiastical History* of the latter writer furnishes some notices of such events as are connected with the Christian Church before the reign of Constantine. Ammianus Marcellinus [AMMIANUS MARCELLINUS, P. C.] is a valuable contemporary authority for the period (A.D. 353-378) included in the extant portion of his history. Aurelius Victor in his *De Caesaribus*, and the author of the *Epitome* which passes under his name [AURELIUS VICTOR, P. C.], give an abridgment of the history both of East and West; the *De Caesaribus* comes down to the reign of Constantius II., and the *Epitome* to the time of Theodosius the Great. Eutropius [EUTROPIUS, P. C.] in his *Breviarium* comes down to the accession of Valens, at whose command he wrote, and Orosius in his History to the reign of Honorius [OROSIUS PAULUS, P. C.]. But these writers are brief, and relate chiefly to the affairs of the West. This is also the case with the more copious and valuable work of Olympiodorus [OLYMPIODORUS, P. C.], which is known to us only by the abridgment and extracts given by Photius (*Bibliotheca*, Cod. 80). It relates chiefly or wholly to the reign of Honorius. The history of Zosimus, who lived apparently under Theodosius II., probably came down to his own time; but the extant portion extends only to A.D. 409. [ZOSIMUS, P. C.] Notices of the affairs of the East are to be gleaned from the Western Chroniclers, Marcellinus, Prosper of Aquitaine, Prosper Tyro, and Victor of Tunes; from the poems of Claudian [CLAUDIANUS, P. C.]; and from the writings of the Emperor Julian, and of the Christian fathers Athanasius, Gregory Nazianzen, and Chrysostom. [ATHANASIUS, ST., P. C.; CHRYSOSTOM, ST. JOHN, P. C.; GREGORY OF NAZIANZUS, P. C.] Of the later Byzantine writers [BYZANTINE HISTORIANS, P. C.], there are several whose Chronicles or Histories include this period; the most valuable are Theophanes Isaacius in his *Chronographia* and Zonaras in his *Annales*. Cedrenus, Glycas, Malalas, Joel, and the versifying chroniclers, Constantine Manasses and Ephraemius, are of less value; the *Chronicon Paschale* or Alexandrian Chronicle, though meagre, is of more value. Ecclesiastical History, after the time at which Eusebius closes his history, was written by Socrates [SOCRATES, P. C. S.], Sozomen, and Theodoret [SOZOMENUS, P. C.; THEODORETUS, P. C.], whose works extend from the time of Constantine to that of Theodosius II.; and by Evagrius [EVAGRIUS, P. C.], whose work, designed as a sequel to those of the three writers just mentioned, comes down to near the close of the sixth century. These histories are valuable, not only from the importance of ecclesiastical affairs after the conversion of Constantine, but from their frequent notice of secular events. The history of the whole period is contained in the *Fall of the Roman Empire* by Sismondi, in Lardner's Cyclopædia; and in the great work of Gibbon [GIBBON, EDWARD, P. C.], and with greater minuteness in the *Histoire des Empereurs* of Tillemont [TILLEMONT, SEB. LE NAIN DE, P. C.], who has carefully collected almost every thing that has been recorded, and has examined and digested it with critical accuracy and generally sound judgment. The copious but wearisome *Histoire du Bas Empire* of Le Beau embraces the period subsequent to the death of Constantius Chlorus and the accession of Constantine the Great to the rank and authority of Cæsar. To these works we may add the *Historia Byzantina* of Ducange.

The Family of Leo I.

(457.) LEO I., called THRAX (the THRACIAN), MAGNUS (the GREAT), and MACELLES (Μακέλλης), the BUTCHER, was, like his predecessor Marcian, a Thracian of an obscure family. He reigned seventeen years. [LEO I., P. C.]

(474.) LEO II., grandson of Leo I. by his daughter Ariadne, came to the throne at the age of four years, and reigned less than a year. [LEO II., P. C.]

(474.) ZENO, called ISAURUS, an Isaurian, who had married Ariadne, daughter of Leo I., and was father by her of Leo II., succeeded on the death of the latter. His reign, which was troubled by successive rebellions, is described elsewhere. [ZENO, P. C.] He was for a short time expelled from his throne by

(475.) BASILISCUS, who occupied Constantinople nearly two years. He fell at last into the hands of Zeno, A.D. 477, and was starved to death, A.D. 477 or 478.

(491.) ANASTASIUS I., surnamed SILENTIANUS, from his being one of the emperor's Silentiarii, or life-guards, a native of Dyracchium in Epirus, ascended the throne on Zeno's death, by the help of the dowager Empress Ariadne, whom he afterwards married. [ANASTASIUS I., P. C.] His long reign of twenty-seven years was as much affected by foreign invasion and the dissensions of the church as that of Zeno had been by rebellion.

With Anastasius ends the dynasty of Leo I., with which indeed both Zeno and Anastasius can only be classed by virtue of their marriage with Ariadne.

Family of Justin.

(518.) JUSTINUS I., a Dacian peasant who had risen to be general of the emperor's guards, succeeded Anastasius, and reigned nine years, when he abdicated the throne, and died soon after. [JUSTINUS I., P. C.]

(527.) JUSTINIANUS I. was nephew by his mother's side of Justin I. Justinian's reign of thirty-eight years was distinguished by the victories of Belisarius, Narses the Eunuch, and Germanus the emperor's own nephew; and more honourably by his compilation of the Roman law. [JUSTINIANUS, P. C.; JUSTINIAN'S LEGISLATION, P. C.; BELISARIUS, P. C.; NARSES, P. C.; LONGOBARDS, P. C.; OSTROGOTHS, P. C.; THEODORIC, P. C.]

(565.) JUSTINUS II., nephew by his mother Vigilantia to JUSTINIAN I., succeeded to the throne, but, worn down and disabled by illness, he resigned the exercise of sovereignty A.D. 574 to Tiberius, who was created Cæsar; but Justin retained the title of Augustus until his death A.D. 578. [JUSTINUS II., P. C.]

The dynasty of Justin I. ends with Justin II.

(578.) TIBERIUS II., or more fully FLAVIUS CONSTANTINUS TIBERIUS AMICUS THRAX, wielded the sovereign power with the title of Cæsar from A.D. 574, and received the title and authority of Augustus just before the death of Justin II., from which latter period he reigned four years. [TIBERIUS II., P. C.]

(582.) MAURITIUS or MAURICIUS, had been created Cæsar by Tiberius II., whose daughter Constantina he had married. The reign of Mauricius was chiefly marked by wars and negotiations with Persia. Having become unpopular, he was murdered, with most of his family, by the centurion Phocas.

(602.) PHOCAS, who headed a revolt of the army in Thrace [PHOCAS, P. C.], murdered Mauricius, and succeeded to the throne. This bloodthirsty tyrant occupied the throne till he was deposed and put to death by Heraclius, A.D. 610.

From the time of Diocletian to that of Justin I. the limits of the Eastern empire underwent little alteration except by the acquisition of Northern Mesopotamia and of five provinces east of the Tigris, in the reign of Diocletian, and by the cession of these acquisitions by Jovian after the death of Julian the Apostate. Part of the Greater Armenia was annexed to the empire by Theodosius the Great. The Eastern empire was indeed repeatedly invaded; and the Goths in the time of Valens, and the Bulgarians in the reign of Anastasius, had nearly overthrown it. The eastern frontier was almost continually the seat of war with the Persians, and civil dissension in the time of Zeno shook the empire to its centre; but it recovered from these shocks, and the reign of Justinian I. was successful in aggression. The Western empire had been extinguished during the reign of Leo I., and the invasions of Justinian were directed against the provinces of the West, which different nations of barbarians had occupied. Africa and apparently Mauritania, and even a small part of Spain, were recovered from the Vandals by Belisarius, and preserved by Germanus; and Italy, with Sicily, Sardinia, and Corsica, were conquered by Belisarius and Narses. The northern part of Italy and the inland parts as far south as Beneventum were indeed soon lost again, being conquered in the reigns of Justin II. and Tiberius II. by the Lombards [LONGOBARDS, P. C.], who gradually extended their encroachments; and the African conquests of Belisarius were in the next century overrun by the victorious Saracens under the successors of Mohammed [ARABIA, P. C.], but Rome and the coast of the central and southern parts of Italy (under the designation of Longobardia), as well as Sicily, remained in the possession of the Byzantine emperors; who retained a footing in Italy and Sicily (though their possessions were continually disputed by the Latins and the Saracens) almost to the time of the Crusades.

The period from Justinian to Heraclius, the successor of Phocas, was that of the greatest extension of the Eastern empire. The cession of the provinces east of the Tigris in the reign of Jovian was far more than counterbalanced by the acquisition of part of Armenia under Theodosius the Great, by the western conquests of Belisarius and Narses, and by the extension of the Byzantine territory by conquest or settlement along the eastern and northern coasts of the Euxine, the progress of which is not easy to trace. Even after the loss of the northern part of Italy, the Eastern empire was larger than it had been under the emperors who preceded Justinian.

The principal historical authorities for the period from Leo the Thracian to Phocas are Theophanes Isaacius, Zonaras, the Paschal or Alexandrian Chronicle, Cedrenus, Joannes Malalas or Malelas, Michael Glycas, Joel, and the versifiers: these several writers comprehend the whole period, with the exception of Malalas, whose '*Chronographia*' ends during the reign of Justinian I., A.D. 563. The wars of Belisarius are related by Procopius [PROCOPIUS, P. C.], whose introductory chapters to his *Bellum Vandalicum*, *Bellum Geticum* or *Gotthicum*, and *Bellum Persicum*, contain some important notices of events previous to that time. The Secret History (*Historia Arcana*) of Procopius relates to the same period. Agathias relates the events of A.D. 553-559. The history of the Emperor Mauricius (*Historia Mauriciana*) is related by Theophylactus Simocatta; and the reign of Phocas is included in the work of Nicephorus of Constantinople, *De Rebus post Mauricium gestis*. The Ecclesiastical History of Evagrius, a contemporary, comes down to the reign of Maurice, A.D. 594; and that of Nicephorus Callisti, a writer of much later date, to the accession of Heraclius. After the reign of Anastasius, we lose the valuable assistance of Tillemont; but the whole period is included in the works of Ducange, Gibbon, Sismondi, and Le Beau.

Heraclian Dynasty.

(610.) HERACLIUS, son of the patrician Heraclius, governor of Africa, dethroned Phocas and put him to death. His reign was one of the most interesting and eventful in the whole course of Byzantine history; and his character one of the most striking and inexplicable. The middle part of it was characterized by brilliant and successful warlike exertions, by which the empire was saved from impending ruin. The earlier part was characterized by inertness, and the latter part by sensuality and carelessness. [HERACLIUS, P. C. and P. C. S.] He reigned above thirty years.

(641.) CONSTANTINUS III., or more fully FLAVIUS HERACLIUS CONSTANTINUS, or NOVUS CONSTANTINUS, was the son of Heraclius by his first wife Eudocia Fabia. The name of Constantinus was given in the hope that he would renew the glory of the great Constantine. He reigned only about three months, being, as was suspected, poisoned by his step-mother Martina, niece and second wife of Heraclius; she being anxious to make her son Heracleonas (who had been, by his father's will, made colleague with Constantine) sole occupant of the throne.

(641.) HERACLEONAS. The death of Constantine III. excited a revolt against the government of Martina, who ruled in the name of her son; and both she and Heracleonas were compelled by Valentinus or Valentine (who had forced her to raise him to the dignity of Caesar) to admit Constans, son of Constantine III., to a share in the empire; and were soon afterwards deposed, imprisoned, mutilated, and sent into exile, where they died.

(641.) CONSTANS II. (Constans I., son of Constantine the Great, had ruled the Western empire) was originally named Heraclius. He acceded to the throne in his eleventh year, and reigned for twenty-seven years. During the first few years of this reign the government was virtually in the hands of Valentine; but Constans, when he attained to manhood, manifested considerable energy both in military and ecclesiastical affairs. He was however violent and unfortunate: his eastern territories, already much diminished by the progress of the Caliphate, were still further diminished by the extension of that rising empire [ARABIA, P. C., vol. ii. p. 217]; and his Italian dominions were shaken by religious troubles. The murder of his brother Theodosius by the emperor's order (A.D. 661) made Constans a prey to the horrors of remorse. His palace at Constantinople became odious to him; and this, combined perhaps with political reasons, led him to contemplate the reconquest of Italy, and the restoration of the seat of empire to Rome. The ill success of his Italian warfare however made him give up this plan, and he fixed himself at Syracuse, where he was murdered, A.D. 668.

(668.) CONSTANTINUS IV., POGONATUS, or BARBATUS, the BEARDED, eldest son of Constans II., succeeded his father. He had been left by his father governor of Constantinople A.D. 662, and on the news of the assassination of Constans, and of the revolt of his murderers and their partizans in Sicily, fitted out an expedition, which he headed in person, and quelled the revolt (A.D. 669); and having put Mizizus, the emperor whom they had elected, to death, returned to Constantinople. The revolt of the army in Asia followed his return; the troops, by a fanciful analogy drawn from the prevalent theology, requiring to be governed by a trinity of sovereigns, and demanding that Heraclius and Tiberius, brothers of Constantine, should be declared joint emperors with him. The revolt was quelled; but the brothers were pardoned. The Arabs of the Caliphate conquered Asia Minor and the Greek islands, and besieged Constantinople, but were defeated chiefly by the agency of the Greek fire, then just invented [FIRE, GREEK, P. C.]; and the tide of success turning, the emperor recovered Asia Minor and the islands. The Bulgarians however conquered the province now known as Bulgaria, south of the Danube. The empire was divided either in or before the reign of Constantine IV., according to a new system, into military districts, called themata. Constantine IV. died A.D. 685.

(685.) JUSTINIANUS II., sometimes called RHINOTMETUS, or CUT-NOSE, son of Constantine IV., succeeded his father. After an oppressive reign of ten years he was dethroned, had his nose cut off, and was banished to the Crimea by Leontius.

(695.) LEONTIUS reigned three years; and being unfortunate in the war with the Arabs, was in turn dethroned, had his nose cut off, and was confined in a monastery, by Absimarus, one of his generals, who took the name of Tiberius.

(698.) TIBERIUS III. was a vigorous and, for a time, successful prince. He recovered Syria from the Arabs, and had considerable influence in Italy. He was dethroned, and, with his brother Heraclius and his predecessor Leontius, put to death (A.D. 705) by Justinian II., who was restored. [TIBERIUS ABSIMARUS, P. C.]

(705.) JUSTINIANUS II. Justinian regained his throne by the help of the Bulgarians; and continued to abuse his power till he was dethroned and put to death by Philippicus Bardanes, A.D. 711. [JUSTINIANUS II., P. C.]

The Heraclian dynasty ends with Justinian II. It occupied the Byzantine throne (including the period of Justinian's exile) rather more than a century; a period marked by the decided diminution of the empire, though not without temporary vicissitudes and gleams of brilliant but transient success. The enemies from whom the empire suffered most were the Arabs, then invigorated by the fresh infusion of Mohammedan fanaticism. Under Mohammed himself [MOHAMMED ABUL KASEM IBN ABDOLLAH, P.C.] their conquests scarcely encroached upon the boundary of the empire; but under his successors Abu Bekr [ABU BEKR, P. C.] and Omar [OMAR I., P. C.], Palestine, Syria [SYRIA, P. C.], Roman Arabia, Egypt [EGYPT, P. C.], and Cyrenaica [CYRENAICA, P.C.] were subdued. These conquests were made during the latter years of Heraclius. Tripolitana and Africa Proper, the modern states of Tripoli and Tunis [BARBARY, P.C.; TRIPOLI, P.C.; TUNIS, P. C.], were conquered by the same foe during the reign of Constans II., in which also Sicily [SICILY, P. C.] was attacked, though the assailants made but little progress; Cyprus and Rhodes were also taken by them [CYPRUS, P. C.; RHODES, P. C.]; but Cyprus was soon recovered, and, after a longer time, Rhodes also. The contraction of the European territory by the settlement of the Bulgarians, took place under Constantine IV. Africa was wholly and finally lost before the Heraclian family ceased to reign; and although Syria was temporarily recovered by Heraclius, brother and general of Tiberius Absimar, A.D. 699 and 700, it was soon lost again.

To the other evils of the period religious dissension was added. The Monothelite controversy raged during the latter part of the reign of Heraclius and in the reigns of his successors, until it was settled in the sixth general or second Constantinopolitan counci, A.D. 680. Heraclius and his grandson Constans were patrons of the so-called heresy of the Monothelites.

The principal antient authorities for the period of the Heraclian dynasty are Theophanes, Cedrenus, Glycas, Zonaras, Nicephorus of Constantinople, Joel, Ephraemius, and Constantine Manasses. The *Chronicon Paschale*, or *Alexandrinum*, reaches down to the earlier years of the reign of Heraclius; and the wars of that prince with the Persians and Avars are commemorated in the poems of George the Pisidian, an ecclesiastic of that time, and probably an eye-witness of the events which he relates. The Monothelite controversy is discussed largely by St. Maximus, one of the Greek fathers.

(711.) PHILIPPICUS BARDANES succeeded to the now vacant throne. He patronized the Monothelites. His reign was short: he was deposed, blinded and imprisoned, A.D. 713, by Rufus, an officer sent by the one of his generals, George Buraphus, who had rebelled in Asia Minor.

(713.) ANASTASIUS II. (previously to his accession he was called ARTEMIUS) succeeded Philippicus. He patronized the orthodox faith in opposition to the Monothelites. He was dethroned A.D. 715 by the troops which he had sent to attack the Saracens in the port of Alexandria. [ANASTASIUS II., P. C.]

(715.) THEODOSIUS III. made some cessions of territory in Thrace to the Bulgarians. He was deposed (A.D. 718) by Leo, one of his officers, who commanded in Asia Minor. [THEODOSIUS III., P. C.]

Isaurian dynasty.

(718.) LEO III. ISAURUS, the ISAURIAN, had borne in early life the name of Conon: he was a native of Isauria in Asia Minor, from which circumstance he is known in history as Leo Isaurus, or the Isaurian. [Leo III., P. C.] He died A.D. 741, after a reign of twenty-three years.

(741.) CONSTANTINUS V. surnamed COPRONYMUS, because when baptized in his infancy he defiled the font, was an able and energetic prince; but his reign was characterized by varied success in the field, and by the religious troubles aroused by the Iconoclastic controversy. He is charged with every crime by orthodox writers; and was probably a cruel oppressor of the so-called orthodox party; but the Iconoclasts, whom he favoured, revered him as a saint. The revolt of his brother-in-law Artabazes, or Artavasdes, or Artavasdus, who at the commencement of his reign disputed the crown with him, and was apparently supported by the image-worshipping party, was near proving fatal to him; but in the end (A.D. 743) he recovered Constantinople, which Artavasdus had occupied, and deposed that usurper. Constantine died A.D. 775, and was succeeded by his son Leo.

(775.) LEO IV., surnamed CHAZARUS, which name he derived from his mother Irene, who was a daughter of the Chagan or Khan of the Chazars, a Turkish nation settled near the Volga. [TARTARS—*Chazars*, P. C., vol. xxiv. p. 73.] The reign of Leo was short, but was disturbed by the revolt of his brothers, who were exiled, and by hostilities with the Saracens, who were defeated. Leo died A.D. 780. [LEO IV., P. C.]

[780.] CONSTANTINUS VI., sometimes called PORPHYROGENITUS, or more accurately PORPHYROGENNETUS, which title is however usually appropriated to Constantine VII., son of Leo VI., succeeded his father, while yet a minor, under the guardianship of his mother Irene, an Athenian whose beauty and genius had captivated Leo. Her endeavours to prolong her influence led to dissensions which ended in the deposition and blinding, if not the death, of Constantine, A.D. 797.

(797.) IRENE, widow of Leo. IV., succeeded her son. A project is said to have been formed of reuniting the Eastern and Western empires by a marriage between Irene and the Emperor Charlemagne. According to Theophanes and Zonaras and Cedrenus, Charlemagne sent ambassadors for the purpose of arranging the marriage, which was defeated by the influence of Aëtius, then powerful at the Byzantine court. The Western writers, while speaking of the embassy, are silent as to the marriage being one of its objects. Irene was deposed A.D. 802, by Nicephorus, one of her officers, who usurped the throne. The Isaurian dynasty ends with her. It occupied the Byzantine throne eighty-four years.

During the reign of the Isaurian princes the empire continued to decline. Though Leo III. and Constantine V. were able and active, their power was weakened by religious dissension. A few years after the commencement of his reign Leo had attempted to put an end to the use of images in Christian worship. The attempt, which was followed up with even greater earnestness by Constantine, convulsed the whole empire. The successive popes and the bulk of the clergy declared in favour of images; the secular power was wielded by the Iconoclasts or Iconomachi, the opponents of images. The quarrels thus produced between the emperors and the popes combined with the rise of the Frankish power under Pepin and Charlemagne [PEPIN, P. C.; CHARLEMAGNE, P. C., and STEPHEN III. Pope, P. C.] to separate Rome and the adjacent parts of Italy from the Byzantine Empire, which retained only the southern extremity of that country. This formed an adjunct of the province of Sicily, under the title of Sicilia Secunda, 'the Second Sicily;' from which circumstance has arisen the designation of 'the two Sicilies,' as applied in modern times to the kingdom of Naples. The use of images was restored by the influence of Irene and by the authority of the seventh general or second Nicene Council, A.D. 787.

The authorities for the Isaurian dynasty are the same as for the Heraclian; but Nicephorus of Constantinople does not come lower than the reign of Constantine V. The history of the Iconoclastic controversy is given in Gibbon (chap. xlix.) and in the various modern ecclesiastical histories. In that published by the Useful Knowledge Society the account will be found in chap. xi. § 6.

(802.) NICEPHORUS I. [NICEPHORUS I., P. C.] fell in battle against the Bulgarians after a short and calamitous reign of nearly nine years.

(811.) STAURACIUS, son of Nicephorus, was mortally wounded in the same battle in which his father fell: but lingered for some months, during which he was deposed, and was succeeded by Michael Rhangabe.

(811.) MICHAEL I., surnamed RHANGABE, had married Procopia, daughter of Nicephorus. His short reign was unfortunate: and being defeated by the Bulgarians and threatened by the revolt of Leo the Armenian, he abdicated the throne A.D. 813.

The *Chronographia* of Theophanes, one of the most important authorities in Byzantine history, ends with the reign of Michael Rhangabe.

(813.) LEO V. [LEO V., P. C.], surnamed from the country of his birth ARMENUS, THE ARMENIAN, seized the sceptre from the feeble grasp of Michael Rhangabe. He defeated the Bulgarians, who had penetrated to the walls of Constantinople, and reformed the whole administration of the empire. He patronized the Iconoclasts, who now gained the ascendant and persecuted the orthodox. After a vigorous and successful reign, he was murdered by the friends of Michael, one of his officers whom he had condemned to death and was on the point of executing.

Dynasty of Amorium.

(820.) MICHAEL II., surnamed BALBUS or the STAMMERER, or, from his birth-place, MICHAEL OF AMORIUM, was rescued from prison by his friends, and placed on the throne. He also favoured the Iconoclasts. His reign was unfortunate. The Saracens conquered Crete and Sicily, and almost conquered what remained to the Eastern Empire in Italy; and Michael was twice besieged in his capital by one of his own subjects, Thomas, who had rebelled, but whom, by the aid of the Bulgarians, he at length conquered. He died A.D. 829, and was succeeded by his son Theophilus.

(829.) THEOPHILUS, a vigorous and active prince, was continually engaged in war, but with little success. He protected the Iconoclasts and persecuted the orthodox, yet he has escaped the reproaches which were so liberally heaped on the Isaurian princes who followed the same course. He died A.D. 842, and was succeeded by his son Michael.

(842.) MICHAEL III., surnamed EBRIOSUS, THE DRUNKEN, came to the crown a minor, under the care of his mother Theodora, who restored the use of images and finally crushed the Iconoclastic party. During the reign of the dissolute Michael war was carried on unfortunately against the Saracens in the neighbourhood of the Caucasus, in Crete, and in Asia Minor; but the Sclavonians, who had possessed themselves of Greece, were subdued, and the Bulgarians and the Chazars were converted to Christianity; a change which either abated their warlike restlessness, or diminished their hostility to the empire. Michael was assassinated (A.D. 867) by Basilius or Basil I., whom he had raised to be his colleague in the empire. The Amorian dynasty ended with him.

During the reigns of the Amorian princes the decline of the empire continued, and would have been more rapid but for the diminished power and energy of its great rival the Caliphate. Cyprus (if indeed it had not been conquered at an earlier period), Crete, and Sicily were lost; and the remaining Byzantine territories in Italy were nearly lost in the reign of Michael II.; and the activity and valour of Theophilus were fully tasked in contesting with the caliph Motassem the possession of the central parts of Asia Minor: for the regions south of the Taurus appear to have been already subdued.

The history of Leo the Armenian and of the Amorian dynasty is contained in the works of Zonaras, Cedrenus, Glycas, Joel, Ephraemius and Constantine Manasses; in the *Chronographia* of the anonymous continuator of Theophanes, in the works of Leo Grammaticus and Symeon Magister, in the *Vitæ Imperatorum Recentiorum* of Georgius Monachus, and in the *Reges* of Genesius: the continuator of Theophanes and the writers subsequently enumerated, all commence their histories with the reign of Leo V., at the point where Theophanes ceases.

Macedonian Dynasty.

(867.) Basilius I. Macedo, or the Macedonian, an extraordinary man, the son of a small landowner in Macedonia or Thrace, rose from the low condition of a slave among the Bulgarians, by whom in his youth he had been carried captive, to the possession of the Byzantine throne, by becoming the colleague of Michael III., whom he soon after murdered. He subdued the Paulicians, a warlike sect, whom long persecution had driven into revolt, and recovered a considerable part of Asia Minor and the south of Italy and Sicily from the Saracens, who had conquered them. He died A.D. 886, and was succeeded by his son Leo. [Basilius the Macedonian, P. C.]

(886.) Leo VI., surnamed Philosophus, the Philosopher, or Sapiens, the Wise, was engaged in wars with the Bulgarians in the north, and in the south with the Arabs, who attempted to recover Sicily; but his wars were on the whole unfortunate. He died A.D. 911, and was succeeded by his son Constantine. He was the author of various works, the chief of which are noticed elsewhere. [Leo VI., P. C.]

(911.) Constantinus VII. Porphyrogenitus, or Porphyrogennetus, succeeded his father while yet a child of six years. He had for his first colleague

(911.) Alexander, the son of Basilius I., next in order of birth to Leo VI. He died after a reign of a year A.D. 912. The next colleague of Constantine was

(919.) Romanus I., surnamed Lecapenus or Lacapenus [Romanus I., P. C.], who assumed the Imperial power A.D. 919, and successively raised his three sons, Christophorus in A.D. 919, and Stephanus, and Constantinus VIII. in A.D. 928, to the title at least of emperors. Romanus engrossed the administration of affairs and left to Constantine VII. only the title of emperor, compelling him to pass his time in retirement, in which he became distinguished by his literary and other accomplishments. But in A.D. 944 Constantine was restored to the possession of the imperial power: Christopher had been for some time dead (A.D. 931 or perhaps 926), and Stephen and Constantine, the surviving sons of Romanus, had just before expelled their father from the throne, and were themselves deposed by the people, who restored Constantine to the actual possession of the sovereignty, which he retained till his death A.D. 959, carrying on war with considerable success against the Arabs, and receiving the submission of the Iberian mountaineers. His literary works are of considerable importance [Byzantine Historians, P. C.] and include: 1, The life of his grandfather Basil the Macedonian, incorporated in the Continuation of the *Chronographia* of Theophanes. 2, *De Thematibus*, a description of the themata or military provinces of the empire. 3, *De Administrando Imperio*, 'On the administration of the Empire,' written for the instruction of Romanus, son and successor of Constantine. 'It contains' (says Dr. Plate, in Dr. Smith's *Dictionary of Greek and Roman Biography*) abundance of geographical, historical, ethnographical, and political facts of great importance; and without it our knowledge of the times of the author, and the nations which were either his subjects or his neighbours, would be little more than vagueness, error, or complete darkness.' 4, 5, Two works on military affairs, respectively styled *Tactica*, 'Tactics,' and *Strategica*, 'Strategics.' 6, *De Ceremoniis Aulae Byzantinae*, 'On the Ceremonies of the Byzantine Court,' a detailed account of the observances of royalty and administration at that time. We owe also to Constantine various valuable *Collectanea* or compilations, especially that *De Legationibus*, on the Embassies of the Romans to other nations and of other nations to them; which contains numerous valuable Excerpta from Polybius and other writers. Others of these *Collectanea* are on veterinary medicine and on agriculture. [Geoponika, P. C.]

(959.) Romanus II. [Romanus II., P. C.] distinguished as Junior, the Younger, sometimes as Puer, the Boy, reigned only four years, dying in A.D. 963 of poison administered to him by his wife Theophano.

(963.) Basilius II. and Constantinus IX., or as some call him (not recognising the son of Romanus Lecapenus) Constantinus VIII., aged respectively five and two years, were nominally the successors of their father Romanus II.; but their profligate mother and guardian Theophano married Nicephorus, a valiant and successful general, and raised him, nominally to a share, but actually to the sole possession of the empire.

(963.) Nicephorus II. Phocas exhibited as a sovereign the same military skill and valour which he had previously shown. [Nicephorus II., P. C.] His reign was a constant scene of warfare: in the east he was successful: Cilicia and the north of Syria, with the strong cities of Tarsus, Antioch, and Aleppo, were recovered; and even Mesopotamia was invaded, though with less success. In the west his success was less signal and complete: he could only dispute with the Saracens and with the Western Emperor Otho the possession of the southern extremity of Italy and of the island of Sicily. But wars are costly: and the necessities, perhaps the avarice, of Nicephorus made him unpopular, and the infamous Theophano, who was weary of him, conspired with her paramour Joannes or John Zimisces to assassinate him. He was murdered A.D. 969.

(969.) Joannes I. Zimisces or Tzimisces (Τζιμισκής) succeeded to the sovereignty of Nicephorus; and, like him, was distinguished by warlike pre-eminence, both as a subject and as emperor. One of his first acts was to banish the guilty Theophano. A rebellion, raised by Bardas Phocas, was soon suppressed; and Joannes was equally successful against foreign foes. He defeated the Russians, who had nearly conquered Bulgaria, and restored the Bulgarian king to his throne, but in subordination to the empire: he recovered to the empire, though only for a short time, its long lost possessions in Mesopotamia, and extended the conquests which Nicephorus had already made in Syria. His victorious career was cut short by poison administered by some of his own courtiers, after a reign of only six years.

From A.D. 975 begins the actual reign of Basil II. [Basilius II., P. C.], now arrived at an age to exercise the sovereign power, and of his brother Constantine; but the youth of Constantine in the first instance, and afterwards his luxurious indolence and carelessness, left the government to the able and energetic Basil. A dangerous rebellion, raised by Bardas Sclerus, was with much difficulty suppressed, and the conquest of Byzantine Italy and Sicily by Otho or the Saracens was prevented chiefly by their wars with each other, which enabled Basil to renew with greater prospect of success the struggle for the possession of those countries. His martial prowess retained the conquests of his predecessors in Syria, despite of the efforts of the adjacent Saracen powers. By the complete overthrow of the Bulgarian kingdom he restored the long lost frontier of the lower Danube, as far up as Sirmium: he defeated the Caucasian mountaineers and protected the Byzantine part of Armenia from invasion: and he was preparing for the complete conquest of Sicily and Byzantine Italy when he died A.D. 1025. Constantine survived his brother only three years; and his death A.D. 1028 closed the commonly reputed period of the Macedonian dynasty (though it continued in the female line still longer), the supremacy of which was of longer duration than that of any other Imperial dynasty, except the closing one of the Palaeologi.

The Macedonian period of a hundred and sixty years was one of apparent, if not of real revival. The frontiers of the empire had been extended in the north from the defiles of Mount Haemus to the bank of the Danube, and in the south from the range of the Taurus to the heights of Lebanon and the banks of the Euphrates and even of the Tigris. The throne had been occupied by several warlike princes, and the decay of the rival powers, the Caliphate [Caliph, P. C.] and the Bulgarian kingdom, rendered their prowess effectual for the revival of Byzantine greatness. The literary taste and acquirements of Leo VI. and Constantine VII. conduced also to the revival of literature; and several valuable writers belong to this period. The history of this æra is contained in Zonaras [Zonaras, Joannes, P. C.], Cedrenus, Glycas, Ephraemius, and Constantinus Manasses; the anonymous continuator (or continuators) of Theophanes (sometimes called, but on insufficient ground, Leontius), Symeon Magister, Georgius Monachus, Leo Grammaticus, and Genesius. Of these authorities Genesius ends with the death of Basil I., A.D. 886; Leo Grammaticus and Georgius Monachus, with the death of Romanus I. Lecapenus (A.D. 948 or 949), a few years after his deposition; and the continuator of Theophanes and Symeon Magister, with the early part of Romanus II. To these we may add Leo Diaconus, who lived in the reign of Basil II., and whose history comprehends the reigns of Romanus II., Nicephorus Phocas, and Joannes Zimisces (A.D. 959-975). [Byzantine His-

TORIANS.] Sismondi's *Fall of the Roman Empire* ends with the tenth century.

(1028.) ROMANUS III. surnamed Argyrus or Argyropulus, ascended the throne as the husband of Zoë, one of the daughters of Constantine IX., who also left another daughter, Theodora. Romanus, after a short reign, in which his troops were defeated by the Saracens, both in Sicily and in Syria, was assassinated by his wife and her paramour Michael, whom she elevated to the throne. [ROMANUS III., P. C.]

(1034.) MICHAEL IV. PAPHLAGO, the PAPHLAGONIAN, reigned meanly and miserably for more than seven years and a half.

(1041.) MICHAEL V. CALAPHATES or CALAPHATA (*i. e.* a repairer of vessels, a name derived from the occupation of his father) succeeded his uncle Michael IV. He banished Zoë, but the people of Constantinople, inspired with indignation at this punishment inflicted on one of her high birth, insisted on her recal, and on the release of her sister Theodora from the monastery in which she had been placed, and deposed Michael, depriving him of his eyes, after he had reigned little more than a year.

(1042.) ZOE and THEODORA reigned jointly for a few months, when Zoë married and raised to partnership in the empire

(1042.) CONSTANTINUS X., or as some reckon CONSTANTINUS IX., surnamed, from his valour, MONOMACHUS, the SINGLE COMBATANT. This emperor had to repress a revolt in Cyprus, to repel the Servians on the Illyrian frontier, and to defend his throne from his rival, Georgius Maniaces, the greatest of the Byzantine warriors of his day, who being driven by injustice to revolt, advanced against Constantinople and defeated the imperial army, but fell, probably by assassination, in the moment of victory. Another rebel, Leo Tornicius, a relative of the emperor, was defeated by Constantine, who also vanquished a Russian fleet which threatened Constantinople [RUSSIA, P. C.], and extended the limits of the empire in the East by incorporating the territory of a subordinate chieftain of Armenia and Iberia who had revolted and was subdued. Zoë died A.D. 1050 and Constantine A.D. 1054.

Theodora was thus left sole inheritor of the sovereignty. She had previously refused to marry; but toward the close of her short reign, she consented, on her death-bed, to a nominal union with an aged warrior named Michael.

(1056.) MICHAEL VI., STRATIOTICUS, thus succeeded to the empire, which he held for about a year, when he was deposed. Theodora had died a few days after their marriage. The short reign of Michael VI. was troubled by the unsuccessful revolt of Theodosius, a cousin of the late emperor Constantine X.

(1057.) ISAACUS I. COMNENUS, whose successful revolt had deposed Michael VI., obtained the empire, but was soon after induced by his failing health to resign it. The succession was offered first to Joannes Comnenus, the Emperor's brother, who declined it; and then to Constantine Ducas.

Family of Ducas.

(1059.) CONSTANTINUS XI. (or X.), surnamed DUCAS reigned seven years, in which the empire was assailed by the Hungarians and other enemies on the side of the Danube. On his death the throne was occupied by his sons.

(1067.) MICHAEL VII. surnamed PARAPINACES, ANDRONICUS I., and CONSTANTINUS XII. (or XI.) PORPHYROGENITUS, or PORPHYROGENNETUS, all minors, succeeded to the nominal possession of the throne, under the guardianship of their mother EUDOCIA [EUDOCIA, P. C.], who after a regency of some months conveyed by marriage the actual sovereignty to Romanus, one of the officers of her army.

(1068.) ROMANUS IV. surnamed DIOGENES, valiantly opposed the progress of the Turks, who were in force in Asia Minor, but his efforts resulted in his defeat and captivity (A.D. 1071). [SELJUKIDES, P. C.] On his release, he attempted to recover his throne, his title to which was considered as lost by his captivity, but he was defeated, taken prisoner, and deprived of his eyes with such cruelty, that he died a few days after. [ROMANUS IV., P. C.] Eudocia had, during his captivity, been confined in a convent.

MICHAEL VII. then assumed the exercise of the sovereign power: but by his cowardice he incurred the contempt of his subjects, and he was, with his brothers, deposed by the rebel Nicephorus Botaniotes, who succeeded to the throne. The reign of the family of Ducas ended with Michael VII. It occupied the Byzantine throne less than twenty years.

(1078.) NICEPHORUS III. BOTANIOTES [NICEPHORUS III., P. C.] had to struggle for the throne with a rival, NICEPHORUS BRYENNIUS, who had revolted against Michael at the same time as his namesake. Alexius Comnenus, the general of Botaniotes, defeated Bryennius, and compelled him to surrender, but shortly afterwards raised a revolt on his own account, and succeeded (A.D. 1081) in deposing Botaniotes and acquiring possession of the throne. He was the nephew of the Emperor Isaac I., and son of that Joannes or John Comnenus who, on Isaac's resignation, had refused the crown. The accession of Alexis was the commencement of the permanent sway of the Comnenian family or dynasty.

The century and a half which elapsed from the close, at least in the male line, of the Macedonian dynasty, and the accession of the Comnenian, was a period of disaster and decline. The various domestic revolutions, several of them accompanied by bloody civil wars, have been noticed. In the west, the Normans, who had first visited southern Italy as pilgrims, then, on the invitation of a fugitive revolter of the Byzantine city of Bari, as mercenary soldiers, had gradually conquered, between A.D. 1040 and 1080, the Byzantine portions of Italy and Sicily, the last relics of the conquests of Belisarius and the other generals of Justinian. In the East, the Turks, under their sovereigns of the Seljukian dynasty [SELJUKIDES, P. C.; TURKEY, TURKS, P. C.], conquered the Caucasian and Armenian provinces of the empire, and either before or very soon after the accession of Alexius, succeeded in establishing in Asia Minor a kingdom of which the capital was fixed at Nicaea, or Nice, in Bithynia, about a hundred miles from Constantinople.

The disasters of the period were augmented by the increasing bitterness and the complete separation of the Greek and Latin churches [GREEK CHURCH, P. C.], which weakened the small degree of sympathy yet remaining between the East and the West of Europe; and led the latter to regard with comparative indifference the threatening progress of revived Mohammedanism under the protection of the Turkish power.

For the history of this period we have still the chroniclers already enumerated; but Cedrenus ends with the year 1058, and Constantine Manasses with A.D. 1081. To these we may add Joannes Scylitzes Curopalates, the fragments of whose history refer to the period from A.D. 1058 to 1078; Nicephorus Bryennius (not the Emperor so called, but the son-in-law of Alexius Comnenus), whose *Commentarii* give the history of Alexius before his accession to the empire; and Anna Comnena, daughter of Alexius, and wife of this Nicephorus, who has in her *Alexias* given the history of her father's life.

Comnenian Dynasty.

(1081.) ALEXIUS or ALEXIS I. COMNENUS. The commencement of the long reign of this prince was unfortunate: the Turks pursued their conquests on the east, and the Normans, crossing the Adriatic, inflicted some severe defeats on the Emperor. The hostility of the Turks was however repelled, and that of the Normans diverted by the first Crusade; and Alexius, following in the wake of the Crusaders, recovered possession of Asia Minor, with the exception of the inland and mountainous districts. He died A.D. 1118. [ALEXIS COMNENUS I., P. C.; CRUSADES, P. C.]

(1118.) JOANNES II. COMNENUS, or as he is commonly termed CALO-JOANNES, HANDSOME JOHN, given ironically on account of his diminutive stature and homely features, succeeded his father Alexius. His eminent virtues rendered his reign one of the most truly glorious in the Byzantine annals. He repelled the hostile attempts of the Hungarians and others on the Danube, and of the Turks in Asia. A vain attempt to dispossess him of the throne at the commencement of his reign was made by his accomplished but ambitious sister Anna Comnena and her husband Nicephorus Bryennius. [ANNA COMNENA, P. C.] Joannes II. died of a wound received while hunting, A.D. 1143, just as he was on the point of attempting to subjugate the Latin States founded by the Crusaders in Syria. He was succeeded by his son Manuel.

(1143.) MANUEL I. COMNENUS bore, in character, a singular resemblance to our own Richard I. He continued the warlike exertions which his father had made, and against the same enemies; but his intervals of remission from warlike toil were spent in indolence, his wars and luxuries alike exhausted his subjects, and his long struggles merely maintained, without extending, the limits of the empire.

(1180.) ALEXIUS or ALEXIS II. COMNENUS ascended the throne on the death of his father Manuel I. He was only ten years of age at his accession, and was under the guardianship of his mother Maria: but both mother and son were, in about three years, put to death by Andronicus Comnenus, son of Isaac Comnenus, who was a younger son of Alexius I.

(1183.) ANDRONICUS I. COMNENUS then usurped the throne, but after a reign of two years was murdered by the people of Constantinople. [ANDRONICUS COMNENUS, P. C.] In him the male line of the Comneni ends. He was succeeded by Isaac Angelus, whom he had attempted to put to death, and compassion for whom had roused the populace against Andronicus.

(1185.) ISAACUS II. ANGELUS was descended from the youngest daughter of Alexius I. His contemptible reign was marked with the final loss of the isle of Cyprus, usurped by a rebel, another Isaac Comnenus, from whom it was taken by Richard I. of England and given to Guy of Lusignan, the expelled King of Jerusalem; and of the territory between the Haemus and the Danube, which was lost by the revolt of the Bulgarians and the re-establishment of their kingdom, the princes of which united themselves and their people to the Latin church. Isaac recovered, however, some parts of the European Albania and Epirus from the Normans of Italy and Sicily. Isaac was dethroned and blinded after a reign of ten years by his own brother, Alexius, who succeeded him.

(1195.) ALEXIUS or ALEXIS III. ANGELUS or COMNENUS (which latter name he assumed), after an unfortunate reign in which he was defeated by the Turks in Asia Minor and by the Bulgarians and Comani in Europe, was dethroned by Alexis, son of Isaac II., who was assisted by the Crusaders of the fourth Crusade.

(1203.) ISAACUS II., the deposed and blinded emperor, and his son ALEXIUS or ALEXIS IV. ANGELUS, were, in consequence of this revolution, placed on the throne; but a revolt of the people, excited by Alexius, a prince of the house of Ducas, led to their deposition and to the murder of Alexius IV., whom Isaac II. soon followed to the grave. The branch family of the Angeli, and indeed the dynasty of the Comneni, ends with these princes.

(1204.) ALEXIUS or ALEXIS V. DUCAS, surnamed MURZUPHLUS, *i.e.*, of the SHAGGY EYEBROWS, the successful revolter, succeeded to the throne (which a shadow of an emperor, NICOLAUS CANABUS, had for an instant occupied), but was at once besieged, and after a few months taken prisoner and put to death by the Crusaders, who captured Constantinople, divided a considerable part of the conquered territory into several Latin principalities, and established a line of Latin princes on the throne of the Eastern Empire. [BALDWIN I., Emperor of Constantinople, P. C.; DANDOLO, ENRICO, P. C.]

The period from the accession of Alexius I. to the capture of Constantinople by the Latins is one of great vicissitude. Alexius I. found the empire reduced in limits and exhausted in resources; but his dexterity in availing himself of the results of the first crusade, and the ability and valour of his successors Joannes II. and Manuel I. extended the limits without perhaps materially increasing the strength of the empire. From the death of Manuel we have a period of rapid contraction and of decline, the Seljukian Turks gradually recovering a considerable part of what they had lost in Asia Minor: until the empire was limited to Thrace, Macedonia, Epirus, Greece and its islands (of which, however, Candia and others were lost by the events of 1204), and a portion of Asia Minor, especially on the coast. Of this diminished territory a considerable part fell with the capital into the hands of the Latins. Of that part which escaped their power, the eastern coast of the Euxine was appropriated to form the new Greek empire of Trebizond or 'Anatolia' [TREBIZOND, EMPIRE OF, P. C.]; and two other fragments were detached in the west to form the despotates of Epirus and Thessaly, the former of which, though sometimes tributary to the Eastern Empire, was never again incorporated with it. [ALBANIA, P. C.] The remainder of the independent portion of the Greek empire, the rulers of which assumed the imperial title, fixed the seat of their government at Nicaea, or Nice, in Asia Minor, and afterward recovered Constantinople, will be regarded as the connecting link between the overthrown and the restored Greek empire. All these states were formed by the Greeks almost immediately after the fall of Constantinople.

The history of Alexius I. is contained in Zonaras and Glycas; both of whom conclude their Annals with his death, in the shorter work of Joel, in the Metrical Chronicle of Ephraemius, which becomes from his reign now more full and important; and especially in the *Alexias* of his daughter Anna Comnena. [ANNA COMNENA, P. C.] The history of the subsequent period is narrated by Ephraemius and Joel, of whom the latter ends with A.D. 1204; and in the histories of Cinnamus, which comprehends the reign of Joannes II. and nearly the whole of that of Manuel I.; and of Nicetas Acominatus, or Nicetas Choniates, which extends from the death of Alexius I. to the death of Baldwin I., first Latin emperor, A.D. 1206. The Latin authorities, Gulielmus Tyrensis (William of Tyre), and the others contained in the *Gesta Dei per Francos* of Bongarsius, or Bongars, and others not in that collection, are enumerated in Michaud's *Bibliographie des Croisades*. [CRUSADES, P. C.]

Latin Emperors of Constantinople.

(1204.) BALDUINUS I. [BALDWIN I., P. C.], Count of Flanders and Hainault, was appointed Emperor by the victorious crusaders; but was, after a year's reign, captured in battle by the revolted population of Thrace and the Bulgarians their allies, and died in captivity.

(1206.) HENRICUS or HENRY, surnamed ANDEGAVENSIS, of ANJOU, brother of Baldwin I., succeeded him. He died after a reign of incessant warfare A.D. 1216.

(1216.) PETRUS DE CURTENAIO, PETER OF COURTENAY, Count of Auxerre, ascended the throne in conjunction with and in the right of his wife IOLANDIS or YOLANDE, sister of Baldwin and Henry. He never reached Constantinople, but was taken prisoner on his way thither by the despot of Epirus, and died in captivity A.D. 1219. Yolande died soon after.

(1219, or, according to others, 1221.) ROBERTUS, or ROBERT, second son of Peter of Courtenay and Yolande, succeeded to the throne. He was, some time after, expelled by his own subjects, and died A.D. 1228.

(1228.) BALDUINUS II. [BALDWIN II., Emperor of Constantinople, P. C.], youngest son of Peter of Courtenay and Yolande, succeeded his brother Robert; but, as he was a minor, JOANNES BRIENNENSIS (JOHN OF BRIENNE), titular king of Jerusalem, a veteran of nearly fourscore years, was appointed (A.D. 1229) his colleague. John repelled the Nicene Greeks and the Bulgarians, who had besieged Constantinople, and died soon after A.D. 1237. The reign of Baldwin in Constantinople lasted till A.D. 1261, when the city was surprised and recovered by the Greeks under the Cæsar Alexius Strategopulus. Baldwin escaped and survived the event about fourteen years. The principal western historian of this transient Latin empire is Villehardouin, one of the leaders in the capture of Constantinople.

The Greek writers will be noticed when speaking of the authorities for the contemporary Greek emperors of Nice.

Greek Emperors of Nicaea or Nice.

(1204.) THEODORUS I. LASCARIS [THEODORUS LASCARIS, P. C.], in an active reign of eighteen years, re-established the Eastern Empire in a portion of its antient Asiatic territory, of which Nice was made the capital. He had married Anna, daughter of Alexius III. Angelus or Comnenus.

(1222.) JOANNES III. DUCAS VATATZES succeeded Theodore Lascaris by virtue of his marriage with Irene, daughter of Theodore Lascaris, or rather by his merit, which induced that prince to prefer him to his own four brothers. His prudence and valour gradually extended his dominions, until he had recovered nearly all that the Latins had conquered in Asia and Thrace, except Constantinople itself. He crushed the Greek principality, or despotate, of which Thessalonica was the capital, and recovered a portion of territory from the Greek empire of Trebizond. He died A.D. 1255.

(1255.) THEODORUS II. LASCARIS, son of John III., succeeded his father, and died after a reign of four years.

(1259.) JOANNES IV. LASCARIS, a minor, son of Theodore II., succeeded, but he was soon virtually and afterwards openly deposed, and then blinded by Michael Palaeologus, first emperor of the family of the Palaeologi, and first of the restored Greek emperors of Constantinople.

The historians of this period are Georgius Acropolita, whose history just comprehends the period when the seat of the empire was at Nice (A.D. 1204-1261); Nicephorus Gregoras, whose history begins at the same point but comes down later than that of Acropolita; and the Metrical Chronicle of Ephraemius, which ends with the recapture of Constantinople in 1261. The history of Nicetas Choniates comprehends only a year or two after the capture of Constantinople by the Latins.

Restoration of the Seat of the Eastern or Greek Empire to Constantinople.

Family of the Palaeologi.

(1260.) MICHAEL VIII., PALAEOLOGUS, or more fully PALAEOLOGUS COMNENUS, great-grandson, through his mother, of Alexius III., ascended the throne as the colleague of the boy Emperor Joannes IV. In 1261 Constantinople was recovered by Alexis Strategopulus, and Michael restored the seat of government to that city. But if the Latins were expelled, the empire never recovered the extent which it had before the Latin conquest. It had been dismembered on the east and west by the empire of Trebizond and the despotate of Epirus; though the despot of Epirus had, in the reign of Joannes Vatatzes, recognised that prince as his lord paramount. Some petty Latin principalities remained in Greece, especially the Duchy of Athens, which continued till the time of Mahomet II. [Athens, P. C., vol. iii. p. 19.] The important islands of Corfu, Cephalonia, and Candia, were finally separated from the empire by the Venetians or other western powers: Cyprus had been previously lost in the reign of the weak Isaac II. Lesbos, Chios, and Rhodes were however recovered. Michael acted with great prudence: he allowed and encouraged the Venetians, Pisans, and other Latins engaged in commerce or manufactures to remain at Constantinople, or in the suburbs, and established a Genoese colony in the suburb of Galata. His guilt in blinding and exiling his unhappy colleague Joannes was punished by Arsenius, patriarch of Constantinople, with excommunication; and the retaliatory measure of the deposition of Arsenius led to serious schism in the church of nearly fifty years' duration. A hypocritical union with the Latin church, ratified at the Council of Lyon, A.D. 1274, augmented the religious troubles of the Greeks, though it averted the threatened attempts to re-establish the Latin throne of Constantinople. Michael died A.D. 1283.

(1283.) Andronicus II. Palaeologus, or more fully Ducas Comnenus Angelus Palaeologus, distinguished as the Elder [Andronicus Palaeologus, P. C.], succeeded his father Michael VIII.; and reversing the policy which Michael had pursued, dissolved the hollow union of the churches and was excommunicated by the Pope (A.D. 1307.) His reign is marked by the establishment in Asia Minor (about A.D. 1300) of the rising monarchy of the Osmanli, or Ottoman Turks, so called from Othman their founder, in place of the declining kingdom of the Seljukians, which was finally overthrown (A.D. 1307) by the Mogul ...ans of Persia, the descendants of Zinghis or Gengis Khan. [Turkey; Turks, P. C., vol. xxv. p. 395, &c.] The devastating invasion of the remaining Asiatic provinces of the Eastern Empire by the Ottomans was repelled by some Catalan and other mercenaries under Roger de Flor, whose assassination, by order of Andronicus, in consequence of the disasters occasioned by him and his men, led to intestine war, which was at length ended by the retreat and establishment of the Catalans in the Duchy of Athens. The closing years of the reign of Andronicus were clouded by another intestine war or succession of wars between himself and his grandson and colleague Andronicus III. (A.D. 1321-1328), who obliged the old emperor to abdicate. Andronicus died four years after his abdication (A.D. 1332.)

(1328.) Andronicus III. Palaeologus, or more fully Ducas Comnenus Angelus Palaeologus, distinguished as the Younger, succeeded on the abdication of his grandfather. He was defeated by the Catalans of Athens, and by the Turks, who conquered all or nearly all of the empire that remained in Asia Minor. Rhodes, after a short period of virtual independence, had been occupied by the Knights of St. John of Jerusalem [Hospitallers, P. C.], in the reign of Andronicus the Elder. Andronicus III. died A.D. 1341.

(1341.) Joannes V. Palaeologus, called by some Joannes Palaeologus I., and (1342) Joannes VI. Cantacuzenus, or more fully Angelus Comnenus Palaeologus Cantacuzenus. Some writers number these princes differently, making Palaeologus Joannes VI., and Cantacuzenus Joannes V. Palaeologus, while yet a minor, succeeded his father, Andronicus I., under the guardianship of Cantacuzenus, who had been chief minister and captain of Andronicus III. The overthrow of Cantacuzenus's power and his condemnation to death drove him to rebellion, and he was crowned at Adrianople A.D. 1342. A civil war, in which Turks, Bulgarians, Servians, and Latins were engaged as auxiliaries or mercenaries, ended favourably for Cantacuzenus: and he became the recognised colleague of Palaeologus, who accepted his daughter in marriage. Cantacuzenus was again crowned, A.D. 1347, at Constantinople. The fierce theological controversy about the light of Mount Tabor [Barlaam, P. C.] added to the agitation of the period: and a new civil war between the emperors broke out A.D. 1353, in which the Turks aided Cantacuzenus, but which ended in his abdication (A.D. 1355), and his retirement to a monastery, where he employed himself in writing a history of his own time (from A.D. 1321 to 1357) and where he died. From the abdication of Cantacuzenus begins the actual reign of Joannes Palaeologus, which was marked by the extension of the power of the Turks in Europe, and their capture of Adrianople (A.D. 1361), which they made their capital. They first gained a permanent footing on the European side of the Dardanelles in A.D. 1354, during the second civil war between Cantacuzenus and Palaeologus, by capturing the castle of Tzympe, now Chini or Jemenlik, near Gallipoli. [Turkey, Turks, P. C., vol. xxv. p. 396.] Palaeologus, to save the relics of his empire, now reduced to Constantinople and the immediately adjacent parts of Thrace, and some portions of Macedonia, Northern Greece, and the Morea, hastened into the west to solicit aid from the Pope and the western princes, to obtain which he professed himself a Roman Catholic: but he not only failed in his purpose, but was arrested for debt at Venice. Released by the intervention of his son Manuel, despot of Thessalonica, he returned home, where he had to suppress a revolt of his son, Andronicus (A.D. 1385), who was taken prisoner and condemned to lose his sight. The operation of blinding was not effectually performed, and Andronicus escaped and imprisoned his father, but was obliged to release him. He obtained, however, the cession of a portion of Thrace, which was formed into the vassal principality of Selybria. Joannes Palaeologus died, after an unhappy reign, in A.D. 1390 or 1391.

(1391.) Manuel II. Palaeologus succeeded his father, Joannes V., during whose life he had shared both the name and exercise of sovereignty. He was attacked by the Turks, and by his brother Andronicus, prince of Selybria; but made a treaty with the latter, left him in Constantinople as regent if not co-emperor; and visited Italy, France, England, and Germany (A.D. 1400-1402), to solicit aid against the Turks. Bajazet, the Turkish sultan [Bayazid I., P. C.], meanwhile threatened the overthrow of Constantinople and the extinction of the empire, which was saved rather by the opportune victory of Timour or Tamerlane [Timur, P. C.] over the Turks at Angora, and the captivity of Bajazet (A.D. 1402), than by Latin aid. Manuel recovered to the empire the whole of the Morea. He died A.D. 1425.

(1425.) Joannes VII., Palaeologus, surnamed Porphyrogenitus or Porphyrogennetus sometimes called Joannes Palaeologus II., succeeded his father Manuel, and followed the same policy of seeking aid from the west, to conciliate which he brought about the hollow union of the Greek and Latin churches at the council of Florence, A.D. 1439, to be present at which, he visited Italy. He ruled personally in Constantinople: the fragments of the empire in the Morea and in the Tauric Chersonnesus, the Crimea, were ruled by his brothers as his vassals. His reign precipitated the downfall of the empire, for his project of union with the Latin church disgusted his subjects; the allies secured by it were defeated by the Turks at Varna A.D. 1444 [Murad II., P.C.], and the Turks attacked the Morea and allowed its ruler, Constantine, the Emperor's brother, to retain it only on condition of paying tribute. Joannes VII. died A.D. 1448.

(1448.) Constantinus XIII. (some call him XII.) Palaeologus, surnamed Dragases, last emperor of the East, succeeded his brother Joannes VII. He resigned his possessions in the Morea to his brothers Demetrius and Thomas. His brief reign was ended by the capture of Constantinople by the Turkish Sultan Mahomet II. A.D. 1453. Constantine fell bravely in the defence of his capital; and the empire of the East fell with him: its dismembered portions were subdued by the ambitious and powerful Mahomet a few years after, except such as were occupied by the stronger hand of the Latins. Demetrius and Thomas Palaeologus were expelled from the Morea in or soon after A.D. 1460; the empire of Trebizond was extinguished in A.D. 1464, and all the valour of Scanderbeg [Scander-Beg, P. C.], who died a fugitive in A.D. 1467, did not prevent the final subjugation of Epirus. [Mahomet II., P. C.]

Thus were extinguished the name and the last remains of the Roman state. From its reputed foundation by Romulus it had subsisted for twenty-two centuries; from the settlement of the empire by Augustus nearly fifteen centuries; a duration as yet unexampled in the history of the world, unless it be in China. From the establishment of Constantinople by the first Constantine to the capture of the city in the time of the last Constantine, that magnificent city was never in the possession of an enemy except during the half century of Latin occupation, and even then the continuity of the Imperial power was hardly interrupted though the seat of empire was temporarily fixed at Nice. The despotic character of the government, if it prevented the growth of that national spirit and character which really constitute the strength and prosperity of a nation, yet prevented the dissolution of the empire, which presents amid frequent disasters a remarkable cohesiveness and unity, until the Latin conquest in A.D. 1204. But as from the same despotism the prosperity of the empire depended on the personal character of its ruler, its history exhibits alternations of decline and recovery according as the emperors were men of feeble character or of vigour and ability; but each instance of the recovery generally fell short of its predecessors. During the temporary fluctuations of the condition of the empire, the tide of its greatness and prosperity was gradually ebbing. Theodosius the Great died in possession of the whole extent of the empire both in the east and west. Justinian recovered only a portion of the latter. Heraclius saved the empire from extinction at the hands of the Persians, and effectively crushed their power; but he did not recover what had been taken by the Lombards in the west, and Africa and Palestine, which were wrested from his successors by the Saracens, were never recovered. The revival effected in the Macedonian period by Basil I., Nicephorus, John Tzimiscea, and Basil II., fell short of that of Heraclius; and that of the earlier Comneni fell short of the success of the Macedonian princes. The restored empire of Lascaris and Vatatzes, never more than a fragment of the empire of the Comneni, grew less and less until its extinction by the Turks. Yet this fragment preserved the name of the 'Roman Empire,' which it has transmitted to the provinces of modern Turkey, Roumelia or Rum-ili in Europe, the last seat of the Byzantine Empire [RUM-ILI, P. C.], and Roum or Rúm, in Asia Minor, the seat of the empire of Trebizond.

The history of the last period of the empire is contained in the 'Roman History,' or rather 'Romaic History,' of Nicephorus Gregoras (from A.D. 1204 to 1351); in the history of the emperors (from Michael Palaeologus to Andronicus the Elder, A.D. 1308) by Georgius Pachymeres; in the history of the Emperor Joannes Cantacuzenus, containing the account of his own time; in the 'Historia Byzantina' of Ducas, especially including the reigns of the two Johns, V. and VI., and their successors to 1462; in the Chronicle or Annals of Georgius Phrantzes or Phrantza, from the recovery of Constantinople in 1261 to A.D. 1477; and in the History of the Turks by Laonicus Chalcocondyles. We do not mention the contemporary Latin historians whose works include notices of Byzantine history; and of modern historians we shall only mention Ducange, Le Beau, with his continuator Ameilhon, and Gibbon. Much valuable information is contained in the articles on the Byzantine Emperors and other eminent personages connected with the Eastern Empire, chiefly written by Dr. Plate in Dr. Smith's *Dictionary of Greek and Roman Biography*. Gibbon's *Decline and Fall of the Roman Empire*, with all its admirable qualities, is unsatisfactory as a history of the Eastern Empire. The unity which he has given to his episodes has destroyed that of his main subject; and we have to gather from different parts of his work the various portions which constitute the history of a reign or period. The empire itself is forgotten while we follow his absorbing narratives of the migrations of the Huns, the conquests of the Saracens or Moguls, and the vicissitudes of the Crusades; and the Byzantine history, interesting and important as it is, is yet to be written in a form suitable for the English reader.

ROMANELLI, GIOVANNI FRANCESCO, was born at Viterbo in 1617. He studied a short time with Domenichino, but he is chiefly known as the scholar of Pietro da Cortona; and he was one of the principal hangers on of Bernini, who appears to have selected Romanelli as a rival to Carlo Maratta and the school of Sacchi; and even to Pietro Cortona himself. Romanelli's picture of the Deposition, in the church of Sant' Ambrogio della Massima, gave him a temporary reputation above all his rivals, which induced Pietro da Cortona to paint a picture for the same church, his San Stefano, which, when it was hung up in its place, so far eclipsed the picture of Romanelli, that Bernini himself observed that it was easy to see who was the master and who the scholar. Romanelli showed more delicacy of execution but considerably less power than Cortona. There is a Presentation in the Temple in one of the chapels of St. Peter's, worked in mosaic, from a picture by Romanelli which is in the church of the Certosa. He was twice in Paris with his patron Cardinal Barberini, and he died at Viterbo in 1662, when about to set out with his family upon a third visit to that capital. There is a large copy of Guido's Triumph of Bacchus at Hampton-Court, by Romanelli.

(Pascoli, *Vite de' Pittori &c. Moderni*; Lanzi, *Storia Pittorica*, &c.)

ROMBERG, ANDREAS and BERNHARD, eminent German composers, were the eldest sons of brothers who enjoyed a considerable share of reputation as instrumental performers during the middle and latter part of the last century.

ANDREAS was born at Osnabruck in 1767; BERNHARD in 1770. Both held appointments in the royal chapel of the Elector of Cologne, at Bonn, about the year 1790. The former was distinguished by his superior performance on the violin; the latter as an almost unrivalled player on the violoncello; and both by their compositions, even at that early period of their career. The progress of the French armies at the commencement of the revolutionary war drove the two cousins to Hamburg, where their talents immediately procured them engagements. In 1795 they quitted that city, and visited many parts of Germany and Italy, establishing their reputation, wherever they presented themselves, as professors of the first class. They returned to Hamburg in 1797, where the elder remained; but the younger left that city two years after, and proceeded alone through England and Spain to Lisbon, and subsequently obtained a good situation in the royal chapel at Berlin. Andreas in the meantime turned his attention more exclusively to composition, and produced four operettas; he also set Schiller's 'Ode to Music.' For the church he wrote a 'Dixit Dominus' and a 'Te Deum,' each for four voices, and a 'Pater Noster' for three, besides many psalms. For the chamber or concert-room he composed much music, Schiller's 'Song of the Bell' ('Das Lied von der Glocke'), among other things, which is well known to connoisseurs in every part of Europe. He also produced two full operas, 'Die Grossmuth des Scipio' ('The Magnanimity of Scipio'), and 'Die Ruinen von Paluzzi' ('The Ruins of Paluzzi'), the drama of the latter from Mrs. Radcliffe's 'Italian;' and, if an opinion of the work may be formed from a pianoforte arrangement, it seems to be an opera that might be successfully adapted to one of our musical theatres.

Bernhard, while in Berlin, wrote two operettas and much instrumental music, particularly for the violoncello. Both cousins indeed were for a time chiefly known as authors by their compositions for their respective instruments. Their posthumous fame is mainly attributable to their symphonies and overtures, the best of which have become familiar to the amateurs of this country by the admirable performance of them at the concerts of the Philharmonic Society.

Andreas Romberg died in 1821, and leaving a family in embarrassed circumstances, a concert for their benefit was generously got up in London by the Philharmonic Society, which afforded them temporary relief. Bernhard was appointed one of the professors at the Conservatoire de Musique at Paris, in 1801, and created Chevalier of the Legion of Honour, but retired from the office two years after. He came to London a second time in 1814, when the allied sovereigns visited this country, and gave a concert, by which he was no gainer, either in purse or reputation; for imprudently, not to say presumptuously, fixing his tickets of admission at a guinea, his auditors were few, and his own performance too plainly announced either the decay of his powers, or that he had not kept pace with others in the improvements of his art. He died in 1841.

(*Biographisches Lexicon*; *Harmonicon*, vol. ix.)

ROMISH CHURCH. An account has been elsewhere given [PATRIARCH, P. C., vol. xvii. p. 317] of the rise and nature of the patriarchal dignity. It may be added to what is there stated, that the increase in the number of these dignitaries in the fifth century was occasioned by the erection of the bishopric of Jerusalem (which had previously been subordinate to the archbishopric of Caesaraea) into a patriarchate. It is a curious illustration of the little reverence actually paid to superior antiquity and apostolic origin, that the Christian Church first established, and which enjoyed, at its origin, the care and instruction, not of one only of the apostles, but of all, was the last which received the highest ecclesiastical rank; and hardly ever were its patriarchs enabled to compete in power and influence with their fellows of Rome or Constantinople, Alexandria or Antioch.

We here give a table of the patriarchs down to the capture of Constantinople and the overthrow of the Eastern Empire, A.D. 1453. We give the occupants of the patriarchal sees from the time of their asserted foundation, with the date of the accession of the respective bishops or patriarchs, according to the generally received computation: but we may observe that the succession of the earlier bishops is very obscure, and that the asserted apostolic foundation of the several churches (with the exception of Jerusalem) is quite destitute of Scriptural support, and has been vehemently disputed: not to speak of the question as to whether the government of the primitive Church was, in the modern sense of the word, episcopal or not. The bishops of Constantinople before Metrophanes, who was bishop in the early part of the fourth century, are especially doubtful.

In the fourth century the succession is perplexed by the schism occasioned by the Arian controversy; and from the sixth century, owing to the Jacobite schism, there has been a double succession in the patriarchates of Alexandria (the Jacobite patriarchs of which are sometimes, from their nation, called the Coptic patriarchs) and Antioch: and the perplexity in the patriarchate of Antioch has been occasionally increased by the rivalry of contending Jacobites, as in the schisms of the thirteenth, fourteenth, and fifteenth centuries. After the conquest of Palestine and the greater part of Syria, by the first crusaders, and the capture of Constantinople in the fourth crusade, the confusion was made still greater by the appointment of Latin patriarchs at Antioch, Jerusalem, and Constantinople. In order to prevent mistake, we give in Roman letter the prelates who were regarded by the Greek government and church as the legitimate holders of the see, without regard to the orthodoxy or heterodoxy of their opinions individually: the Jacobite prelates are given in italics, and the Latin patriarchs of the East in small capitals. We give the names in the usual Latin form, which has, in most cases, continued in use in English books; the few cases in which the names have been Anglicized will cause no difficulty, as the reader will easily recognise John in Joannes, Peter in Petrus, Mark in Marcus, Theodore in Theodorus, &c.

The list of the popes given elsewhere [Pope, P. C., vol. xviii. p. 405] is repeated here for the convenience of comparing dates, &c. The chief authorities employed by us are Le Quien, *Oriens Christianus*; Fabricius, *Bibliotheca Graeca*, vols. vi., viii., x., xi., xiv., ed vet., viii., ix., xi., ed Harles; the *Tractatus Praeliminares*, given in the *Acta Sanctorum* of the Bollandists, *Maii*, vol. iii., *Julii*, vol. iv., *Augusti*, vol. i.; Bandurius, *Imperium Orientale*, vol. i., p. 187, &c.; and *L'Art de Vérifier les Dates*. The lists in Fabricius are generally taken from the *Acta Sanctorum*, so that these two authorities are, in most cases, identical.

When two years not consecutive are assigned as the date of accession, it must be understood that the time of accession is not agreed upon, but that it occurred either in the years marked, or in the interval between them. Dates at the end of a name show that the person named was patriarch in that year or in those years, but that the year of accession is unknown. A, subjoined to a name, denotes Arian; M, Monothelite; Ic., Iconoclast; J, Jacobite, or Monophysite; H, Heretic (reputed), without refference to the nature of his heresy.

Rome.	Alexandria.	Antioch.	Constantinople.	Jerusalem.
A.D.	A.D.	A.D.	A.D.	A.D.
		33, Petrus I. (The Apostle Peter)	Andreas (The Apostle Andrew)	Jacobus I. (the Apostle James, the Lord's brother)
42, Petrus (the Apostle Peter)	52 ? Marcus I. (the Evangelist Mark).	40-44, Evodius	Stachys; bishop for 16 years	61 or 62, Simon or Symeon I. son of Cleophas
57-67, Linus	62-65, Ananias or Hananias	68-69, Ignatius I.	Onesimus, 14 years ‡	[See removed to Pella]
78, Cletus or Anacletus*	84-87, Abilius or Miloï or Melianus		Plutarchus, 16 years	107, Justus or Judas Justus
			Diogenes, 15 years	111, Zacchaeus or Zacharias
68-91, Clemens I.	98-99, Cerdo or Kerdanous		Felix, 5 years	Tobias
101, Anacletus or Cletus*	107-110, Primus or Abrimius or Obrimius	108-117, Hero or Heron or Heros	Polycarpus I., 18 years	Benjamin
			Sedecion, 19 years	Joannes I.
100-110, Evaristus	119-122, Justus	128-136, Cornelius	Eleutherius, 7 years	116, Mathias, Matthias, or Matthaeus
109-119, Alexander I.	130, Eumenes or Eumenius		Athenogenes or Athenodorus, 4 years	
119-130, Sixtus I.	143, Marcus II. or Marcianus	140-150, Eros		Philippus
127-140, Telesphorus	153-154, Celadion or Celadianus or Claudianus.		Polycarpus II., 18 years	124, Seneca
		168-176, Theophilus	Euzoius, 16 years	Justus
138-152, Hyginus	167, Agrippinus		Laurentius, 11½ years	Levi
142-156, Pius I.	179, Julianus	176-186, Maximinus	Pertinax, 19 years	Ephrem or Ephres
151-165, Anicetus	188-189, Demetrius	189-199, Serapion	Alypius, 13½ years	Josephus or Joses
161-173, Soter or Soterus			Olympianus, 11 years ‡	Judas II. or Quiriacus
170-177, Eleutherus			Marcus, 13 years	135, Marcus I. first Gentile bishop
185-192, Victor I.			Cyriacus or Cyrillianus, 16 years	[See restored to Jerusalem, or rather to Ælla, the city built by Hadrianus, the Roman emperor, close to the ruins of Jerusalem]
197-201, Zephyrinus				
217-219, Callistus or Calixtus I.		211, Asclepiades	Castinus or Cestinus, 7 years	
222-224, Urbanus I.		217-219, Philetus	Taratus or Titus, 35½ years	
230-231, Pontianus	230-231, Heraclas or Hierocles	228-230, Zebennus or Zebinna	Domitius or Domitianus, 24½ years	
				156, Cassianus
235, Antherus or Anteros	246-247, Dionysius	236-237, Babylas	Probus, 12 years	Publius
236, Fabianus				Maximus I.
252, Cornelius		250-251, Fabius or Fabianus or Flavius or Flavianus		Julianus I.
253, Lucius I.				Gaianus or Gaius I.
253-255, Stephanus I.		252, Demetrius or Demetrianus		Symmachus
257-258, Sixtus II.				Gaius II.
259-260, Dionysius	264-265, Maximus	260, Paulus (Paul of Samosata), H.		168, Julianus II.
				Capiton or Apion
270-271, Felix I.		269-270, Domnus I.		185, Maximus II.
274-275, Eutychianus	281-282, Theonas	273-274, Timæus		Antoninus
283-284, Caius		280-283, Cyrillus I.		Valens
296, Marcellinus				Dolichianus
304-308, Marcellus I.	300, Petrus I. Martyr	300-303, Tyrannus		Narcissus deposed
309-310, Eusebius	310, See vacant for a year			Dius
310-311, Melchiades	311, Achillas or Archillas or Archelaus			Germanion
				Gordius
				Narcissus restored before A.D. 196
314, Sylvester I.	312, Alexander	313-316, Vitalis	315 ? Metrophanes I.: first really authenticated occupant of the see §	212, Alexander
		318-319, Philogonus or Philogenes		250, Mazabanes
				266, Hymenaeus
		322-324, Paulinus I. or Paulus or Romanus	316-325, Alexander	298, Zabdas
			340, Paulus I. expelled	302, Hermon
	326, Athanasius	324-325, Eustathius †	341, Eusebius, A.	313-314, Macarius I.
	Pistus, A.	331, Paulinus II., A. This prelate is omitted by Le Quien.	342, Paulus I. restored, but immediately expelled again	331-333, Maximus III. previously coadjutor of Macarius
			342, Macedonius, A., reputed founder of the sect of the Macedonians, deposed	
		331, Eulalius, A.		348 ? Heraclius nominated by Maximus as his successor
		332, Eusebius, A.		
		332, Euphronius, A.	347, Paulus I. restored, but soon after again expelled and murdered.	
		333, Flacillus or Placillus or Phlacillus or Phacellius, A.		348-351, Cyrillus deposed in 357 or 358
336, Marcus				
336-337, Julius I.	341, *Gregorius*, A.	345, Stephanus I., A.		

* It is very doubtful if there were more Popes than one of the name of Cletus or Anacletus at this early period; and whether, if there was only one, he is to be placed before or after Clemens I.

† Eustathius was deposed by the Arians, to whose doctrines he was earnestly opposed, and died in exile. A party of his adherents broke off from the church and formed a sect which existed for some time under the name of Eustathians.

‡ Most of the authorities give the bishops between Onesimus and Olympianus in the following order; and omit the length of each episcopate, which, as given above, is evidently too great, as may be seen by adding them together.

Polycarpus I.	Sedecion	Eleutherius	Polycarpus II.	Euzoius	Alypius
Plutarchus	Diogenes	Felix	Athenodorus	Laurentius	Pertinax

§ In *L'Art de Vérifier les Dates*, the three prelates next preceding Metrophanes are thus given:
Philadelphus Eugenius Rufinus

ROME.	ALEXANDRIA.	ANTIOCH.	CONSTANTINOPLE.	JERUSALEM.
A.D. 352, Liberius. During his exile Felix the Martyr acted as papal vicar, and is on that account sometimes enumerated among the Popes as Felix II., which causes a difference in the numbering of later Popes of that name.	A.D. 354-356, *Georgius Cappadox*, Familar to us as St. George of Cappadocia, the patron saint of England. [GEORGE, ST., P. C., Vol. XI., p. 170] 361, *Lucius*, A.	A.D. 348, Leontius, A. 358, Eudoxius, A. 359, Anianus, A. 361, Meletius † 361, Euzoius, A. 362, *Paulinus III.* (Eustathian).	A.D. 350, Macedonius, A., restored; but again deposed in 360 360, Eudoxius, A. 370, Demophilus, A., deposed in 380 370, *Evagrius, recognized by the orthodox party, but not by the government*	A.D. 358? Eutychius 361? Cyrillus restored but again expelled 363, Irenaeus or Erenius 363? Cyrillus again restored, and again expelled
	373, Petrus II. *Lucius (restored)*, A.	376, Dorotheus or Theodorus I., A. 376, *Vitalis, elected by the Apollinarists, a section of the Orthodox seceders.* This schism endured a very little while	379-381, Gregorius I. Nazianzenus *Maximus Cynicus, usurper* *Marinus*, A. *Dorotheus*, A.	367, Hilarion or Hilarius 378, Cyrillus finally restored
366 367, Damasus I. 384-385, Siricius 398, Anastasius I.	380, Timotheus I. 385, Theophilus	388-389, *Evagrius* (Eustathian) 381-322, Flavianus I.†	381, Nectarius 397-398, Joannes I. Chrysostomus, deposed	386-389, Joannes II. Sylvanus
401-402, Innocentius I. 417, Zosimus 418, Bonifacius I. *Eulalius, Anti-pope.* 422-423, Cœlestinus I. 432, Sixtus III.	412, Cyrillus I. 444, Dioscorus I. deposed A.D. 451, and died A.D. 454 451, Proterius 457, *Timotheus II. Aelurus* (II.) usurped the see and was banished soon after	404, Porphyrius 413-414, Alexander I. 417-422, Theodotus I 428-422, Joannes I. 442, Domnus II. 442, Maximus 456, Basilius I. 458, Acacius or Alexander	404, Arsacius 406, Atticus *Bardas*, A. 426, Sisinnius I. 428, Nestorius, H., founder of the Nestorian sect, deposed 431, Maximus I. or Maximianus 434, Proclus	416-417, Praylus or Praylius 418-428, Juvenal
440, Leo I., Magnus, or the Great. 461, Hilarius 467, Simplicius	460, Timotheus II. Solofaciolus 475, *Timotheus II. Aelurus, restored by the usurper Basiliscus*; died 479	459-462, Martyrius 471, *Petrus II. Gnapheus* or *Fullo* (the Fuller) usurped the see, but was expelled almost directly 471, Julianus	446-447, Flavianus I. 442, Anatolius 458, Gennadius I. 471-472, Acacius	452, *Theodosius*, usurper 453, Juvenal restored 458, Anastasius
483, Felix II. (or III.) 422, Gelasius I. 496, Anastasius II. 428, Symmachus 514, Hormisdas 523, Joannes I. 526, Felix III (or IV.)	472, Timotheus II. Solofaciolus restored, died A.D. 483 482, *Petrus III., Mongus*, H. 483, Joannes I. Talaia; not counted by some, as he was deposed by the Emperor Zeno, and Mongus put in possession of the see 490, Athanasius II.	475-476, Petrus II. Gnapheus restored, but soon banished 477, Joannes II. Codonatus deposed 478, Stephanus II. 472-481, Stephanus III. 482, Joannes II. restored, but again expelled 482, Calendion 485, Petrus II. Gnapheus restored		
530, Bonifacius II. *Dioscorus, anti-pope* for a month.	496-427, Joannes II. (I.) Mela or Hemula. Le Quien calls him Joannes I.	488, Palladius, H. 428-499, Flavianus II. 512, Severus I., heresiarch 519, Paulus II.	482, Flavitas or Fravitas or Phraitas or Flavianus II. 490, Euphemius or Euthymius deposed	478-479, Martyrius 486, Salustius
531-532, Joannes II. 535, Agapitus or Agapetus I. 536, Sylverius or Silverius 540, Vigilius. Vigilius had been anti-pope for a time when Sylverius was deposed by the Emperor Justinian I.; but, on the death of Sylverius, either was recognised as legitimate Pope, or resigned his usurped dignity and was re-elected	507, Joannes III.(II.) ἔγκλειστος. a. Inclusus. 516-517, Dioscorus II. 518, Timotheus III. 536, { Gaianus { Theodosius I. These prelates contested the patriarchate, but were both expelled. Their respective adherents formed the two sects of the Gaianites and Theodosians	521, Euphrasius 527, Ephraemius or Euphraemius 541-542, *Sergius*, J. Here the great Jacobite schism begins. Their patriarchs, though taking their title from Antioch, have generally resided at Diarbekr 545, *Paulus*, J. 545-546, Domnus III. 552, Anastasius I. deposed	426, Macedonius II. deposed 511, Timotheus I. 518, Joannes II. Cappadox. 520, Epiphanius 535, Anthimus I., H., deposed 536, Mennas or Menas	423-494, Elias I. deposed 513, Joannes III. 524, Petrus
555, Pelagius I. 560, Joannes III. 573-574, Benedictus I. 577-578, Pelagius II. 520, Gregorius I. Magnus or the Great	538, Paulus 542, Zoilus, deposed 551, Apollinaris 567, *Petrus IV.*, J. * 569, Joannes IV. (III.) 662, *Damianus*, J. 572, Eulogius I. 593-605, *Anastasius Apozygarius*, J.	569-570, Gregorius I. 578, *Petrus*, J. 591-600, *Julianus I.*, J. 523, Anastasius I. restored 597-604, *Athanasius I.*, J. 528-599, Anastasius II. Fabricius, after giving Gregorius II., who never existed, gives Anastasius III., whose existence is very doubtful	552, Eutyches or Eutychius deposed 565, Joannes III. Scholasticus 577, Eutychius restored 582, Joannes IV. Nesteuta or Jejunator i. e. the Faster 594-595, Cyriacus 607, Thomas I.	544, Macarius II. elected, but his election invalidated by the Emperor 544, Eustochius, deposed 556-563, Macarius II. restored 570-574, Joannes IV. 591-594, Amos 600-601, Isaac, Isaacius or Hesychius
604-605, Sabinianus 606-607, Bonifacius III. 607-608, Bonifacius IV.	607, Theodorus Scribo 602, Joannes V. (IV.) Eleemosynarius or the Almoner 614, *Andronicus*, J.	610-629, Patriarchate probably vacant	610, Sergius I.	608-602, Zacharias
614-615, Deusdedit or Deodatus or Adeodatus I. 617-619, Bonifacius V. 625-626, Honorius I. 638-639, Severinus 639-640, Joannes IV. 641, Theodorus I. 649, Martinus I. 654, Eugenius I. 655-657, Vitalianus 669-672, Deusdedit or Deodatus or Adeodatus II. 676, Domnus or Domnio or Donus I.	616-620, Georgius I. 620, *Joannes*, J., omitted in some lists 622-625, *Benjamin I.*, J. 630, Cyrus 643-648, Petrus III. He fled from Alexandria, and for many years there were only Jacobite Patriarchs 659-661, *Agatho*, J. 677, *Joannes III.*, J. He is Joannes III. in the Jacobite lists, they not acknowledging Joannes I. or IV. or V.	622, Athanasius I., the Jacobite patriarch acknowledges the council of Chalcedon and is recognised as patriarch by the Emperor Heraclius 631-639, *Joannes I.*, J. 639-640, Macedonius, M. 648-649, *Theodorus I.*, J. Jarihus or Georgius I., M. Macarius, M., deposed in 681 Some authors mention a Thomas as patriarch for twenty years about this time 665-668, *Severus II.*, J.	632, Pyrrhus deposed 641, Paulus II. 654-655, Pyrrhus restored 655, Petrus 666-667, Thomas II. 662, Joannes V. 674-675, Constantinus I. 676-677, Theodorus I. deposed 678, Georgius I. 683, Theodorus I. restored	632-634, Modestus 634-635, Sophronius I., who died some time between A.D. 638 and 644, then the see was vacant till A.D. 706, and was administered by Sergius, Bishop of Joppa; Stephanus, Bishop of Dora; Joannes, Bishop of Philadelphia, and Theodorus, a presbyter
678, Agathon or Agatho 682, Leo II.		680-684, *Athanasius II.*, J.		
684, Benedictus II. 685, Joannes V. *Theodorus, Anti-pope* *Petrus II., Anti-pope*	686, *Isaac*, J.	681, Theophanes 684-685, Alexander II. 686? Georgius II.	686, Paulus III.	
686, Conon *Theodorus, Anti-pope* *Paschalis, Anti-pope*	688-682, *Contention for the Jacobite Patriarchate*	687-638, *Julianus II.*, J.	692-693, Callinicus I. deposed	

* Previous to or during the Patriarchate of Apollinaris the Gaianists had elected Elpidius for their patriarch, while the Theodosians elected Dorotheus: then the two sects united to choose Joannes, a monk, for their Patriarch; or rather, as the passage in Theophanes, which is evidently corrupt, may be understood, accepted the Theodosian Dorotheus as bishop of the united body, which appears to have held Monophysite or Jacobite principles. See Theophanes, *Chronographia*, A.M. 6057 Alex. æra = A.D. 565. Petrus, who succeeded either Joannes or Dorotheus, appears in our table, with the succeeding Jacobite patriarchs. The orthodox (or Melchite) patriarchs who admitted the authority and held the doctrines of the Council of Chalcedon, were however recognised by the Byzantine Emperors and by the Greek Church.

† From the time of Meletius to that of Flavianus, the succession is very much perplexed. Meletius, who was orthodox, was deposed and exiled, and his successors Euzoius and Dorotheus, though Arians, were recognised by the Byzantine government. The orthodox withdrew with Meletius, whom they still recognised for their Patriarch, on whose death Flavianus was elected by them. The Eustathian seceders, already noticed, continued separate from the Meletians, and in A.D. 388 or 389 elected Evagrius for their patriarch; but his death, and that of Dorotheus, and the overthrow of the Arian party, left Flavianus in or soon after A.D. 392 in sole possession of the patriarchate.

ROME.

A.D.
687, Sergius I.
701, Joannes VI.
705, Joannes VII.
708, Sisinius
708, Constantinus
714-715, Gregorius II.
731, Gregorius III.
741, Zacharias
752-753, Stephanus II., omitted in some lists because he died before consecration
752-753, Stephanus III. (II.)
757, Paulus I.
Theophylactus, Anti-pope
Constantinus II., Anti-pope
Philippus, Anti-pope
768-768, Stephanus IV. (III.)
772, Hadrianus or Adrianus I.
795, Leo III.
816, Stephanus V. (IV.)
817, Paschalis I.
824, Eugenius II.
Zizinus, Anti-pope
827, Valentinus
827, Gregorius IV.
843-844, Sergius II.
847, Leo IV.
Here the supposed *Pope Joan* or *Joannes VIII.* is placed. [JOAN, POPE, P. C.]
855, Benedictus III.
Anastasius III., Anti-pope
858, Nicolaus I.
867, Hadrianus or Adrianus II.
872, Joannes VIII.
882, Martinus II. or Marinus I.
884, Hadrianus or Adrianus III.
885, Stephanus VI. (V.)
891, Formosus
Sergius III., Anti-pope
897, Bonifacius VI., reputed to be Anti-pope by some
896-897, Stephanus VII. (VI.)
Romanus, Anti-pope
897-901, Theodorus II.
897-901, Joannes IX.
900-905, Benedictus IV.
903-907, Leo V.
Christophorus, Anti-pope
904-908, Sergius III.
910-911, Anastasius III.
912-913, Lando or Landus
912-914, Joannes X.
928, Leo VI.
929, Stephanus VIII. (VII.)
931, Joannes XI.
936, Leo VII.
939-940, Stephanus IX. (VIII.)
943, Martinus III. or Marinus II.
946, Agapitus or Agapetus II.
955-956, Joannes XII.
963, Leo VIII.: Baronius and some other writers do not regard Leo as legitimate pope
964, Benedictus V. He was elected as successor of Joannes XII. by the partisans of that pope: but some authors do not recognise him
965, Joannes XIII.
972-973, Domnus or Donus II.
972, Benedictus VI. (V.) Some writers reverse the order of these last two popes
974, Bonifacius VII., generally reckoned an usurper, expelled
974-975, Benedictus VII. (VI.)
983-984, Joannes XIV.
985, Bonifacius VII., having deposed Joannes, re-occupied the papal chair, but was soon murdered
985, Joannes XV. 'Filius Roberti:' not recognised in many lists
985-986, Joannes XVI. (XV.)
996, Gregorius V.
997, Joannes XVII. (XVI.) not recognised by many.
999, Sylvester II.
1003, Joannes XVIII. (XVII. or XVI.)
1003, Joannes XIX. (XVIII. or XVII.)
1009, Sergius IV.
1012-1013, Benedictus VIII. (VII.)
Gregorius VI., Anti-pope
1024, Joannes XX. (XIX. or XVIII.)
1032-33, Benedictus IX. (VIII.)
Sylvester III., Anti-pope
1044, Gregorius VI.
1046-47, Clemens II.
1048, Damasus II.
1049, Leo IX.

ALEXANDRIA.

A.D.
692, *Simon Syrus*, J.
700-703, *Jacobite Patriarchate vacant*
703-705, *Alexander II.*, J.
724-726, *Cosmas I.*, J.
727, *Theodorus*, J.
727-729, Orthodox or Melchite Patriarchate revived. Cosmas patriarch perhaps till 775
738 to 743, *Jacobite patriarchate vacant*
743, *Chaïl* or *Michael I.*, J.
757 or 775, Some place here another orthodox patriarch, Politianus, who is said to have lived till 801
766, *Mennas* or *Minas I.*, J.
774-776, *Joannes IV.*, J.
798-799, *Marcus I.* (or III.), J.
801, Eustathius
805, Christophorus
819-826, *No Jacobite Patriarch*
826, *Jacob I.*, J.
830-837, *Simon* or *Simeon*, J.
831-837, *Jacob II.* or *Joseph*, J.
836-844, Sophronius I.
850, *Chaïl* or *Michael II.*, J.
851, *Cosmas II.*, J.
859, Michael I.
859-860, *Sanutius I.*, J.
871-872, Michael II.
881, *Chaïl* or *Michael III.*, J.
889 or 906 to 913, *No Jacobite patriarch*
906-908, Christodulus
913, *Gabriel I.*, J.
923, *Cosmas III.*, J.
932-934, Eutychius
933-934, *Macarius I.*, J.
940, Sophronius II.
Isaac
Job
953-954, *Theophanius*, J.
958, *Mennas or Minas II.*
Elias in 968, J.
976-977, *Ephraem*, J.
981, *Philotheus* or *Theophilus*, J.
Arsenius
1002-5, *Zacharias*, J.
Georgius or Theophilus soon after A.D. 1000
1032, *Sanutius II.*, J.
1047, *Christodulus*, J.
Leontius or Alexander in A.D. 1059
Joannes
Sabas

ANTIOCH.

A.D.
702-742, No orthodox patriarch
709, *Elias*, J.
723-724, *Athanasius III.*, J.
739-740, *Joannes II.*, J.
742, Stephanus IV.
744-745, Theophylactus
751, Theodorus I. or II.
754-755, *Isaac*, J., *not recognised by all the sect*
755, *Athanasius IV.*, J.
755-759, *Georgius*, J.
Joannes } Jacobite Anti-
David } patriarchs
773, Theodoritus I.
789-790, *Joseph*, J.
790-812, No orthodox Patriarch
792-793, *Cyriacus*, J.
798, *Abraham, Jacobite Anti-patriarch*
812, Jobus
817-818, *Dionysius I.*, J.
836-837, *Simon, Jacobite Anti-patriarch, successor of Abraham*
848, *Joannes III.*, J.
847, Nicolaus I.
Zebinas, Jacobite Anti-patriarch
870, Stephanus V.
870, Tadusus or Theodorus II. (or III.) or Theodosius I.
873 to 877, *No Jacobite patriarch*
877-878, *Ignatius I.*, J.
Photius mentions an Eustathius patriarch of Antioch about this time
883 to 886, *No Jacobite patriarch*
886-887, *Theodosius*, J.
891-893, Simeon I.
896-897, *Dionysius II.*, J.
904, Elias I.
909-910, *Joannes IV.*, J.
922, *Basilius I.*, J.
931 to 935, No orthodox patriarch
935, Theodosius II. (or I.) or Theodotus II. or Stephanus VI.
936, *Joannes V.*, J.
Theodoritus II.
Agapius I.
956, *Joannes VI.*, J.
957-958, *Dionysius III.*, J.
Christophorus, killed in A.D. 966 or 969
962, *Abraham*, J.
965, *Joannes VII.*, J.
Eustratius, doubtful
970, Theodorus II. (or III. or IV.)
976, Agapius II.
986-987, *Athanasius V.*, J.
Joannes III. about A.D. 1000
Nicolaus II. doubtful
1004, *Joannes VIII.*, J.
Elias II.
1033-34, *Dionysius IV.*, J.
Georgius III., till A.D. 1051
1044 to 1049, *No Jacobite patriarch*
1049, *Joannes IX.*, J.
Basilius II., doubtful

CONSTANTINOPLE.

A.D.
705, Cyrus
711-712, Joannes VI.
715, Germanus I. abdicated
730, Anastasius, Ic.
754, Constantinus II., Ic.
766, Nicetas I., Ic.
780, Paulus IV.
784, Tarasius
806, Nicephorus I. banished
815-816, Theodotus I. Cassiteras, Ic.
821, Antonius I., Ic.
832 Joannes VII., or Jannes Lecanomantes, Ic., deposed
842, Methodius I.
846, Ignatius, deposed
857, Photius, deposed
867, Ignatius restored
877, Photius, restored but again deposed
886, Stephanus
893, Antonius II.
895-896, Nicolaus I. Mysticus, deposed
906, Euthymius I. deposed
911, Nicolaus I. restored
925, Stephanus II.
928, Tryphon
931-933, Patriarchate vacant
933, Theophylactus
936, Polyeuctus
970, Basilius I. Scamandrinus, banished
974, Antonius III. Studita, abdicated
979-982, Patriarchate vacant
982-983, Nicolaus II. Chrysoberges
995-996, Sisinnius II.
999, Sergius II.
1019-20, Eustathius
1025, Alexius or Alexis
1043, Michael I. Cerularius, deposed

JERUSALEM.

A.D.
705, Patriarchate re-established in the person of Joannes V. who died, according to some, in A.D. 735
735, Eusebius or Basilius, but his existence is doubtful
742-754, Theodorus, who, according to some authorities, was still patriarch in 767
Basilius or Eusebius, said to have been patriarch in 772 or 773, but his existence is doubtful
Elias II. Some authorities place his exaltation in 760; others some time before 785, when he was expelled by Theodorus, a monk
785, *Theodorus*, usurper
Elias II. restored, and died A.D. 807 at latest
796-799? Georgius I. or Gregorius I., or Sergius I.
801-803, Fortunatus? but he was probably not patriarch of Jerusalem
801-807, Thomas I.
821-829, Basilius
835-843, Sergius
856-859, Salomon
862-863, Theodosius
879, or perhaps earlier, Elias III.
907, Sergius II. or Georgius II.
911, Leo or Leontius
927-928, Anastasius or Athanasius I. His existence is doubtful
928, Nicolaus I., also doubtful
Christophorus, or Christodorus, or Christodulus, in A.D. 937
Agathon, or Agathonus. His existence is doubtful
Joannes VI., burnt by the Saracens A.D. 969
Christophorus, or Christodorus, or Christodulus II.
Thomas II.
Josephus
Alexander, some time in the reign of the Byzantine Emperor, Basilius II., *i. e.*, from A.D. 976 to 1025; but his existence, at least his occupation of the patriarchate, is doubtful
Agapius. His patriarchate is doubtful
984, or later. Jeremias, or Joannes, or Orestes, martyred, or died from injuries received, A.D. 1012
1009? Theophilus I.
1010? Arsenius I. perhaps till A.D. 1023
Jordanus in A.D. 1033
Nicephorus I. in A.D. 1048, but some place him before Arsenius and Jordanus
Mennas. His existence is very doubtful

ROME.	ALEXANDRIA.	ANTIOCH.	CONSTANTINOPLE.	JERUSALEM.
A.D. 1055, Victor II. 1057, Stephanus X. (IX.) Benedictus X. (IX.) not recognised by some 1059, Nicolaus II. 1061, Alexander II. *Honorius II., Anti-pope* 1073, Gregorius VII. *Clemens III., Anti-pope* 1086, Victor III. 1088, Urbanus II. 1090, Paschalis II. *Albertus, Anti-pope* *Theodoricus, Anti-pope*	A.D. 1078, *Cyrillus I.*, J. Theodosius II. 1092, *Chail or Michael IV.*, J. Cyrillus II.	A.D. 1051-53, Petrus III. Theodorus III. (or IV. or V.) about A.D. 1057 1058, *Athanasius VI.*, J. 1064, *Joannes X.*, J. Theodosius III. (or II.) 1074, *Basilius II.*, J. 1075, *Joannes XI.*, J. Aemilianus about A.D. 1078 1077, *Dionysius V.*, J. 1079, *Abdon, Jacobite usurper* 1086, *Joannes XII.*, J. 1088, *Abdon, usurper again* 1089, Nicephorus Maurus 1088, *Dionysius VI.*, J. Joannes IV. in A.D. 1098 1090, *Athanasius VII.*, J.	A.D. 1059, Constantinus III. Lichudes 1064, Joannes VIII. Xiphilinus 1075, Cosmas I. abdicated 1081, Eustratius Garidas deposed 1084, Nicolaus III. Grammaticus or Cirdynatus or Theoprohletus	A.D. 1053, Sophronius II., perhaps till A.D. 1076 Marcus II. His existence is very doubtful Euthymius died in or before 1094
1118, Gelasius II. *Gregorius VIII., Anti-pope* 1119, Callistus or Calixtus II. 1124, Honorius II. *Coelestinus II., Anti-pope* 1130, Innocentius II. *Anacletus II., Anti-pope* *Victor IV., Anti-pope* 1143, Coelestinus II. 1144, Lucius II. 1145, Eugenius III. 1153, Anastasius IV. 1154, Hadrianus or Adrianus IV. 1159, Alexander III. *Victor IV., Anti-pope* *Paschalis III., Anti-pope* *Calixtus III., Anti-pope* *Innocentius III., Anti-pope* 1181, Lucius III. 1185, Urbanus III. 1187, Gregorius VIII. 1188, Clemens III. 1191, Coelestinus III. 1198, Innocentius III	1102-3, *Macarius II.*, J. Eulogius II. 1128 to 1131, *No Jacobite patriarch* 1131, *Gabriel II.*, J. 1145-46, *Chail or Michael, IV.*, J. 1146-7, *Joannes V.*, J. Sophronius III. in A.D. 1160 1164-7, *Marcus (II. or IV.,)* J. Elias in A.D. 1180 1189, *Joannes VI. or Jonas*, J. Marcus I. (or III.) in A.D. 1195 Nicolaus I. in A.D. 1210 and 1223	1100, BERNARDUS, first Latin patriarch: the Latin series is printed in capitals Theodosius IV. (or III.) or Theophilus 1130, *Joannes XIII.*, J. Joannes V. about A.D. 1130 1135-6, RADULPHUS I. 1138, *Athanasius VIII.*, J. 1142, AYMERICUS Soterichus Athanasius II. in A.D. 1160 1166, *Michael I.*, J., to A.D. 1199 Simeon II. in A.D. 1178? Theodosius V. (or IV.) in A.D. 1176? or 1180 1180, *Theodorus, Jacobite*, Anti-patriarch, to A.D. 1193 1187, RADULPHUS II. His existence is disputed 1193, Theodorus IV. or V. or VI., Balsamon	1111, Joannes IX. Hieromnemon or Chalcedonius 1134, Leo Stypiota, abdicated 1143, Michael II. Curcuas or Oxita, abdicated 1146, Cosmas II. Atticus, abdicated 1147-48, Nicolaus IV. Muzalo, abdicated. 1151, Theodotus II. 1153-4, Neophytus elected but not consecrated 1154, Constantinus IV. Chliarenus 1156, Lucas Chrysoberges 1169, Michael III. 1176-7, Chariton 1177-8, Theodosius Borradiotes, abdicated 1183, Basilius II. Camaterus, deposed 1186, Nicetas II. Muntanes, deposed or abdicated 1189-90, Leontius. Some authorities place him after Dositheus. He was deposed 1190-91, Dositheus of Jerusalem, deposed	1094, or earlier. Symeon or Simeon II. died 1099 1099, ARNULPHUS, first Latin patriarch, deposed by order of the pope before consecration. The Latin pontiffs are printed in capitals 1099, DAYBERTUS, or DAYMBERTUS, or DAGOBERTUS, or THEODEBERTUS, expelled 1103, EBREMARUS, intruder 1107, GOBELINUS or GIBELINUS 1111-12, ARNULPHUS restored 1118, GORMUNDUS 1127-8, STEPHANUS 1130, GULIELMUS or WILHELMUS I. 1145-6, FULCHERIUS Eucherius I. doubtful Macarius III. doubtful Jacobus II. Arsenius II. in A.D. 1146 Joannes VII. or Nicolaus, in 1156 1157, AMALRICUS Nicephorus II. In A.D. 1166
1216, Honorius III. 1227, Gregorius IX. 1241, Coelestinus IV. 1242-48, Innocentius IV.	1216 to 1235, *No Jacobite patriarch* 1235, *Cyrillus II.*, J. Gregorius I. 1243 to 1251, *No Jacobite patriarch*	1199, *Athanasius IX.*, J., to A.D. 1207 1200, *Michael II., Jacobite, Anti-patriarch*, to A.D. 1215 1201, PETRUS I. 1203, Joachim I. 1208, *Joannes XIV.*, J. 1209, PETRUS II. 1219, RAYNERIUS 1222, *Ignatius II.*, J. 1226, ALBERTUS till A.D. 1246 Hierotheus or Dorotheus Simeon III., Julianus Athanasius III. His existence is very doubtful HELIAS ROBERTUS CHRISTIANUS till A.D. 1268 David: doubtful	1191-2, Georgius II. Xiphilinus 1199, Joannes X. Cameterus 1204, THOMAS MOROSINI, first of the Latin patriarchs, who are distinguished by being printed in capitals 1206, Michael IV. Autorianus 1211-15, GERVASIUS or EVERARDUS 1213, Theodorus II. Irenicus 1215-6, Maximus I (or II.) 1216-7, Manuel I. Charitopulus or Sarantenus 1220-21, MATTHAEUS or MATHIAS 1222, Germanus II. Nauplius 1227, SIMON 1234-5, NICOLAUS PLACENTINUS 1240, Methodius II. 1240 to 1244, Patriarchate vacant 1244, Manuel II.	1180, HERACLIUS or ERACLIUS, or ERACLES, withdrew to Acre in 1187 on the recapture of Jerusalem by the Moslems Athanasius II. The seat of the Greek patriarchate, which had been removed at the time of the Latin Conquest, was restored by him to Jerusalem in A.D. 1188 1188, Leontius Dositheus I. translated in 1190 or 91, to Constantinople 1191, Marcus III. (or II.) or Florus, expelled 1191, SULPITIUS or ALBERTUS I. EREMITA at Acre 1193, Dositheus I. restored, but afterwards resigned 1194, MONACHUS, perhaps also called SIMON at Acre Theophanes I. about A.D. 1200 1203, SIFFRENUS or SOFFRIDUS or GALFRIDUS at Acre, abdicated 1203, ALBERTUS II. at Acre
1254, Alexander IV. 1261, Urbanus IV. 1265, Clemens IV. 1271-2, Gregorius X. 1276, Innocentius V. 1276, Hadrianus or Adrianus V. 1276, Joannes XXI. (XX. or XIX.) 1277, Nicolaus III. 1281, Martinus IV. 1285, Honorius IV. 1288, Nicolaus IV. 1294, Coelestinus V. 1294-5, Bonifacius VIII.	1251, *Athanasius*, J. Nicolaus II. in A.D. 1260 1261-2, *Gabriel III.*, J. and *Joannes VII.*, J. Competitors for the patriarchate 1262, *Joannes VII.*, J. *alone* 1269, *Gabriel III.*, J. *alone* 1271, *Joannes VII.* restored Athanasius III. in A.D. 1276 and 1308 1293 4, *Theodosius II.*, J.	1253, *Dionysius VII.*, J. Euthymius I. in A.D. 1260 1253, *Joannes XV.*, J., Anti-patriarch 1264, *Ignatius III., Josue*, J. Theodosius VI. (or V.) 1283, *Ignatius IV.*, J. Arsenius: not till after A.D. 1283 Dionysius I. or David and Cyrillus II. Competitors Dionysius I. alone Cyrillus III., or Cyriacus, or Cyrianus 1292, *Ignatius V. or I.*, J., to A.D. 1332 *Here begins the Jacobite Schism: beside the regular line there were rival patriarchs in Syria* marked J. S., *and in Cilicia* marked J. C. 1293, *Ignatius or Michael I.*, J. C.: *perhaps till* A.D. 1313 1293, *Ignatius or Constantinus*, J. S.: *till* A.D. 1349	1253, PANTALEON JUSTINIANI, last actual Latin patriarch 1255, Arsenius I. Autorianus, abdicated 1260, Nicephorus II. 1260-1, Arsenius I. restored, but again abdicated 1267, Germanus III. abdicated 1267, Josephus I. deposed 1275, Joannes XI. Veccus or Beccus, deposed 1282, Josephus I. restored; but abdicated afterwards 1283, Gregorius II. Cyprius 1289, Athanasius I. deposed 1294, Joannes XII. Sozopolitanus, abdicated	1214, RODULPHUS or RADULPHUS 1216, LOTHARIUS or GALTERUS or GUALTERUS, perhaps preceded Rodulphus 1224-5, GERONDUS or GERALDUS 1240, ROBERTUS or GUIDO 1255, JACOBUS PANTALEON: became pope in 1261, as Urbanus IV. The Latin patriarchate was then offered to, but refused by BARTHOLOMAEUS BRAGANTINUS and HUMBERTUS Gregorius II. (I.) in A.D 1260 1263, GULIELMUS or WILHELMUS II. 1272, THOMAS AGNI DE LENTINO 1279, ELIAS Athanasius III. 1288, NICOLAUS DE ANAPIIS. After the capture of Acre in 1291, the Latin patriarchate was only titular Thaddaeus in A.D. 1298 Sophronius III. Athanasius IV. deposed

Rome.	Alexandria.	Antioch.	Constantinople.	Jerusalem.
A.D.	A.D.	A.D.	A.D.	A.D.
1303, Benedictus XI. (X.)	1300-01, *Joannes VIII.*, J.		1303-4, Athanasius I. restored, but again abdicated	1304-11, Gabriel Brulas
1303, Clemens V. The papal court was removed by him to Avignon	Gregorius II.			Athanasius IV. restored
	1320-21, *Joannes IX.*, J.	1313, *Ignatius or Michael II.*, J. C., *till* A.D. 1349	1311 to 1313, Patriarchate vacant	Lazarus in A.D. 1338, deposed
1316, Joannes XXII. (XXI. or XX.)	1326-7, *Benjamin II.*, J.	Dionysius II.	1313, Niphon I. deposed	Gerasimus
		Sophronius	1314 to 1316, Patriarchate vacant	Lazarus restored: he was patriarch in A.D. 1367
Nicolaus V., Anti-pope in Italy	1339-40, *Petrus I.*, J.	1332-3, *Ignatius VI. or II., or Ismael Magedus*, J.: *till* A.D. 1365		
			1316, Joannes XIII. Glycys, abdicated	Sophronius IV.
1334, Benedictus XII. (XI.)				Dorotheus I. elected in the reign of the Byzantine Emperor Joannes V. or Joannes Palaeologus I. which extended from A.D. 1355 to 1384
		Joannes VI.	1320, Gerasimus I.	
		Marcus I.	1321 to 1323, Patriarchate vacant	
		Ignatius II. in A.D. 1344		
1342, Clemens VI.	1348, *Marcus III. (or V.)* J.	1349, *Basilius I. or Philoxenus*, J. S. *and* C. *The Syrian and Cilician patriarchates were united in him: but a new series of Jacobite patriarchs of Tur-Abdinum*, marked J. T., begins	1323, Esaias	
	Gregorius III. in A.D. 1360		1333, Joannes XIV. Calecas or Aprenus banished	
				Theophilus II., patriarch in the early part of the reign of Joannes VII. or Joannes Palaeologus II., who acceded in A.D. 1419
1352, Innocentius VI.			1347, Isidorus I. Bouchiras	
			1349-50, Callistus I. deposed	
			1354, Philotheus, deposed	
			1355-6, Callistus I. restored	
1362, Urbanus V.	1363 to 65, *No Jacobite patriarch*	1364, *Ignatius I. or Basilius Saba, or Sala*, J. T. *till* A.D. 1389	1362-3, Philotheus restored	Theophanes II., A.D. 1430
				Joachim, A.D. 1439
	1365, *Joannes X.*, J.	1365, *Ignatius VII. or III. Schiahab*, J., *till* A.D. 1381		Theophanes III., in A.D. 1440 or 1441
	Niphon in A.D. 1367	*Basilius II. Gabriel*, J. S. *and* C., *till* A.D. 1387		Abraham, in A.D. 1468
	Gabriel IV., J. in A.D. 1376?			
		Pachomius I. deposed in A.D. 1370		
	Marcus II. (or IV.)			
1370, Gregorius XI., restores the papal court to Rome.	1376? *Matthaeus I.*, J.	1370, Michael I.	1375-6, Macarius	
	Nicolaus III.	Pachomius I. restored	1378-9, Nilus	
	Gregorius IV.	Marcus II. died A.D. 1378		
1378, Urbanus VI.	*Gabriel V.*, J. in A.D. 1411	1381, *Ignatius VIII. or IV., or Abraham Bar Garib*		
Clemens VII., Anti-pope. Great Schism in the Western Church				
	Joannes XI., J. in A.D. 1430 and 1440	*Cyrillus*, J., *till* A.D. 1412		
		1387, *Philoxenus*, J. S. *and* C., *till* A.D. 1421	1388, Antonius IV.	
1389, Bonifacius IX.	Philotheus I. in A.D. 1439 and 1450			
		1389, *Ignatius II., Josue*, J. T., till A.D. 1417	1396, Callistus II. Xanthopolus	
1404, Innocentius VII.	*Matthaeus II.*, J. in A.D. 1454			
Benedictus XIII., Anti-pope.		Pachomius II.	1396? Matthaeus I.	
1406, Gregorius XII. His abdication and that of the anti-pope Benedictus closed the great schism	Athanasius IV.	Nicon or Nilus		
		Michael II. in A.D. 1401		
		Pachomius III.	1410, Euthymius II.	
		1412, *Ignatius IX. or V. Benehamus*, J., *till* A.D. 1455		
1409, Alexander V.			1416, Josephus II.	
1410, Joannes XXIII. (XXII. or XXI.)		1417, *Ignatius III., Masudas*, J. T., *till* 1420	1440-41, Metrophanes II. died A.D. 1443	
		1421, *Basilius III. or Simeon*, J. S. *and* C., *till* 1445: *he was the last patriarch of that Schism, which then ceased*		
1417, Martinus V.				
Clemens VII., Anti-pope			1443 to 1445, Patriarchate vacant	
1431, Eugenius IV.				
Felix V., Anti-pope, elected by the council of Basel but soon abdicated		1421, *Ignatius IV. or Henoch*, J. T., *till* A.D. 1445		
		Joachim II.		
		Marcus III.	1445-6, Gregorius III. Melissenus or Mammas: fled into Italy in 1451 or 1452	
		Dorotheus I. in A.D. 1439		
		1445, *Ignatius V. Cuma*, J. T., *till* A.D. 1456		
			1453, Gennadius II. abdicated in 1457-8, or 9	
1447, Nicolaus V.		Michael III.		

ROPES, RIGIDITY OF. [RIGIDITY OF ROPES, P.C.S.]

ROSALI'NA. [FORAMINIFERA, P. C. S.]

ROSELLI, COSIMO, a celebrated old Florentine painter, was born at Florence, according to Gayo, in 1439. There are few of his works remaining; the principal is the fresco in the convent of Sant' Ambrogio, at Florence, painted in 1456, according to an inscription seen upon it by Rumohr, when Cosimo cannot have been more than eighteen years of age according to the above date: Vasari however says it was painted in his youth. And Rumohr observes that Cosimo, in the commencement of his career, followed the path which was opened by Angelico da Fiesole and Masaccio; but that after a few brilliant examples of his ability, he left the approximation of the representation of things as they really appear, to follow an uninteresting, inanimate, and ugly manner. The fresco represents the transportation of a miracle-working chalice from the church of Sant' Ambrogio to the episcopal palace; the abbess and nuns follow in the procession, and at the palace-gate is a group of priests and choristers ready to receive it: around is a crowd of curious spectators. The story is told, and the picture described, in Richa's 'Chiese di Firenze.' The picture has been engraved by Lasinio for his series of old Florentine paintings, and there is a group from it in Lastri's 'Etruria Pittrice.'

Cosimo was one of the painters invited by Pope Sixtus IV. to Rome to paint the Cappella Sistina, built in 1473, by Baccio Pintelli [PINTELLI, P. C. S.], for that pope. Cosimo's paintings in this chapel are still in good preservation; they are—the Destruction of Pharaoh's Host in the Red Sea, in which the Israelites are also represented returning thanks for their deliverance; Moses receiving the Tables of the Law while the Israelites are worshipping the golden Calf; the Sermon on the Mount and the healing of the Leper; and the Last Supper. The landscape of the third picture was painted by Cosimo's pupil, the eccentric Piero di Cosimo, afterwards the master of Andrea del Sarto. These works were painted for a prize in competition with others in the same chapel by Sandro Botticelli, Domenico Ghirlandajo, Don Bartolomeo, Luca da Cortona, and Pietro Perugino. Cosimo was very anxious to get the prize, but he doubted his ability, at the same time that he had little faith in the pope's judgment; he therefore, knowing his weakness in composition and design, painted his picture very high in colour, and used plenty of ultramarine and gold, counting upon attracting the pope's fancy by his gaudy display. When the pictures were all uncovered, his fellow painters laughed at Cosimo for his puerilities. Cosimo however proved himself a good man of the world, if not a good painter; his gay works fixed the pope's attention and he obtained the prize; the other painters were censured by his holiness for not using finer colours, and they were obliged to retouch them and heighten their effect in the same manner, to the great triumph of Cosimo, whose works however were in reality inferior to all the others.

Cosimo Roselli was still living in 1506: Vasari says he was sixty-eight years old when he died; if therefore he were born in 1439, 1507 may have been the year of his death. He was the master of Fra Bartolomeo.

(Vasari, *Vite de' Pittori*, &c., ed. Schorn; Rumohr, *Italienische Forschungen*; Platner und Bunsen, *Beschreibung der Stadt Rom.*, vol. ii., pt. 1; Gaye, *Carteggio inedito d'Artisti*, vol. ii., ap. 1.)

ROSELLI'NI, IPPO'LITO, Cavaliere, was born August 13, 1800, at Pisa. His father was a merchant, and Rosellini himself was designed for his father's business; but he acquired such a love of the study of antiquities from his first tutor, Padre Battini, a Servitant monk of St. Antonio, who was a tolerable numismatist, that he commenced at an early age to give himself up to those studies for which he afterwards distinguished himself, and the mercantile career was wholly abandoned. In 1821 he finished his university studies in Pisa, and took the degree of Doctor of Theology. He afterwards studied the Oriental languages for three years with the celebrated (now Cardinal) Mezzofante at Bologna; and in 1824 he was appointed professor of Oriental languages in the university of Pisa. In 1825 he appears to have devoted himself with much zeal to the study of Egyptian hieroglyphics, following the steps of Champollion, of whose discoveries he was an ardent advocate. When Champollion, in 1826, for the further development of his system, examined the Egyptian monuments in Rome, Naples, and Turin, Rosellini, by the permission of the Tuscan government, attended him in his researches; and he accompanied him to Paris, and there spent the autumn of that year in similar researches: he published also in the same year an explanation of an Egyptian monument in the gallery degl' Uffizj at Florence.

In the autumn of 1827 the Grand Duke Leopoldo II. granted Rosellini a year and a half leave of absence, with funds for himself and six companions, to carry out his design of personally exploring the monuments of Egypt. After a considerable delay in Paris the French government of Charles X. determined upon sending Champollion with five companions upon a similar expedition at the same time, and they all embarked together at Toulon, July 31, 1828, and landed on the 18th of August following in Egypt, where they remained fifteen months, exploring all the principal monuments of Egypt and Nubia.

Rosellini arrived at Pisa January 6, 1830, and commenced immediately a course of lectures on the Egyptian hieroglyphics, the substance of which is in the 'Elementa Linguæ Ægyptiacæ' of Padre Ungarelli, published at Romo, in 1837. Rosellini had himself made his principles known in a letter to M. Peyron, in 1831. Tho great results of the expedition however were to appear in a joint production by Champollion and Rosellini; the former undertaking to explain all the historical monuments, and Rosellini the civil and religious. This design was however rendered impossible by the death of Champollion, which took place March 5, 1832, and Rossellini expressed his sincere regret and disappointment in a eulogium on his departed friend, which he published under the following title:—'Tributo di riconoscenza ed amore alla memoria di Champollion.' Rosellini was thus compelled to undertake the whole work himself, which was his original design, and the prospectus explaining the plan of the work had already appeared in January, 1831. Accordingly in November, 1832, appeared the first volume of 'I Monumenti dell' Egitto e della Nubia,' by Rosellini alone, explaining the historical monuments; the second appeared in 1833; and by 1836 three more, explaining civil monuments, were published; but between the publication of the fifth and sixth volumes a long interval occurred, partly through Rosellini's appointment as librarian of the university of Pisa, but chiefly through a serious illness with which he was afflicted in the chest, and which incapacitated him for nearly two years. At the same time, with the above volumes of letter-press, appeared two large folios of illustrations, the historical monuments in 1832, and the civil in 1834. The description of the historical monuments was completed in 1838-41, in two volumes, the third being divided into two parts, making in all four volumes in five on the historical, and three on the civil monuments, and these were all that were published during Rosellini's lifetime. The remaining part were the religious monuments of the Egyptians, which he was occupied upon until the period of his death, and though he did not live to see the publication, he completed the MS. of this part.

In 1839 he gave up the professorship of Oriental languages and commenced a series of archæological lectures; but in 1841 these labours were remitted him on account of his extremely bad health, and in order that he might bestow what time he could devote to study to the completion of his great work on Egypt. On the 16th of May, 1843, however, his case was found hopeless, and he died on the 4th of June following, in his forty-third year. The third part of the work was published in 1844, under the direction of the professors Bonaini and Severi, in one volume of illustrations and one volume of text.

This great work on Egypt, yet unrivalled as a review of Egyptian art and customs, though in a scientific-literary view it treads only upon the threshold of Egyptian history and antiquities, may be thus briefly described:—its title is—'I Monumenti dell' Egitto e della Nubia disegnati della Spedizione Scientifico-Letteraria Toscana in Egitto, distribuiti in Ordine di Materie, interpretati ed illustrati del Dottore Ippolito Rosellini'—The Monuments of Egypt and of Nubia drawn by the Tuscan Literary and Scientific Expedition in Egypt, arranged according to their Subjects, and explained and illustrated by Dr. Ippolito Rosellini. It is in three parts, each of which is in one large folio volume with illustrative letter-press in octavo. The first volume, Tavole, M. R., contains the historical monuments, *Monumenti Storici*, in 169 plates, with four volumes of text, 1832-41; the second, Tavole M. C., contains the civil monuments, *Monumenti Civili*, in 135 plates, with three volumes of text, 1834-36; and the third, Tavole, M. D. C., the monuments of religious worship, *Monumenti del Culto*, in 86 plates, with one volume of text, 1844. An index of the whole work is said to be in preparation by Rosellini's pupil Giuseppe Bardelli, who published a short life of Rosellini at Florence in 1843—'Biografia del Professore Ippolito Rosellini,' of which an abstract appeared in the 'Allgemeine Zeitung' and in the 'Kunstblatt' in the following year; the latter notice has been used in the biographical portion of this article. Rosellini bequeathed his Egyptian MSS. to the university of Pisa; the drawings and plates are all the property of the Grand Duke. Among the MSS. is a voluminous but unfinished 'Diccionario Geroglyphico,' Hieroglyphic Dictionary, with several thousand names.

ROSHAN is a small tract, and a part of that immense region of Central Asia which is called Turan or Independent Turkistan. It lies between 37° and 38° N. lat., and between 70° and 72° E. long., but its extent is not well known, as the country has never been visited by Europeans. It is a very mountainous tract, being traversed in every direction by those ranges which constitute the western declivity of the Bolor Tagh, and surround the elevated table-land of Pamir. Along its southern boundary runs the river Oxus, which in these countries is called Panj. Its course is here so rapid that it cannot be crossed for the greater part of the year. This circumstance, and the great quantity of snow which covers the higher portions of the mountains for nine or ten months, render the country almost inaccessible except after midsummer, and in tho month of January, when the river, notwithstanding its rapidity, is frozen over in many places. Tho cultivation of grain is limited to wheat and barley; several kinds of fruit are plentiful, especially stone-fruits. The mulberry-tree is much cultivated, and the fruit is used for making flour. Horses are not numerous: the camel with two hunches is the principal beast of burden. Cattle and sheep, both of the usual description, constitute the principal stock. The inhabitants, whose number is stated not to exceed a thousand families, speak a peculiar language. The sovereign of this country is dependent on the khan of Kunduz, but this dependance is only nominal.

(Wood, *Journey to the Source of the River Oxus.*)

ROSMI'NI, CARLO DE', born in 1758 at Roveredo, in the Italian Tyrol, studied first at Innsbruck, and then in his native town, where he began early to show his aptitude for literary composition by writing several disquisitions on poetry. He afterwards removed to Ferrara, where he published in 1789 a Life of Ovid:—'Vita di Ovidio Nasone,' to which were added a letter by Vannetti on the style and the language of Ovid, and a parallel between the Orpheus of Ovid and the same character in Virgil. This work obtained for Rosmini the honour of being inscribed among the members of the Florentine academy. He next wrote: 'Della Vita di L. Anneo Seneca libri quattro,' Roveredo, 1793. In 1801 he wrote an account of Vittorino da Feltre, a celebrated preceptor of the fifteenth century, and of his system of education: 'Idea dell' ottimo Precettore nella Vita e Disciplina di Vittorino da Feltre e de' suoi Discepoli.' This book may be called a treatise on pedagogy, as well as the next work published by Rosmini on Guarino Veronese, a contemporary of Vittorino da Feltre, and upon his school: 'Vita e Disciplina di Guarino Veronese e de' suoi Discepoli,' 3 vols. 8vo., Brescia, 1805-6. In 1808 Rosmini published an elaborate biography of the learned Filelfo: 'Vita di Francesco Filelfo da Tolentino,' 3 vols. 8vo. His next work was a Life of Trivulzio, a great captain of the sixteenth century: 'Dell' Istoria intorne alle Militari Imprese ed alla Vita di Gian Jacopo Trivulzio detto il Magno Libri XV.,' 2 vols. 4to., 1815, a biography enriched with handsome engravings and valuable documents. The last work of Rosmini was his history of Milan: 'Dell' Istoria di Milano Libri XVIII.' This history embraces the period from the reign of Frederic Barbarossa down to 1535, when Milan was annexed to the dominions of Charles V. Tho author wrote a continuation of it down to the beginning of the reign of the Empress Maria Theresa in 1740, which continuation is still inedited. Rosmini ranks among the principal Italian biographers of our times. He died at Milan in 1827.

(Tipaldo, *Biografia degli Italiani illustri.*)

ROSSI, ROSSO DE', or IL ROSSO, called in France, Maître Roux, a celebrated Florentine painter, was born in Florence in 1496. He studied the works of Michael Angelo, and was distinguished for the boldness and freedom of his style. He executed several works in various cities of Italy, but his paintings are not numerous in Italy, as he passed the best portion of his career from about 1530 in the service of Francis I. at Fontainebleau, where he superintended all the works of the palace, with a princely allowance, and a house in Paris, given to him by Francis. In the year 1541, however, while still at Fontainebleau, a few hundred ducats were stolen from him, and he accused his friend and assistant Francesco Pellegrini of the theft, who was put to the torture and was declared to be innocent. Rosso's sorrow for what had happened, and the taunts of Pellegrini and his friends together, annoyed him to that extent that ho poisoned himself, to the great astonishment and grief of Francis and his own pupils and assistants. He is said to have been called Il Rosso on account of his red hair: he was remarkable for his large and handsome person and general accomplishments and acquirements. Rosso was the boldest painter that had appeared in Italy up to the time of Vasari. Very few of his works were left at Fontainebleau; many of them were destroyed by his successor Primaticcio. Many of his works have been engraved.

(Vasari, *Vite de' Pittori, &c; Lettere Pittoriche;* D'Argenville, *Vies des Peintres.*)

ROSSI, JOHN CHARLES FELIX, R.A., was born at Nottingham in 1762; his father, a native of Siena, though not a licensed practitioner, practised as a medical man at Nottingham. Young Rossi was apprenticed very early to a sculptor of the name of Luccatella, with whom he remained, after he had served his time, as a journeyman, at eighteen shillings per week; but being employed by his master to correct some work on which Luccatella's principal assistants had been engaged, he suspected that his own abilities were of a superior class, and he demanded and obtained higher wages. It was now, however, having once felt the longing for praise, impossible for him to remain in his then subordinate situation, and he determined upon trying to better himself in London. There, still a boy, he entered himself as a student of the Royal Academy; and in 1781 he obtained the silver medal, and in 1784 the gold one, which entitled him to three years' maintenance at Rome. He went to Rome in 1785; in 1788 he returned to London; in 1800 he was elected an associate of the academy; and only two years afterwards, a very short interval, he was elected an academician. He was subsequently appointed sculptor to the Prince Regent, and he was employed in decorating Buckingham Palace. He was afterwards sculptor to William IV. But he had little to do after the completion of his great public monuments in St. Paul's Cathedral, and he depended in the latter years of his life chiefly upon a pension from the Royal Academy. He died February 21, 1839. He was twice married, and had eight children by each wife.

Rossi was both a classical and a monumental sculptor, and his style was manly and vigorous, especially in his monumental works, but they are not remarkable for any refinement either of sentiment or execution. Of the first class the following may be mentioned:—A Mercury in marble, executed in Rome; a recumbent figure of Eve, in marble; Edwin and Eleanora; Celadon and Amelia; Musidora; Zephyrus and Aurora; and Venus and Cupid. A statue of Thomson the poet by him is in the possession of Sir Robert Peel; and there is a large colossal statue of Britannia on the Exchange at Liverpool. His best works, however, and those by which he is and will be known, are the following monuments in St. Paul's Cathedral:—The Marquis Cornwallis, in the nave; Captain Faulkner and Lord Heathfield, in the south transept; and Captains Mosse and Riou, and Lord Rodney, in the north transept. The principal of these are those to Lords Cornwallis, Heathfield, and Rodney, and Captain Faulkner; all of which, except the second, are groups of three or more figures of the heroic size. That to Lord Cornwallis is placed opposite to Flaxman's monument to Nelson, and is in a similar style of composition and on a similar scale: it is a pyramidal group, the Marquis, as a Knight of the Garter, on a pedestal forming the apex; below are three allegorical figures—Britannia, and impersonations of the Begareth and Ganges, representing the British empire in the East. The sitting male figure or Ganges has much grandeur of form. Lord Heathfield is a single statue, represented in his regimentals: on the pedestal is an alto-rilievo of Victory descending from a castellated rock to crown a warrior on the sea-shore with laurel. Against the same pier is tho monument to Captain Faulkner, R.N., who was killed on board the Blanche frigate in 1795: Neptune, seated on a rock, is in the act of catching the naked figure of a dying sailor; Victory is about to crown him with a laurel. Lord Rodney's monument is a pyramidal group, the statue of the admiral forming the apex; below is Fame communicating with History.

(*Art-Union Journal; Companion to St. Paul's Cathedral.*)

ROTA'LIA. [FORAMINIFERA, P. C. S.] The most abundant genus of the Foraminiferous order, in the Cretaceous system of strata.

ROTTECK, KARL WENCESLAUS RODECKER VON, was born on the 18th of June, 1775, at Freiburg-im-Breisgau, which now belongs to the Grand Duchy of Baden, but at that time was subject to the House of Austria. His father, Auton Rodecker, was ennobled by the Emperor Joseph II. nnder the name Rodecker von Rotteck, on account of the eminent services which he had dono to his country and the emperor as perpetual dean of the Medical Faculty in the University of Freiburg, and as one of the councillors in the board of administration of Austrian Suabia. His mother, Charlotto Poirot d'Ogeron, a native of Remiremont in Lorraine, is described as a lady of rare virtue and attainments. Karl von Rotteck received a very careful education, and as early as 1790 was admitted a student in the faculty of law in the university of his native town. He took the degree of doctor of civil law in 1797, yet he always preferred history to law, and in 1798 was appointed professor of history at Freiburg. In this capacity he met with just approbation. Although he did not appear as a writer before 1811, except as the author of a few minor productions, he nevertheless devoted all his spare time towards the accomplishment of a great historical work, which secured him a high rank among the historians of Europe. Of his 'Allgemeine Weltgeschichte,' (Universal History,) the first volumo was published in 1811, but it was only finished in 1827. Germany having recovered its independence through the treaties of 1814 and 1815, and political liberty having been promised to its inhabitants, Rotteck made the constitutional law of Germany an object of his particular attention; and desiring to propagate his ideas, gave up his chair of history, and petitioned for that of politics and the law of nations in the same university, which he obtained in 1818. On those subjects he published a great number of works and memoirs as well as articles in the leading liberal periodicals of Germany, and the princes of Germany being then active in checking the rising liberal spirit of the nation, he obtained great popularity. In 1819 he was chosen by his university as their representative in the first chamber of the States of Baden. In the same year appeared his 'Ideen über Landstände,' (Ideas on Representative Bodies,) a work distinguished by great historical learning, liberal views, and that lucid and attractive style for which he is remarkable among the German historians and publicists. Some time afterwards he wrote a work on standing armies, the danger of which he endeavoured to show, and a history of the transactions of the States of Baden, which were well received by the people, but made him many enemies among the friends of the old state of things. Thus, lecturing in the university, propagating his liberal views through countless minor productions, and representing Freiburg in the states, he continued till 1830. The ontbreak of the French revolution in 1830 gave fresh vigour to his activity; he became the leading spirit of the best among the liberal periodicals of Germany, several of which were founded by bim; and giving up his seat in the first chamber of the states as member for the university, he accepted the membership for the city of Freiburg, which placed him in the second chamber, among the representatives of the people. At the head of those members who by their unremitting zeal in developing political freedom in Baden set an example to all Germany, Rotteck was exposed to slander, and at last violent attacks. As soon as the fear of France had subsided, the German governments took courage to punish those who had given offence. In consequence of a decree of the Diet, in 1832, the Baden government forbade Rotteck to lecture in the University of Freiburg, and he was declared to have forfeited, for fivo years, the right of editing any newspaper. Germany now looked upon him as a political martyr, and from its most distant provinces he received addresses and presents. His native city elected him mayor, but the government refused to give their sanction: they likewise tried to exclude him from the second chamber of the states, and to prevent his re-election; bnt there they failed, and from 1830 to 1840 he continned to represent Freiburg without any interruption. In 1840 the Baden government re-admitted him as a lecturer at Freiburg, but it was too late: after a severe illness, rendered worse through the moral sufferings he had been exposed to, Rotteck died on the 20th of November, 1840. His death was mourned as a public calamity in all Germany.

The principal work of Rotteck is his 'Allgemeine Weltgeschichte' mentioned above, which extends from the commencement of authentic history to 1815. It went through fifteen editions: the last with a continuation gives the history of the years from 1815 to 1840, by K. H. Hermes, Brunswick, 1841-45, 11 vols. 8vo., of which nine are the work of Rotteck, and the two last the continuation of Hermes. No general history ever enjoyed such popularity as this splendid production of Rotteck; in Germany it is in the hands of almost every educated family; its fame soon spread over Europe and America; and it was consequently translated into most of the European languages. The English translation by T. Jones, Philadelphia, 1840-1842, four vols. 8vo., 2nd edition, London, 1842, is however only a translation of an extract of the 'General History,' which Rotteck published under the title 'Auszug aus der Weltgeschichte,' Freiburg, 1831, &c. four vols. 8vo. Contrary to the practice of most German historians, Rotteck simply relates history, indulging neither in critical investigation of trifles, nor in metaphysical contemplation of the broad facts of human deeds. But the whole is represented from a liberal point of view, and enlivened by sound reflections on the origin of freedom and slavery, and the causes of the rise and fall of nations. The style of Rotteck is clear and attractive, but sometimes a little rhetorical; the logical order is never interrupted; and every page shows that the author possessed that rare taste and that discretion which enable a man to distinguish between trifles and important facts, and to give neither too much nor too little. The reader who wishes to obtain a strong impression of the peculiar merits of this work, as the production of a German historian, need only compare it with Hammer's far-famed History of the Turkish Empire. Among the other works of Rotteck we mention 'Kleinere Schriften' (Minor Works), five vols. 8vo., 1829-1835, which contain a great number of valuable memoirs, essays, letters, &c., on various, mostly historical subjects; 'Lehrbuch des Vernunftrechts und der Staatswissenschaften' (Doctrine of Law as a Metaphysical Science, and of Public and Constitutional Law), four vols. 8vo., 1829, &c.; 'Staatsrecht der Constitutionellen Monarchie' (The Public Law of Constitutional Monarchies), three vols. 8vo., 1824, &c. Rotteck was the co-editor, with Welcker, of that excellent work 'Staats-Lexicon,' &c. (Political Dictionary), which is still unfinished. Dr. Hermann Rotteck, the son of the late historian, published 'Rotteck's Nachgelassene Schriften' (Posthumous Works), Freiburg, five vols. 8vo., 1841-43, which contain also most of the 'Minor Works' mentioned above.

(The Life of Rotteck by his Son, in the fourth vol. of *Nachgelassene Schriften*; Rotteck's *Ehrentempel*, Freiburg, 1842; *Conversations-Lexicon Supplement*.)

ROTTI. [SUNDA ISLANDS, P. C.]

ROTULI'NA. [FORAMINIFERA, P. C. S.]

RO'VERE, DELLA, the name of a noble family originally from Savona, in the territory of Genoa, which gave to the church two celebrated Popes [SIXTUS IV. and JULIUS II., P. C.] besides many cardinals and other distinguished persons. Pope Julius II. caused his nephew Francesco Maria Della Rovere to be adopted by Guidobaldo of Montefeltro, Duke of Urbino, who was childless, as his successor in the duchy. Accordingly, after the death of Guidobaldo in 1507, Francesco Maria took possession of Urbino. Under Leo X. he was driven away from his duchy to make room for Lorenzo de' Medici, a relative of the new Pope. But after the death of Leo X., Francesco Maria was reinstated in the dominion of Urbino and Pesaro. He was much engaged in the Italian wars of that age, in which he acquired the reputation of an able commander. He died in 1538, and was succeeded by his son Guidobaldo, who was a patron of learning and of the arts. Guidobaldo died in 1574, and was succeeded by Francesco Maria II. This prince surpassed his predecessors as a patron of learning, and was himself learned in various branches of knowledge. Urbino continued to be under him, what it had been from the times of the Montefeltro family, a favourite resort of men of science and of literature. Francesco Maria II. by his liberality assisted the celebrated naturalist Aldovrandi of Bologna, in forming his rich museum of natural history. Duke Francesco Maria II. lost his only son Federico in 1623, and the court of Rome claimed the reversion of the duchy as a fief of the Papal see. Ferdinand II., Grand Duke of Tuscany, who had married the Princess Vittoria della Rovere, daughter of the Duke of Urbino, was induced, chiefly through religious scruples, to give up his claims to the succession; and thus Tuscany lost the chance of extending its sway from sea to sea as far as the Adriatic. In 1632 Duke Francesco Maria died, when his dominions were seized by Pope Urban VIII. and annexed to the Papal territories.

(Sansovino, *Famiglie Illustri d'Italia*; Tiraboschi, *Storia della Letteratura Italiana*.)

ROY, GENERAL. [TRIGONOMETRICAL SURVEY, P. C.]

RUAULT, JEAN, more generally known by his Latin name Rualdus, was born at Coutances, in Normandy, about the year 1580. He distinguished himself in early life by his knowledge of the classical languages and of ancient history. He afterwards obtained considerable success as a teacher, and was for several years professor of classical literature at the university of Rouen; from whence he went to Paris, where his lectures were attended with similar success. His fame as a scholar caused him to be twice appointed to the important office of rector of the university of Paris, and in 1629 he succeeded the celebrated Frederic Morel as Professor of 'Belles Lettres' in the Collège Royal. He died in the year 1636. The erudition of Rualdus is described as having been exact and profound, but fault is found with him as a writer on account of the prolixity of his style and its want of elegance. His oral teaching procured for him a greater reputation than his writings. The work by which he is best known is a valuable edition of Plutarch. The best copy of it is that printed at Paris, of which, as it is now rarely to be met with, we give the title in full:—'Eorundem Plutarchi Operum editio altera Gr. et Lat., ex interpretatione Hermani Cruserii et Wilhelmi Xylandri, cum notis doctorum variorum et Johannis Rualdi variantibus lectionibus è MSS. codicibus excerptis et indicibus, ex recensione Philippi Joannis Mausaci.' Parisiis. Typis Regiis, 1624, 2 vols. folio (*Bibliographie*, &c. de Do Bure, art. 6080, Paris, 1768). On account of the rarity of this edition that of Frankfort, 1620, likewise in 2 vols. folio, is generally used, but it is far inferior to it. Clarke however, in his Bibliographical Dictionary, gives the preference to the Frankfort edition (vol. v. p. 249, London, 1804). There also remain of Ruault—1, A Collection of Latin Poems, Paris, 1610, 12mo.; the volume contains two books of epigrams and one of religious poems, besides two harangues on scriptural subjects and panegyrics of St. John the Baptist and St. Ursula. 2, 'Controversia de Duellis,' Paris, 1625, 8vo. 3, A Latin funeral oration on Achille de Harlay. 4, 'Preuves de l'Histoire du Royaume d'Yvetot,' Paris, 1631, 8vo. (*Dict. Bibliographique*, Cailleau, Paris, 1790, vol. ii. p. 513). This being the only edition of this curious work it is an object of research among the collectors of rare books. Ruault attempts to show that the territory of Yvetot, so celebrated in one of the most popular of French songs, was really constituted a kingdom by Clotaire. [YVETOT, P. C.]

The name of Ruault is not found in most Biographical Dictionaries; we are indebted for the short details of his life to the 'Biographie Universelle,' vol. xxxix. It is there stated that the notice of Ruault in l'Abbé Gougot's 'Hist. du Collège Royal de France' is incomplete.

RUBRUQUIS, WILLIAM DE. This distinguished traveller of the middle ages, was a friar of the Minorite or Franciscan order. Pits, or Pitseus, an English Catholic of the sixteenth century, in his curious biographical work—'Lives of the Kings, Bishops, Apostolical Men, and Writers of England,' claims him as an Englishman, and as one that did honour to his country. It appears, however, pretty plainly that he was a native of Brabant. His real name was Ruysbrock, or Rysbruck, which, according to the fashion of the times, he Latinized into Rubruquis. The date of his birth is not preserved, but he was probably born about the year 1228. He entered the cloisters early in life, and soon after completing his noviciate and taking the major vows, he went to the Holy Land, with other monks and missionaries. The recent successes of the fourth grand crusade under Louis IX. of France, afterwards canonized as Saint Louis, had revived the hopes of the Christians of the West. Fresh streams of pilgrims were flowing thither; and some of these counted upon setting up their tabernacle of rest in Jerusalem, and upon finding provision and settlement for life in the Holy Land.

But before Rubruquis could reach the Syrian shore these hopes were overcast; the devout French king had been defeated near Tunis, rather by endemic diseases than by the sword of the Saracen, and had been made prisoner, with the remnant of his host, by the Mohammedans. Louis, however, was soon released upon paying a ransom, and entering into a treaty with the Soldan; and he was in Palestine in 1253. Although some monkish envoys, who had previously been sent in quest of that great, undiscoverable, Christian potentate of the East, Prester, or Priest John, had returned disappointed, and with very discouraging accounts of the difficulties and perils of their journey, King Louis could not discharge his imagination of that visionary personage; and being more anxious than ever to contract an alliance with that fancied Christian prince, he resolved to send another mission in search of him. A report had reached Louis that the great Tartar, Sartach, son of Baatu-Khan, who commanded in the western parts of Tartary, was a good Christian. If this Sartach were not Prester John, still his faith and devoutness, if truly reported, must make him a valuable ally to the Christians who were warring in the Holy Land against the Paynim. The mission of Louis was, therefore, to find that Tartar prince, wherever he might be, and at whatsoever toil and danger. It was composed of Rubruquis, friar Bartholomew of Cremona, and a certain friar Andrew, whose country or birth-place is not named. Rubruquis, though the youngest of the three, appears to have been considered as the head of the mission. He, no doubt, owed this pre-eminence to his superior scholarship, wit, and courage. Before his departure King Louis strictly enjoined him to write down everything he saw and heard among the Tartars; and, by conscientiously obeying the royal order, and by making a good use of his eyes (his ignorance of the Tartar languages made his ears of less account), he brought back a great deal of curious information on the subject of that nomadic people.

After spending a short time at Constantinople among the Greek Christians, whose schism gave them great offence, Rubruquis and his companions took shipping, and entered the Euxine, or Black Sea. On the 21st of May, 1253, they were safely landed at Soldaia, now Soudac or Soujac, in the Crimea, not far from Cherson, where Howard the philanthropist died in 1790. But here their troubles began. They had brought no presents of any value, and presents are necessary passports all through the East. They were told that they would never get at Sartach unless they had rich gifts to lay at his feet. They, however, pleaded their vow of poverty, as Franciscans, and boldly went on, travelling sometimes in carts, and sometimes on rough horses. They crossed the Steppes which separate the Dnieper or Borysthenes, from the river Don, or Tanaïs, and then directed their course due east, over immense desert plains where nothing was to be seen but earth and sky, and here and there the barrows or tumuli of the Comans. On the 22nd of July, being in a famishing condition, they reached the banks of the Don, where they found some fish, flesh, and dry bread. Crossing the river they plunged again into the hungry desert. On the 2nd of August they reached the temporary residence or encampment of the great Sartach. As they had nothing to give, beyond a little sweet wine, a few preserved fruits, and a bag full of sweet biscuits, their reception was of the sourest. They soon discovered that Sartach's Christianity was all a dream. That Tartar chief, however, determined to send them on to his father Baatu. From his encampment they had to travel solely on horseback, in the break-neck Tartar fashion. After dreadful fatigue, and many privations and dangers, they reached Baatu, who was encamped on the banks of the Volga, not far from its confluence with the Caspian. Baatu told them that he could enter into no negociations, and that they must continue their journey until they came to Manchu-Khan, the great Tartar Emperor, who was to be found somewhere in the direction of China. Of this long journey 'of hunger and thirst, cold and fatigue, there was no end.' At last, on the 27th of December, the poor monks arrived at the camp and court of the Tartar Emperor; and were lodged in a small dirty hovel. It is not possible to fix the spot where the erratic Manchu-Khan was then residing. Rubruquis only tells us that it was in a vast plain, as flat as the surface of a lake; that, before reaching the plain, he had crossed a lofty range of mountains, and had travelled due north. The emperor was attended by many Chinese mandarins, and by ambassadors from India, from Persia, and from Turkey. He gave a grand feast, at which all the great men got drunk on cosmos, or the fermented milk of mares. On the 5th of January (1254) the friars were presented at court, where they had to perform several humiliating ceremonies. Manchu-Khan gave them to understand that he was master of the whole world, and that the King of France and all the monarchs of christendom must submit to him. About the court were a good many Nestorian Christians; but their faith was sadly corrupted, and their priests were little better than conjurors and quacks.

A week or two before Easter Manchu-Khan removed to Kara-Corum or Kara-Kûm, a royal city on the east side of the river Orchan. The monks followed him, and were kindly entertained by a French goldsmith, his wife, a Hungarian woman, and one Basilicus, the son of an Englishman, who had been born in Hungary.

On Whitsunday Rubruquis was called into the presence of the emperor, who had been told that the friars had called him a foul infidel. Rubruquis solemnly denied the fact. 'Then,' said the Khan, 'be not afraid.' The brave monk smiled and said, 'If I had feared, I should not have come hither!' He was then told that he must return the way he had come, and make himself strong for the journey by eating good meat. He took his departure a fortnight after Midsummer day. 'From Kara-Corum,' says the good friar, 'unto the court of Baatu, our journey lasted four months and ten days, during all which time we never saw a town, or so much as a single fixed house, except one village in which we did not break bread; nor in all this time did we ever rest from our rough riding, except one day when we could find no horses.' The court of Baatu was then about to migrate to Sarai, on the eastern bank of the Volga. Rubruquis accompanied it during a whole month; but then, tired of the slow and indirect movements of the Tartars, who, as usual, were conducting their flocks and herds with them, he procured a guide and pushed rapidly forward for Sarai, keeping due south and always near to the Volga. After a very remarkable journey, the dangers and fatigues of which were supported with admirable temper, and in the course of which he threaded the great defiles of Mount Caucasus, crossed the Araxes, and traversed Armenia, Persia, and Asia Minor, Rubruquis reached Tripoli, in Syria, in the month of August, 1255. He had been, altogether, about two years and six months on his laborious travels, and he now earnestly besought his superior to allow him to go to King Louis at Paris; for that devout prince had quitted the East after witnessing the failure of all his high hopes. But the Franciscan provincial, being a strict disciplinarian, ordered the poor friar to write to Louis, and then retire to the convent of his order at Acre. The manuscript account of the travels was soon transmitted to Paris, together with an earnest prayer that his Christian Majesty would obtain the provincial's permission for his going, for a short season, to France. It has not been ascertained whether he obtained the favour, or whether he remained shut up in his cell at Acre. Indeed, after his return to Syria, nothing more seems to be known about Rubruquis except that he was living, somewhere, as late as the year 1293, when Marco Polo was on his way back to Europe from the remotest regions of the East. He was a man of rare good sense. The sobriety of his descriptions is marvellous for the time in which he lived. He was the first European traveller that gave a correct account of the Caspian Sea.

(Hakluyt, *Collection of Voyages and Travels*, A.D. 1600; Purchas, *his Pilgrimes*, 1625; *Recent Edition of Rubruquis's Travels from a MS. in the British Museum collated with other MSS. at Cambridge and Leyden, published by the Geographical Society of Paris*; Charles Mac Farlane, *Romance of Travel.*)

RUFFO, FABRI'ZIO, born about the middle of the eighteenth century, was a younger son of a noble and wealthy Neapolitan family. He was brought up for the church, for which however he had little disposition. Being introduced at Rome to Pope Pius VI., he was appointed treasurer, in which capacity he exhibited considerable economic abilities, and he incurred the jealousy of many of the older members of the Roman court. At last he resigned his office on being made a cardinal, and returned to Naples, where King Ferdinand appointed him intendant or chief administrator of his palace and domain of Caserta. Ruffo was fond of agriculture, and he applied himself to make improvements on the estate. When King Ferdinand was driven away from Naples by the French republican army in 1798, Ruffo followed him to Sicily. He had disapproved of the provocation given to the French by the court of Naples, and he was consequently at variance with the favourite minister Acton. The latter, in order to get rid of his presence, recommended him to Queen Caroline as a fit man to recover the kingdom of Naples by placing himself at the head of the Royalist population of Calabria, in which province the family of Ruffo had large estates, and exercised considerable local influence. The queen approved of the plan, however hazardous it might appear, and made the king sanction it by bestowing on Ruffo the rank of his vicar-general, with full powers to act. Ruffo, glad to escape from the intrigues and vexations of the court of Palermo, accepted the office. In February, 1799, he crossed over in a boat with an escort of only five men and 3000 ducats, and landed at Bagnara, a fief of his family. He collected a number of adherents, and unfurling the royal flag with a white cross, proclaimed a crusade against the French and their partisans. The republicans of Naples had committed many errors and acts of oppression in the provinces, and had exasperated the rustic population, which were not ripe for the change from old absolutism to a republican form of government. The Calabrians flocked by thousands to Ruffo's standard. The army of 'the Holy Faith,' which was the name it assumed, marched against the town of Monteleone, which surrendered by capitulation, as well as Catanzaro; it afterwards stormed Cotrone, which was given up to plunder; took Cosenza though the treason of its commander; and thus in less than a month Ruffo was master of all Calabria, where he re-established the king's government. He was joined by many regular officers and soldiers, and was supplied with artillery. He then took the road to Apulia, and laid siege to Altamura, which opposed his passage. The inhabitants defended themselves desperately, but the town was taken and plundered for three days with circumstances of great atrocity. The people in other parts of Apulia hoisted the royal flag; the Abruzzo was already in open revolt against the republicans of Naples, who were soon after abandoned by the French troops, which withdrew at the beginning of May towards North Italy, in order to oppose the Austrians and Russians, who were predominant in that quarter. Naples was left to its fate with only a small French garrison in one of the castles. On the other side Ruffo was joined by some regular Russian and Albanian forces from Corfu. He then advanced towards Naples by Avellino, and surrounded the capital at the head of from fifty to sixty thousand men, mostly irregulars. After some fighting outside of the town, an insurrection of the lower orders from within facilitated the entrance of Ruffo's bands, and the town became a scene of carnage; but the republicans still defended themselves in the castles and the adjacent districts, where they had fortified the massive palaces and houses. Ruffo, willing to spare further destruction, entered into a convention with the republicans, who were to be shipped off for France. The capitulation was signed by him, and a part of the republicans were actually sent off to France, when King Ferdinand arrived from Sicily in the bay, at the end of June, on board the English admiral Nelson's ship, and refused to sanction the capitulation, saying that Ruffo had exceeded his powers in treating with rebels, and he appointed a special court to try the republicans, many of whom, chiefly of the higher orders of society, were put to death. The minister Acton charged Ruffo with partiality for the Jacobins, as they were called, and the cardinal, disappointed and humiliated, seized the opportunity of leaving Naples for the conclave, which had been summoned to assemble at Venice for the election of a pope. Ruffo followed the new pope, Pius VII., to Rome, where he was made Prefect of the Annona. Some years after he returned to Naples, where he resumed his place at the court. When the court of Naples was obliged to emigrate a second time to Sicily in 1805, in consequence of its own imprudence and tergiversations, Queen Caroline proposed to Ruffo to put himself again at the head of the country people to oppose the French, but Ruffo replied that 'once was quite enough in a man's life for such vagaries.' He retired to Rome, where he remained till 1809, when he went to France and made his peace with Napoleon, and he was one of the cardinals who sanctioned by his presence his second marriage. In 1814 he rejoined Pope Pius VII. at Rome. After a time he returned to Naples, and took again his seat in the council, where he displayed a marked moderation of sentiments. He went to Rome in 1823 to the conclave in which Leo XII. was elected, and died at Naples in 1827 at an advanced age.

Ruffo was a man of ability and accomplishments. He was worldly and lax in principles, by no means fanatical or cruel; and the atrocities which disgraced his otherwise romantic expedition of 1799 cannot be justly attributed to him, although he may be blamed for not reckoning on them before he put himself at the head of the insurrectionary movement. There was blame attached to all parties in those times; the republicans of Naples had assumed a task beyond their strength; they mistook their own coterie for the nation, and they suffered cruelly for it, for the people were not on their side. The same error has been repeated again and again in other countries in our times. There is a graphic sketch of Ruffo's expedition in a miscellany entitled 'Sketches of popular Tumults,' published by Knight & Co. in 1837.

Contemporary with this Ruffo, there was another Cardinal Ruffo, of another branch of the same family, who was long archbishop of Naples.

(Petromasi, *Storia della Spedizione del Cardinal Ruffo*; Colletta, *Storia del Reame di Napoli*; Coppi, *Annali d'Italia*.)

RUFI'NUS, LICINIUS, a Roman jurist, who lived under Antoninus Caracalla (A.D. 211-217), whom he mentions once (*Dig.* 24, tit. i. s. 41). He was also consulted by Paulus (*Dig.* 40, tit. 13, s. 4). There are seventeen excerpts in the Digest from a work of Rufinus entitled Regularia. The Florentine Index mentions only twelve books of this work, and the superscription 'Lib. xiii.' in a passage of the Digest (42, tit. 1, s. 34) may be a mistake.

(Zimmern, *Geschichte des Röm. Privatrechts*, i. 382.)

RUGENDAS, GEORG PHILIPP, a celebrated German battle painter, was born at Augsburg in 1666. He was the pupil of Isaias Fisches, an eminent historical painter in his time; but Rugendas devoted himself at an early age almost exclusively to battle painting, in which he was partly confirmed by the admirable battle-pieces of Bourguignon, Lembke, and Tempesta, which he studied on his journey to Vienna, Venice, and Rome. At Rome he entered the famous Flemish Schilder-Bent, or Society of Painters, in which he was received, from his predilection for battle painting, under the nickname of Schild: all the members of this society were known only by nicknames.

In 1795, after an absence of five years, he returned to Augsburg, and had the opportunity of witnessing its siege in 1703, and of thus studying from nature what he had hitherto only acquired from his imagination and from the pictures of others. He lost a great portion of his property through this siege, but what he lost in substance he more than gained by excellent opportunities he found of perfecting himself in the line of art which he had adopted, and he acquired extraordinary excellence as a battle painter; and became distinguished also for his etchings of battles and skirmishes: he excelled in the manner in which he represented smoke, and made use of it in separating and arranging his groups. There is or was a large picture of the siege of Augsburg in the Stetten collection at Augsburg. Rugendas was made director of the Academy of Augsburg in 1710: he died at Augsburg in 1742. His pictures are very numerous, and there are not many collections without one or more examples of his style. He painted besides battles and skirmishes, horse-markets, and horse-exercises, and he generally introduced many objects into his pictures. His design is vigorous and bold, but his colouring is unequal, sometimes being high and warm, and at others heavy and monotonous; and though his light and shade is often well studied and very effective, many of his pictures are now black and obscure. Owing to an illness he painted many years with his left hand. There is a picture of the battle of Blenheim by Rugendas. He was the ancestor of a numerous family of painters and engravers, sons and grandsons. A Life of him by J. C. Füssli was published, together with a Life of Kupetzky, by the same writer: Leben Georg Philipp Rugendas and G. Johann Kupetzky; Zürich, 1758.

Christian Rugendas, his second son, engraved about sixty of his father's designs in a very spirited manner, chiefly in mezzotinto. His own etchings, of which there are about thirty, are also much prized.

RUISCH, RACHEL, a distinguished Dutch flower-painter, was born at Amsterdam in 1664: she was the daughter of Professor Ruisch, who had her taught flower-painting by Wilhelm Van Delst. In 1695 she was married to the portrait-painter Juriaen Pool, who was two years her junior, to whom she bore ten children and with whom she lived fifty years. In 1701 she and her husband were elected members of the Society of Painters of the Hague, and in 1708 John William elector of the Pfalz, appointed her his court painter. She died at Amsterdam in 1750, aged eighty-six, and she continued to paint till she was upwards of eighty years old. Her works have been compared with those of Van Huysum and De Heem, and have sometimes been sold for very high prices, even 8,500 francs for a single picture.

(Van Gool, *Nieuwe Schouburg der Nederlantsche Kunstschilders*, &c.; Van Eynden and Vander Willigen, *Geschiedenis der Vaderlandsche Schilderkunst*, &c.)

RULER, PARALLEL. A good form of this instrument is explained in MARQUOI'S RULERS, P. C. S., which is particularly applicable to the case in which numerous and related parallels or perpendiculars are to be drawn. The ordinary instruments are of two kinds, which might well be called parallel *rulers* and parallel *rollers*.

The principle of the common parallel ruler is a parallelogram of constant sides and changeable angles: one side being fixed and the angles altered, the other side changes position, it and its parallels always remaining parallel to the first side and its parallels. Two rectangular rulers are connected by two cross-bars of equal lengths, which move on pivots in the rulers in such manner that the four pivots, two in each ruler, shall be the four points of a parallelogram. The line joining two pivots on the same ruler is always made parallel to the length of the ruler. One ruler being held fixed, and a line drawn with the edge of the other ruler in any position, then any motion given to the other ruler by the rotation of the cross-bars gives, on the edge of the moving ruler, a line parallel to the first line. The defects of this construction are, that the four pivots may not make an accurate parallelogram, in which case the instrument is worthless: and the sides of the two rulers, when the instrument is closed, may not be parallel to one another, in which case all the lines must always be taken off the same ruler. Moreover, one ruler remaining fixed, there is but a small command of distance from it; so that, to gain the parallel required, it may happen that the first ruler has to be advanced, the second brought up to it, the first ruler advanced again, and so on. Now, owing to the rotation of the pivots, this gives an oblique motion to the instrument; so that it often happens, by the time that the required parallel is gained, the point through which it is to be drawn is off the ruler. To meet this disadvantage, and to give the instrument more extent, three rulers are sometimes put together, each connected with the next by cross-bars in such manner that the cross-bars connecting the first and second have an opposite revolution to those connecting the second and third. At its best however this instrument is rather clumsy; but, such as it is, it is safe and easily learnt, when well made.

The simplest kind of roller is the common round ruler, which, with a little practice, will draw parallels for ordinary use very well. It is good practice in the use of instruments to draw parallels in this way; the ruler being held in the middle and gently allowed to take its own rolling motion. If a ring be well drawn round the ruler, it is good practice in drawing perpendiculars to adjust the ruler so that the ring may roll over the line to which perpendiculars are to be drawn. But a roller which is more easily used is sold in all the shops. It consists of an ordinary ruler of rectangular form, both edges of which are bevelled and divided into equal parts: one side into inches and tenths, the other into inches and twelfths; the inch divisions being made to come exactly opposite each other. A roller is let into room cut out of the middle of the ruler, in such manner as to project a very little way from the under and upper faces of the ruler. When the instrument is put down on the paper, either of the bevelled edges may be brought down on the paper, or both may be clear of it. In this last case the roller (the efficient ends of which are *toothed* cylinders, the middle part being in a frame) rolls easily, and additional stability is given if, while it rolls, one of the bevelled edges be kept slightly on the paper. The ends of the roller are graduated and a fixed index is in the frame, so that by allowing equal numbers of divisions to pass the index at each roll, a good approximation (though not quite with a draughtman's accuracy) may be made to equidistant parallels. Perpendiculars to a given line are drawn by adjusting the ruler so that opposite divisions of the bevelled edges may travel on the given line. With a very little practice this is an instrument of great power and accuracy. Before using it, draw a line with it, roll it away, and then roll it up again to that line, and see if the coincidence is as perfect as before. Various other modes of trial will suggest themselves: indeed no one should use a parallel ruler at all until he has drawn pairs of parallels across each other, and satisfied himself that he can get the opposite sides quite equal.

A rough construction of this kind is now (very recently, September, 1846) sold under the title of 'Schlesinger's Patent,' in which a round ruler of wood is simply connected with a flat bevelled ruler, so as to carry it when it rolls. This is meant to rule lines for writing, but it may be made to do good service as a parallel ruler for other purposes.

RUMOHR, CARL FRIEDRICH LUDWIG FELIX, VON a distinguished writer on art, was born of an old family at Reinhardsgrimma, his father's estate near Dresden, in 1785. He was educated at the Gymnasium, or high school of Holzmünden, in Brunswick, whence he went to the university of Göttingen, but already at the age of fifteen he neglected every other study for that of art, abruptly discontinuing his studies at the university and placing himself with the painter J. D. Fiorillo, well known as the author of a general history of modern painting, and then established in Göttingen. From Fiorillo Rumohr heard much about Italy which excited his imagination and determined him to visit that country as soon as he had acquired some knowledge of the various schools and styles of art. He accordingly visited many collections, but above all the celebrated gallery of Dresden attracted his attention, and especially the works of Raphael and Paul Veronese. In 1804, in his twentieth year, he made his first tour in Italy, and visited Bologna, Florence, Siena, and Rome. In Rome he made the acquaintance of Thorwaldsen, Schick, Friedrich Tieck, and Koch the landscape painter: Carstens had already left. He further enjoyed the friendship of Wilhelm and Alexander von Humboldt, and Monsignore della Genga, nineteen years afterwards Pope Leo XII.

From Rome Rumohr went to Naples, and there commenced the formation of a collection of antiquities; he had already been collecting prints for some years. He returned to Germany in 1805, in the company of Ludwig Tieck. In Bavaria he was honoured with the confidence of the crown prince, the present King of Bavaria. From 1805 to 1815 his time was passed chiefly in Bavaria and on his own estates in Holstein. Though he took great interest in the political changes of that time he meddled very little with them. His literary activity commenced soon after his return from Italy, but his first publication appeared in 1811—'Erläuterungen einiger artistischen Bemerkungen in der Abhandlung des Herrn Hofraths Jacobs über den Reichthum der Griechen an Plastischen Kunstwerken.' This was followed by other essays on various departments of art, and among them a work entitled 'Sammlung für Kunst und Historie,' at Hamburg, in 1816, 2 vols. 8vo.

In 1815 he revisited Italy, and commenced in Florence the researches for his principal work, the 'Italienische Forschungen,' of which the three volumes were published in two portions in a later period of his life. In Rome he found Overbeck leading the German artists into a new or rather old sphere of art, of which a conventional sentimentality is the principal feature, and which forcibly impressed Rumohr. In 1827 appeared at Berlin the first and second volumes of the 'Italian Researches' ('Italienische Forschungen') a critical work on the history of art, and compiled exclusively from the original archives and documents in various buildings at Florence; in this work Rumohr clears up many obscurities and corrects several errors in Vasari. In 1828 he paid a third visit to Italy, when he was consulted in the purchases for the new picture-gallery which was then being established at Berlin, and he acted as Cicerone to the present King of Prussia in Florence, when crown-prince. He was employed by the prince in several purchases, and upon his return to Germany was engaged with others in the selection and arrangement of the objects of art in the Museum. In 1831 Rumohr published the third and last volume of his 'Italienische Forschungen,' and various literary works now followed in rapid succession and on various subjects. In 1832 appeared 'König's Geist der Kochkunst,' at Stuttgart; 'Deutsche Denkwürdigkeiten,' at Berlin; 'Drei Reisen nach Italien,' at Leipzig; and the first volume of his 'Novellen,' at Munich. In 1834, 'S ule der Höflichkeit für Alt und Jung,' at Stuttgart; and in the Leipzig pocket-book Urania, 'Der Letzte Surillo,' a poem, said to be his best production of that class. In 1835, in Munich, the second volume of 'Novellen;' and in Lübeck, 'Kynalopekomachia, der Hundefuchsstreit, mit Bildern von Speckter,' Dog and Fox Fight, a satirical poem on the times. Erwin Speckter was a young artist of Hamburg, much admired by Rumohr: he died in that year. [SPECKTER, ERWIN, P. C. S.] In the same year also appeared the History of the Royal Collection of Prints at Copenhagen, drawn up by Rumohr and the keeper of the collection, Professor Thiele; and at Leipzig, Contributions towards the History of Art and the greater completeness of the Works of Bartsch and Brulliot. [BARTSCH, BRULLIOT.] In 1836 he publishd at Leipzig two works on wood-engraving, 'Hans Holbein der Jüngere in seinem Verhältniss zum Deutschen Formschnittwesen,' and an answer to a censure of this work, 'Auf Veranlassung und Erwiedrung von Einwürfen eines Sachkundigen gegen die Schrift Hans Holbein,' &c. These were followed, in 1837, by a treatise, 'Zur Geschichte und Theorie der Formschneidekunst.'

In 1837 he made a fourth journey into Italy, but he did not go beyond Milan, and this tour was made rather with political views than as an artist. He published an account of his journey at Lübeck in 1838, under the following title:—'Reise durch die östlichen Bundesstaaten in die Lombardei und zurück über die Schweiz und den obern Rhein, in besonderer Beziehung auf Völkerkunde, Landbau, und Staatswirthschaft;' to which he published some additions in the following year—'Historische Beilege,' &c. He had previously published a work of the same kind on Tuscany, namely,—'Ueber die Besitzlosigkeit der Colonen im Neuern Toscana, aus den Urkunden;' Hamburg, 1830. In 1841, however, after a fifth visit to Italy, to Venice, in the previous year, he returned to his more genial subject the history of art, and published in Leipzig an inquiry into the invention attributed to Finiguerra of printing with engraved plates on damped paper—'Untersuchung, dass Maso di Finiguerra Erfinder des Handgriffs sey gestochene Metallplatten auf genetztes Papier abzudrucken.' This was his last labour in the history of art, and his last poetical production of this class was 'Raphaels Lehr-und-Wander-Jahre.'

In 1841 he purchased a house in Lübeck intending to end his days there, and he fitted it up according to his own fancy. The winter of 1842 he spent in Berlin, and he was then attacked with water on the chest: he returned in the spring to Lübeck, where his physician recommended him to visit the baths in Bohemia; he accordingly set out, but being too ill to proceed he remained at Dresden, where he died of apoplexy July 25, 1843.

Rumohr's last literary production was a preface to 'Kampf Demokratischer und Aristokratischer Principien zu Anfang des sechszehnten Jahrhunderts,' Lübeck, 1843. It is a translation from three papers presented to him by Professor Altmeyer of Brussels. His 'Italienische Forschungen' will remain as a monument of his judgment and industry when probably nearly all his other works are forgotten. It is one of the best documentary works in the literature of art, and at the same time abounds in critical and theoretical reflections; it is likewise a work of great interest, though there may be different opinions about the correctness of Rumohr's theories. The two first volumes are upon modern art in Italy generally, from its origin to its decline in the 16th century, which is distributed under fourteen distinct heads; many errors in Vasari are corrected; much obscurity of the 12th, 13th, 14th, and 15th centuries is cleared up by authentic documents; and various false notions concerning the development of art are dissipated by critical reflections: the third volume is under two heads only, which treat chiefly of Raphael, and the architecture of the middle ages.

(*Kunstblatt*, 1844.)

RUNCIMAN, ALEXANDER, an eminent Scotch painter, was born at Edinburgh in 1736. His father was an architect, and Runciman was brought up to the arts from his childhood, and he made coloured sketches in the fields as early as his twelfth year. At the age of fourteen he was placed in the studio of John and Robert Norris, John being considered in his day a famous landscape painter. When only nineteen years of age he set up as an independent landscape painter in Edinburgh, but it seems the people of Edinburgh, like those of many other places, though lavish of their praises were very cautious in their purchases, and Runciman had the gratification of dwelling on his own pictures, for they were left on his hands. This state of affairs continued for about five years, when in 1760 he took to historical painting, and though he had more ability for this line of art his fortune seems to have been very little if at all improved. In 1766 he visited Italy, and at Rome made the acquaintance of Fuseli. Their tastes in art were very similar: both were absorbed by what is termed the sublime, and both were alike wild and extravagant in their execution. 'They were,' says Allan Cunningham, 'rivals in that unbridled licence of imagination, which introduced an air of inspired madness and considerate extravagance into the sublimest and sternest subjects on which they employed their pencils.' Runciman remained five years in Rome, and when he returned home he carried from Fuseli a letter of introduction to a friend, in which was the following passage: 'I send this by the hands of Runciman, whom I am sure you will like: he is one of the best of us here.'

He arrived at Edinburgh in 1771, a fortunate time for him, for Pavillion, the director of the new academy of the arts which had been established at Edinburgh in 1760, had very recently died, and Runciman was appointed to fill his place, with a salary of 120*l.* per annum, then a sufficient income in Scotland. He was further fortunate in finding two generous patrons in Sir J. Clerk, of Pennycuick, and Robert Alexander, an Edinburgh merchant. The former employed him on a great work at Pennycuick, suggested by himself, neither more nor less than the decoration of the hall of that place with twelve great compositions from Macpherson's Ossian, which at that time was believed in Scotland to be authentic. The subjects are—Ossian singing to Malvina; the Valour of Oscar; the Death of Oscar; the Death of Agandecca; the Hunting of Catholda; the Finding of Corban Cargloss; Golchossa mourning over Lamderg; Oina Morval; Cormac attacking the Spirit of the Waters; the Death of Cormac; Scandinavian Wizards making Incantations; and Fingal engaging the Spirit of Loda. The picture of Agandecca is reckoned the best. One cannot but respect the enthusiasm of the painter of such a series as this, but as works of art they are extravagant in treatment and in composition, and incorrect in design. While engaged in this work Runciman painted also 'The Ascension' on the ceiling over the altar of the episcopal chapel in the Cowgate of Edinburgh. He painted also King Lear; Andromeda; Nausicaa and her Nymphs surprised at the Water Side by Ulysses; and Agrippina landing with the Ashes of Germanicus.

Runciman visited London in 1772 and exhibited some pictures there, but all that is remembered of him, says Allan Cunningham, is that he took up his quarters with the widow of Hogarth, who was in those days reduced to let lodgings for subsistance. Runciman died suddenly before his own door in West Nicholson-street, October 21, 1785, in his forty-ninth year. He had contracted an illness while painting the Pennicuick cupola, being forced to lie much on his back, and to this is attributed the shortness of his life.

Runciman's best works are his sketches; his faults are only multiplied in his pictures. The most offensive of his peculiarities of design is his huge length and uniformity of limb, the glaring defect also of the works of Fuseli; he was also invariably extravagant in his attitudes, and was conventional, mannered, and unnatural in his draperies. Indeed, to the precise and academic taste, the works of Runciman will, says Allan Cunningham, be ranked among the crude attempts of arrogant imbecility. In execution he was least defective in his colouring, but in composition he was ever ready, and his invention was grand and fertile. There are a few etchings by him from his own designs: the best is considered 'Sigismunda weeping over the Heart of Tancred.' He is said to have been lively and agreeable in conversation; Hume, Robertson, Lord Kames, and Monboddo were among his associates.

(Cunningham, *Lives of Eminent British Painters*, &c.)

RUSSELL, WILLIAM, LL.D., the son of poor parents, was born in the county of Selkirk in 1741, and educated, very imperfectly, in the country and in Edinburgh. He served a regular apprenticeship as a printer, and, while working as a journeyman in Edinburgh, edited a collection of modern poetry and executed a translation of a tragedy of Crebillon, which was submitted to Garrick, but rejected. In 1767 he went to London to seek his fortune, but for some time found nothing better than a place as corrector of the press for Strachan the printer. While so employed, he contributed to periodicals, and published unsuccessfully several poetical and other volumes, among which was a History of America. In 1779 appeared the first two volumes of the meritorious and popular compilation by which he is now known, 'The History of Modern Europe.' The third, fourth, and fifth volumes, bringing down the narrative to 1763, were published in 1784. In 1787 he married, and took up his residence on a farm in Dumfries-shire, where he spent the remainder of his life. In 1793 he published the first two volumes of a 'History of Ancient Europe;' and he had also begun, in terms of an engagement with Mr. Cadell, to compose a History of England from the Accession of George III. These unfinished works, however, as well as several tragedies and comedies, were stopped by his death, which took place on the 25th of December, 1793.

RYLAND, WILLIAM WYNNE, one of the best English engravers of the eighteenth century, was born in London in 1732. He was apprenticed to S. F. Ravenet, a French engraver, who was settled in England. After the completion of his term of apprenticeship he went to Paris, and studied there chiefly under Le Bas for five years. He did not confine himself however to engraving, but applied himself also much to drawing, under Boucher, a painter of eminence, and after whom he engraved, besides some others, an excellent plate of Jupiter and Leda; he also etched some plates after Oudry while at Paris, illustrating the fables of Fontaine.

Soon after his return to England Ryland was appointed engraver to George III., with a pension of 200*l.* per annum. He engraved two portraits of George III. after Ramsay, and one of Queen Charlotte holding the Princess Royal on her lap after Cotes; it was one of Cotes's principal works. 'It is greatly to be lamented,' says Strutt, in his Dictionary of Engravers, 'that Ryland's engagements in the mercantile line as a printseller, deprived him of so considerable and so precious a part of his time, and prevented his pursuing the arts with that alacrity the strength of his genius required, which seemed formed for great and extensive exertions. The works which he has left behind him abundantly prove that he had sufficient knowledge and judgment to have carried them to great perfection.' These last words refer to the sad event which abruptly put an end to Ryland's labours and life at once, but which Strutt, who must have known Ryland well, does not more particularly allude to. He was executed for forgery in the prime of life, July 28th, 1783.

Strutt, whose work was published only two years after Ryland's execution, seems to have abstained, from delicacy probably towards his widow, from a more particular notice of the disgraceful termination to his brother engraver's otherwise successful career. As this case is not known and as Ryland persisted in his innocence to the last, it may be here briefly related as the facts appeared on the trial:—Ryland appears to have been a discounter of bills, and that he was otherwise commercially engaged as a printseller, has been already noticed. He had once failed in this business, but he afterwards honourably repaid all his creditors in full, though not bound to do so by law. In the spring of 1783 the agents and servants of the East India Company in London appear to have detected several forgeries of their bills, and suspicion attached to Ryland, apparently in more than one case. He received however intimation of his approaching arrest, and by the advice of his wife concealed himself, whereupon the East India Company immediately offered a reward for his detection. He had concealed himself in the house of a shoemaker at Stepney, under the name of Jackson: having however given the man some shoes to mend, the shoemaker discovered the real name of his lodger, and gave notice to the police. When Ryland found that he was discovered, in a fit of despair he attempted to cut his throat: the attempt failed, but he seriously injured himself. A true bill was found against him by the grand jury, June 5, and he was tried at the Old Bailey July 26, before Judge Buller. The specific charge against him was for forging and uttering knowing to be forged a bill of 210*l.* on the East India Company. The case for the prosecution was this: Ryland had uttered or negotiated two bills on the East India Company for 210*l.* and of the same date, the original bill in May, 1782, and the forged bill in November of the same year. The two bills were so much alike that none could swear which was the true bill, except by two small holes through which a needle and thread had passed; and, what was of chief importance, the paper-maker gave evidence to the paper of the other bill being made after the date of the bill. The first bill had been fairly negotiated, but the party from whom Ryland asserted that he had received the second, a Mr. Hagglestone, was nowhere to be found. These facts and the circumstances of his flight and attempted suicide were urged against him by the council for the prosecution. Ryland made his own defence, but owing to the soreness of his throat from his recent attempt, it was written, and read by the clerk of the court: the following were its concluding words, as reported in the Morning Herald of July 28:—'The prosecution has endeavoured to substantiate my guilt by my flight; but let them figure to themselves the fears, the dread, the horrors, of an honest mind, pursued by officers of justice, to take my life, if I could not prove my innocence; let them reflect on the tears, the entreaties and prayers of a fond, loving, and beloved wife, and then conclude my guilt from my flight. They have also presumed to drag into evidence my attempt on my own life. I confess the attempt with shame, horror, and remorse; driven into a state of insanity, how then will they, how can they, torture insanity into a proof of my guilt!

'Two bills, one a good one, one a bad one, have been attempted to be proved in my possession: supposing that to be true, can any man say either is the forged one? Mr. Holt, from his infirmity, may easily make a mistake; and where then is any forgery? I cannot think that the court and jury will sacrifice my life to presumption, and, where there is a possibility of innocence, take it away on groundless suspicions.'

He was found guilty of uttering the bill knowing it to be forged.

After the verdict was pronounced, which he bore with the greatest calmness, he merely observed—'I dare not challenge the justness of my verdict: I am, however, conscious of my innocence; and I hope that my life will be preserved by the royal clemency of my sovereign, on whose bounty it has long subsisted.' He heard his sentence pronounced without being moved, and retired from the court as if unconcerned in the proceedings. He was executed at Tyburn on the 29th of August, about twelve o'clock, in company with five other convicts, four of whom were executed for highway robbery and burglary, the fifth for forgery. The execution was delayed some time by a violent thunder-storm. A white handkerchief was bandaged round the cap of Ryland. The curiosity of the public was so great to witness the execution of this unfortunate man, that as much as ten guineas were paid for a single room which commanded a view of the barbarous and disgusting exhibition: so great a concourse of people had not met for a similar purpose since the execution of Dr. Dodd six years previously.

Character and probability were much in favour of Ryland's innocence, though circumstantial evidence was against him. He was wealthy, according to his own account. Besides the salary of 200*l.* per annum as engraver to the king, he exercised a very lucrative profession, possessed a great stock in trade, and had a large property in the Liverpool water-works. And many witnesses bore testimony to his high character. Strutt says of him—'He was a man respected and beloved by all that were well acquainted with him; for few men in private life ever possessed more amiable qualities than he did. He was a tender husband, a kind father, and a sincere friend. He frequently straitened his own circumstances to alleviate the sorrows of others; for his heart was always open to receive the solicitations of distress.'

Ryland introduced chalk-engraving (lines composed of dots) into England, and in the latter years of his life devoted himself exclusively to engraving in this style, in which he had no equal, but chiefly, except a few drawings by the old masters, after the works of Angelica Kauffmann, a circumstance which is to be regretted, as the works of that lady have little to recommend them to the lovers of art. Ryland engraved twenty-four prints after Angelica, and one of these, Edgar and Elfrida, a large plate, which was finished by Sharp for the benefit of Mrs. Ryland, is one of his principal works. King John ratifying the Magna Charta, a large plate after Mortimer and in a similar style, was generally bought as a companion to it. Ryland left this plate also unfinished, and it was completed by Bartolozzi, likewise for the benefit of his widow. It is his best plate in this style; but the best of these chalk engravings have a very inferior effect to etchings, or line and mezzotinto engravings: the style was, however, like the insipid drawings of Cipriani, much in vogue in the time of Ryland and Bartolozzi.

As an etcher, or where the needle and graver are combined, Ryland was also excellent. The prints which he engraved in France were executed in this style, and Watelet terms his execution in this style most picturesque, and adds that one would suppose his etchings to be the work of a painter. The chalk manner is exactly in its place in imitations of chalk drawings, of which there are no better examples than Ryland's own in the fine Collection of Drawings published by Charles Rogers, as the two of St. Francis, after Carlo Maratti and Guercino, and many others. This work is entitled, 'A Collection of Prints in imitation of Drawings; to which are annexed Lives of their Authors, with explanatory and critical Notes, by Charles Rogers,' &c. 2 vols. fol. London, 1778; containing in all 116 prints, some of considerable size, of which 57 are by Ryland, besides the admirable mezzotinto portrait of Mr. Rogers at the commencement of the work. Among these imitations of drawings, in various styles, the following are particularly worthy of note, either for their excellence or on account of their authors:—The Last Supper, by Leonardo Da Vinci; two drawings, by Michael Angelo, one of which is a sketch of an attempt to restore the Torso of Apollonius; God the Father blessing the Creation, three young men naked, and another drawing, by Raphael; St. Francis, by Carlo Maratti; part of the Cupola of Parma, by Correggio; Jupiter delivering Bacchus to Mercury, by Lodovico Carracci; Joseph and Jesus, and Caricatures of Painters, by Albani; Lot and his Daughters, St. Dominic presenting St. Catherine of Siena to the Madonna del Rosario, St. Francis, St. Cecilia, and Chastity burning the Arms of Cupid, by Guercino; Bathsheba, by Boucher; Jacob persuaded to send Benjamin with his Brethren into Egypt, by Vandyck; and a Monk in his Cell, by Rembrandt. Besides these there are drawings by the following masters:—Baccio Bandinelli, Battista Franco, Perino del Vaga, Bernini, Andrea Sacchi, Steffano della Bella, Borgognone, Filippo Lauri, Cav. Ghezzi, J. Palma the younger, Parmigiano, Cam. Procaccini, An. Carracci, Schidone, F. Mola, Eliz. Sirani, L. Cambiaso, S. Rosa, Jan Breughel, and P. Wouverman. He engraved a few other prints also after P. da Cortona, Vandyck, Cipriani, Boucher, Ramsay, J. B. Oudry, and others.

RYSBRACK, MICHAEL. The date of the birth and the birth-place of this distinguished Flemish sculptor are differently given by different writers, but Charles Rogers, the publisher of the 'Century of Drawings,' &c., who was well acquainted with him, states that he was born at Antwerp June 24, 1693. He was the son of the landscape-painter Pieter Rysbrack, who, after he had given his son some instruction in design, placed him in 1706 with the sculptor Michael Vander Vorst, with whom he remained six years.

In 1720 Rysbrack came to London and distinguished himself for his small models in clay. He was the first sculptor who was extensively employed in England, and he spread a general taste for the art over the country by his fine monumental works. His progress in London was at first slow, and his first work which attracted notice was a bust of the Earl of Nottingham. He was for some time engaged by Gibbs, who contracted with the original parties for monuments, for which he, on his part, contracted with Rysbrack, greatly to his own advantage. For instance, Gibbs received from Lord Oxford 100*l*. each for the statues on Prior's monument in the south transept (or Poet's Corner) in Westminster Abbey, while he gave Rysbrack only 35*l*. each. Rysbrack, however, soon became aware of his own merit, and shook off all dependence on Gibbs. Engagements crowded upon him, and there was not a work of sculpture of any consequence undertaken in England that was not entrusted to Rysbrack. When men found, says Walpole, that there was a man capable of furnishing statues, the taste for monuments was much improved and greatly spread. 'Our monuments until Rysbrack's time,' says the same writer, 'had depended more on masonry and marbles than statuary. Gothic tombs owed their chief grandeur to rich canopies, fretwork, and abundance of small niches and trifling figures. Bishops in cumbent attitudes and cross-legged Templars admitted no grace nor required any. In the reigns of Queen Elizabeth and King James I. a single figure reclining at length on the elbow in robes or serjeant's gown, was commonly overwhelmed and surrounded by diminutive pillars and obelisks of various marbles; and if particularly sumptuous, of alabaster gilt. Gibbs, in the Duke of Newcastle's monument in the Abbey, seems to have had an eye to that kind of tasteless expense. From the reign of Charles I. altar tombs or mural tablets, with cherubims and flaming urns, generally satisfied the piety of families. Bird indeed bestowed busts and bas-reliefs on those he decorated, but Sir Cloudesley Shovel's, and other monuments by him, made men of taste dread such honours.' 'The abilities of Rysbrack,' continues Walpole, 'taught the age to depend on statuary for its best ornaments, and though he was too fond of pyramids for back-grounds, his figures are well disposed, simple, and great.'

Rysbrack, unlike most of the artists of his age, studied exclusively nature and the antique; he had no respect for the works of his great countryman Rubens, and those of Rembrandt he would not look at, in which he was of course actuated wholly by the feelings of a sculptor, form and character being his exclusive study. He was a most industrious sculptor: fine works are to be seen by him in many parts of England, but especially in Westminster Abbey, at Blenheim, at Stourhead, and at Bristol. In few sculptors' workshops has there been more activity than there was in those of Rysbrack in Vere-street, Oxford-street, during about forty years of the half century that he dwelt in England, though latterly, through his successful rivals Scheemaker and Roubiliac, his occupation sensibly diminished.

Rysbrack's busts were very numerous, and include those of many distinguished characters. His first great public work was the bronze equestrian statue of William III., which was made for the city of Bristol, and erected in Queen's Square in 1733. Scheemaker also competed for this statue, and his model was thought so excellent that he was presented with 50*l*., though it was rejected for the design of Rysbrack, who received 3000*l*. for it; Walpole says 1800*l*. The monument to Sir Isaac Newton in Westminster Abbey, which was exposed in 1731, was executed by Rysbrack from a design by Kent. One to Mrs. Oldfield, in the cloisters, put up the year before, was apparently his first independent monument in the Abbey.

In 1735 he finished a colossal statue of George II. for the parade of Greenwich Hospital, at the expense of Sir John Jennings, the then governor: it was cut out of a single block of marble weighing eleven tons, which had been captured from the French by Sir George Rooke. He made also the statue of George II., which was in the old Royal Exchange, London. He obtained however most reputation by his monument to John Duke of Marlborough and his duchess in the chapel at Blenheim. They are represented with their two sons, who died young, supported by Fame and History; in the lower part is a basso-rilievo of the surrender of Marshal Tallard. At Blenheim also, in the library, is a beautiful marble statue of Queen Anne; it was erected in 1726.

In Christ Church College, Oxford, there is a statue of Locke by Rysbrack, which is in the 'Oxford Guide' erroneously attributed to Roubiliac; it was made in 1757. This college contains also some busts of distinguished members by Rysbrack. Besides what have been already mentioned there are the following monuments by him in Wesminster Abbey:—to Admiral Vernon, and Richard Kane, governor of Minorca, in the north transept; to James Earl Stanhope, in the north aisle; to John Friend, M.D.; and John Methuen, in the south aisle; to Sir Godfrey Kneller, in the nave; to John Gay, Nicholas Rowe, John Milton, and Ben Jonson, in the south transept or Poet's Corner; and one to Daniel Pulteney in the cloisters.

The erection of Shakspere's monument by Scheemaker, in Westminster Abbey, is said to have greatly obscured the reputation of Rysbrack; but it only stimulated the industrious sculptor to make still greater exertions. This dread rivalry was the cause of his making his Palladio, Inigo Jones, and Fiammingo, at Chiswick; and subsequently his masterpiece, the Hercules, at Stourhead, the seat of Sir Richard Colt Hoare. This Hercules is a species of historical figure, a record of the English gymnasium or amphitheatre for boxing, an institution which was put an end to, as the principal gymnasiasts generally ended their career by being hanged. The figure was made for Henry Hoare, Esq., who built a temple expressly for it. It is of the heroic size, seven feet high, and cost Rysbrack three years' labour. The head is copied from the Farnese Hercules; the limbs are taken from several different English frequenters of this gymnastic amphitheatre. 'The arms,' says Walpolo, 'were Broughton's; the breast a celebrated coachman's, a bruiser; and the legs were those of Ellis the painter, a great frequenter of that gymnasium.'

There are many other statues by Rysbrack—as a Flora, from the antique, at Stourhead; the Duke of Somerset, at Cambridge, presented by his daughters the Marchioness of Granby and Lady Guernsey; Charles Duke of Somerset and his Duchess, in Salisbury Cathedral; Sir Hans Sloane, in the botanical garden at Chelsea, and his bust in the British Museum; Lady Folkestone, Coleshill, Berks; Lady Besborough, Derby; the second, third, and fourth Dukes of Beaufort, at Badminton, Gloucestershire; Dr. Radcliffe, at Oxford; John Willet, Esq., Merly House, Dorsetshire; a statue of Charles I., for George Selwyn; and the following busts:—Pope, Gibbs, Sir Robert Walpole, Duke and Duchess of Argyle, Lord Bolingbroke, Wooton the landscape-painter, Martin Folkes, Ben Jonson, Butler, Milton, Cromwell, the heads in the Hermitage at Richmond, and those of the English Worthies in the Elysian Fields at Stowe: he made also a good bust of himself. Notwithstanding his industry, Rysbrack was not rich, and when at the age of seventy he gave up his profession, he made a sale of his principal effects—his remaining works and his collections of prints, pictures, drawings, marbles, casts, models, &c., including a large collection of his own drawings, which, says Walpole, were conceived and executed in the true taste of the great Italian masters. The chief amusement of the last three years of his life was in making such drawings in bistre, and many were sold at the two auctions of his effects which took place after his death. He died January 8, 1770.

(Rogers, *Collection of Prints in imitation of Drawings*, &c.; *English Connoisseur;* Walpole, *Anecdotes of Painting*, &c.; Smith, *Nollekens and his Times*, &c.)

RYSO'STEUS, a fossil genus of Reptiles from the bone-bed of the lias on the banks of the Severn. (Owen.)

INDEX TO THE LETTER R.

VOLUME II.

SABI'NEA (named by De Candolle, in honour of Joseph Sabine, F.R.S., long time Secretary to the Horticultural Society of London), a genus of plants belonging to the natural order Leguminosae. It has a cup-shaped campanulate calyx with a truncate nearly entire border, a papilionaceous corolla, with an obtuse keel, rather shorter than the vexillum. The stamens are diadelphous, the free one and four others half as short as the rest. The style is filiform, glabrous, and rolled up with the stamens. The legume stipitate, compressed, linear, elongated, many-seeded, mucronate by the style. The species are unarmed West Indian shrubs, with abruptly pinnated leaves, smooth mucronated leaflets, and one-flowered fascicled pedicels.

S. Florida has its leaflets in 8 or 9 pairs, elliptic oblong, the flowers rising before the leaves. It is native of the American Islands of St. John, Krabben Island, and St. Thomas. The violet flowers are considered poisonous.

S. dubia has its leaflets in 10-12 pairs, elliptic oblong, the flowers appearing after the leaves. It is native of Martinique and Porto Rico.

(Lindley, *Flora Medica*; Don, *Gardener's Dictionary*.)

SABI'NUS, MASSU'RIUS, a Roman jurist, a pupil of Aleius Capito, and the contemporary of Cocceius Nerva. He lived under Tiberius, but he did not die in that reign, as is generally asserted, if the passage of Gaius (ii. 218) refers to Massurius Sabinus, of which indeed there can be no doubt. Massurius Sabinus gave the name of Sabiniani to the school which was opposed to that of the Proculiani. [ROMAN LAW, P. C., p. 118.] He was near fifty years of age when he was raised to the equestrian rank, and was in such poor circumstances that he was mainly supported by the fees of his pupils (Pompon. *Dig.* i., tit. 2, s. 2, § 47). It is said of him by Pomponius 'publicè primus respondit' (he was the first who gave opinions publicly). Though the word is respondit in the common editions of the Digest, the passage is quoted thus by Zimmern: 'publicè primus scripsit.' It follows however from what Pomponius says, that with Massurius began the practice of giving written opinions, which were sealed with the seal of the jurist (responsa signata).

The reputation of Sabinus is shown by the publicity of his name, which was equivalent to the title of a great lawyer (Persius, *Sat.* v. 90; Arrian, *Epictetus*, iv. 3); and by giving his name to the school, of which his master Capito was considered to be the real founder. This is evidence of the greater originality and more enlarged views of Sabinus. His great work was 'Libri III. Juris Civilis,' from which there is no direct excerpt in the Digest, though there are various fragments in Gellius, iv. 1; v. 13, &c.). The system followed in this work had a great influence on subsequent writers. Pomponius wrote at least 36 Libri ad Sabinum, Paulus 47, and Ulpian 51. The arrangement of the matter of the work of Sabinus is made out conjecturally by J. Gothofredus from the labours of his three commentators (Zimmern, p. 313, n. 7).

The other works of Sabinus were—'Commentarii de Indigenis,' 'Libri Memorialium,' 'Fasti,' books of Responsa, a Commentary Ad Edictum, and 'Libri ad Vitellium.'

(Zimmern, *Geschichte des Röm. Privatrechts;* Index to A. Gellius, ed. Gronov. 1706; Grotius, *Vitae Jurisconsultorum.*)

SABINUS, CAELIUS, M., a Roman jurist, and the successor of Cassius Longinus. He was made Consul Designatus by Otho (Tacit. *Hist.* i. 77); and his consulship belongs to the year A.D. 69, in which Otho died and Vitellius became Emperor. He belongs chiefly to the time of Vespasian. He wrote a work, Ad Edictum Aedilium Curulium, which is cited by other jurists (Gaius, Dig. 20, tit. 1, s. 20): but there is no excerpt from Caelius Sabinus in the Digest. He also wrote on other subjects (Dig. 35, tit. 1, s. 72, § 7). The extract in Gellius (vii. 4, Pileatos servos, &c.) is probably from the treatise Ad Edictum, for Gellius in another passage (iv. 2) speaks of Sabinus as the author of such a treatise, though he calls him in this passage, according to some MSS., Caecilius. He is often cited in the Digest simply by the name of Sabinus or Caelius (Dig. 20, tit. 1, s. 14, 17, 65). Caelius Sabinus is cited by Gaius in his Institutiones (iii. 70, 141).

SACCHOLACTIC ACID. [CHEMISTRY—*Mucid Acid*, P. C. S.]

SADI. [SAADI, P. C.]

SAFETY-VALVE. [STEAM-ENGINE, P. C.]

SAGENA'RIA, a fossil genus of plants belonging to the coal-formation. (Brongniart.) It includes species ranked by Sternberg as Lepidodendron.

SAGENO'CRINUS, a genus of fossil crinoidea. (Austin.) From the Silurian strata of Dudley.

SAGENO'PTERIS, a genus of fossil ferns. (Presl.) It occurs in the shales of the Yorkshire coast, and includes part of Glossopteris. (Brong.)

SAGRA. [EUPODA, P. C. S.]

SAHARUNPOOR, a district in the province of Delhi and presidency of Bengal, in Hindustan, formerly extended northward from the city of Delhi as far as the Sewalic Mountains, which form the northern limit of the immense valley through which the Ganges flows. The Ganges and Jumna, north of the city of Delhi, run nearly parallel to each other at a distance of about 53 miles, and the district of Saharunpoor occupied the doab, or flat space, between them. The soil of the whole of this space is exceedingly fertile, producing grain of all kinds, sugar, cotton, indigo, and tobacco. Madajee Sindia obtained possession of it in 1788, and it was held by the Mahrattas till 1803, when it was given up to the British. In 1804 it was formed into two divisions, Northern Saharunpoor and Southern Saharunpoor, with a civil establishment for each; but this arrangement has been since modified, and the greater part of Southern Saharunpoor has been included in the district of Merut. Of the district of Merut, or Southern Saharunpoor as it is still sometimes called, the chief town is Merut, in 28° 53′ N. lat., 77° 45′ E. long. Of the district of Northern Saharunpoor the chief town is Saharunpoor, in 29° 53′ N. lat., 77° 33′ E. long., and about 90 miles, direct distance, N. by E. from the city of Delhi.

(Hamilton, *East India Gazetteer*.)

SAILORS. [SHIPS, P. C.; SEAMEN, P. C. S.]

SAILS. Accidents involving serious loss of life and property are continually occurring from the inability of ordinary sails to resist violent gusts of wind. The sails of a ship [SAIL, P. C., p. 318] usually consist of several widths of canvass sewn together side by side, with the seams arranged vertically; and the principal strength which they have to resist tearing arises from cords sewn along the edges of the sail. If these give way, or if from any accident a tear is commenced, the rupture frequently extends at once along the whole length of the canvass, and the sail is thereby, in nautical phrase, 'torn into ribands.' To provide a remedy for this formidable evil, Mr. Archibald Trail patented in 1844 an improved kind of sail, which, from their fitness to resist violent winds, he terms *Storm-sails.* These are made in the usual manner, and subsequently strengthened by sewing to their surface a number of canvass bands about an inch broad, with cords woven in them, such bands being secured at their ends into the bolt-ropes, or cords forming the boundaries of the sail, and carried diagonally across the surface of the sail at an angle of 45° with the seams, and at a distance of about three feet from each other. Two sets of bands are used, crossing the sail in opposite directions, one set being attached on each side of the canvass; and the distance of the bands from each other is so adjusted with reference to the width of the canvass, that the points where the two sets cross each other may fall upon the vertical seams. By this simple contrivance the strain is so equalized as to render tearing less probable than with an ordinary sail; while, if any injury be inflicted, the rent is confined within the narrow limits of one of the diamond-shaped compartments into which the sail is divided by the protecting bands. In ordinary cases it is proposed to apply these bands not to new sails, but to such as are half-worn; and the patentee states that such sails may be thus protected at one-fifth of their original cost. Many nautical men, after putting the invention to the test of experience, have testified their hearty approval; and it is suggested by some that its adoption may lead to the use of lighter canvass than would be safe with sails of the ordinary make, by which means the sails may be more easily handled, a circumstance of great importance in a gale of wind, while a saving may be effected in the cost of the canvass sufficient to make the extra cost of the protection only one-ninth instead of one-fifth.

SAINT GEORGE, SAINT MARY, SAINT MICHAEL, Islands. [George, St.; Mary, St.; Michael, St.; P. C. S.]

SAINT HILAIRE, GEOFFROY ETIENNE, was born at Etampes, in France, the 15th of April, 1772. He was destined by his father for the church, and received the appointment to a canonry in his twelfth year. He was, however, sent to the college of Navarre, where Brisson lectured on experimental philosophy, and under him he acquired a taste for the natural sciences. He first devoted himself to mineralogy, in which Haüy was his preceptor. On coming to Paris he studied very diligently, and in 1793 was appointed subcurator and demonstrator of the Natural History cabinet, in the Jardin des Plantes. He was subsequently appointed professor of zoology, and lectured conjointly with Cuvier. In 1798 he accompanied the French expedition to Egypt. He was made a member of the Institute in 1807, and appointed professor of anatomy and physiology in the faculty of sciences in 1809. He was sent by the government on a scientific expedition to Portugal in 1808. In 1815 he was returned as a member of the Chamber of Deputies for his native city of Etampes. He died at Paris in July, 1844.

Geoffroy St. Hilaire was one of the most assiduous cultivators and ablest expounders of what is called philosophical anatomy. The idea on which this department of science was founded had been developed in Germany, and successfully applied to zoology and comparative anatomy during the latter part of the last century. It was however, amongst the rich collections of the Jardin des Plantes, and the activity and zeal of such men as Cuvier, Lamarck, Temminck, Desmarest, Valenciennes, Serres, and St. Hilaire, that it received its most important applications and its greatest development. The fundamental idea of this system is the unity of the composition of the various parts of an organic body, and that this unity is capable of expression in a few simple laws. What, in fact, might be predicated in botany of the various parts of a plant by a knowledge of the structure of the leaf, might, in the same way, be predicated of the structure of animals by a knowledge of certain fundamental parts of their organisation. Thus Geoffroy St. Hilaire, amongst his other labours, established the fact that the numerous bones of the head of the fish, and by consequence those of the higher animals, were transformations of the simple vertebræ; and that the laws of development which applied to the one applied to the other.

These views, equally applicable to every organ of the body, were generally developed by St. Hilaire in a work published in 1818, entitled 'Philosophie Anatomique,' which was illustrated with an Atlas of folio plates. He also published several papers and essays on the principles of philosophical anatomy. In 1828 a small work appeared as an introduction to the lectures delivered on natural history in the Jardin des Plantes on the principle of the unity of organic composition, with the title, 'Sur le Principe de l'Unité de Composition Organique,' 8vo. Although previous to the time of Geoffroy the morphological idea lying at the basis of philosophical anatomy had been applied to the explanation of the phenomena of abnormal forms of animals, just as it had been of plants, yet the subject had not been fully developed. In 1822 he published his great work on the anatomical philosophy of human monsters. These beings, which had formerly been regarded as mere unaccountable freaks of nature, were now found to be the result of the action of fixed laws, and their various forms susceptible of the strictest classification. This work contained a new classification of monsters, with a description of and comparison of their different forms, and a history of the various causes supposed to produce them. It also comprehended some new views on the nutrition of the fœtus, and an accurate estimate of the phenomena attending the development of the sexual organs in the male and female fœtus, in which the author pointed out the fact of a unity of composition in the reproductive apparatus of the two sexes in birds and mammalia.

A list of the papers which St. Hilaire contributed to the various departments of natural history would be very long. There is scarcely a branch of zoology to which he did not successfully apply the great principles of his anatomical philosophy; and few indeed are the works on natural history published during the present century that do not bear testimony to the great influence he has exerted. At the same time the views held by the school, at the head of which Geoffroy St. Hilaire may be justly placed, have led to great controversy. Fully as Cuvier was impressed with the importance of Geoffroy's works, he opposed him in some of his conclusions, and this led to a controversy which developed, in these inquiries, a theological element: Geoffroy opposed the doctrine of final causes, as being in opposition to the theory of a unity of composition. In his philosophy he states that he knows nothing of 'intentions' or 'objects' in creation; and when Cuvier spoke of the part an animal 'had to play' in nature, he rejoined that there were 'no animals which had a part to play in nature.' This controversy has recently, in this country, assumed a popular form; but it is obvious, from the use made by the advocates of the doctrine of final causes, of the principles of the 'Anatomical Philosophy,' that this theory is not incompatible with their views.

A complete edition of the works of Geoffroy has been published in France under the title of 'Professional Studies of a Naturalist,' in 42 volumes. Etienne Geoffroy St. Hilaire has left behind him a son, Isidore, now Professor of Zoology at Bordeaux, and formerly at Paris, who has successfully cultivated the favourite science of his father. A complete list of Etienne Geoffroy St. Hilaire's works will be found in Callisen's 'Medicinisches-Schriftsteller Lexicon.'

SALE'NIA, a genus of Echinodermata, remarkably prolific of species in the lower part of the cretaceous system. (Agassiz.)

SALES, DE, FRANCIS, SAINT, was born at the Castle of Sales, near Annecy, in Savoy, on 21st August, 1567. His parents, the Count and Countess de Sales, are described as having adorned a noble birth and elevated station by a life of the strictest piety. The early years of Francis, their eldest son, were spent in acquiring the rudiments of learning at the colleges of La Roche and Annecy. The more effectually to pursue his studies he was, in 1578, sent to Paris, and placed under the care of the Jesuits. He soon became a proficient in rhetoric and philosophy, and, at the same time, he did not neglect those arts which are calculated to adorn an intercourse with society, though in doing so he appears rather to have obeyed the wishes of his father than to have followed his natural inclination. He remained in Paris till 1584, when he was sent to Padua to study civil law under Guy Pancirolli. At Padua he formed an acquaintance, which afterwards increased into friendship, with the Jesuit Antonio Possevino, under whose spiritual direction he placed himself. His success at Padua exceeded the expectation of his friends, and, at the age of twenty-four, he left that university with a high reputation for learning and piety. He afterwards spent some time in Italy, and made a pilgrimage to Notre Dame of Loretto. On his return to his native country, he found that his father had obtained for him from the Duke of Savoy the appointment of Counsellor in the Senate of Chambery, and was desirous of uniting him with a rich heiress, whose fortune would enable him to support the title which he was to inherit. The mind of Francis, for a long time directed towards theological pursuits, had however gradually acquired a disposition which could only be satisfied by an entire devotion to them, and he was anxious to enter the church. But accustomed from his childhood to yield obedience to his father's wishes, he feared to make him acquainted with his desire. In this difficulty he consulted a relation, Louis de Sales, who was canon of the church of Geneva, and through his mediation the Count de Sales was induced to abandon his favourite project, and allowed his son to devote himself to the ministry of the church. After receiving the first orders he was permitted by the bishop to preach. The greatest success attended his first efforts in pulpit oratory. He possessed, indeed, all the qualities calculated to gain the attention of his hearers; a voice powerful and pleasing, an animated and persuasive action, an earnestness which gave evidence that he was himself deeply convinced of the truths he was advocating, were heightened in their effect by a strikingly handsome person and a mild and modest demeanour. In the fulfilment of his pastoral duties he was not less remarkable: he united the most untiring activity in visiting his flock and in relieving the wants of the sick and poor with an unaffected solicitude and evangelical patience. 'His fair, mild countenance,' says a French writer, the bias of whose writings is most unfavourable to the priesthood, 'with rather a childish expression, pleased at first sight; little children in their nurses' arms could not take their eyes off him. He was equally delighted with them, and would exclaim, as he fondly caressed them—here is my little family. The children ran after him, and the mothers followed them.' (Michelet, *Priests, Women, and Families*, translated by Cocks.)

We must now present him exercising these qualities in a larger sphere, and applying them to the conversion of those who differed from him in religious faith. The better to understand the peculiarly difficult nature of the mission with which he was intrusted it will be necessary to give some account of the scene of his labours. The city of Geneva had long renounced the authority of its bishop and that of the Duke of Savoy; it was an independent republic and the stronghold of the Calvinistic party. It had become possessed of the antient duchy of Chablais [GENEVA, P. C.], together with the territories of Gex, Terni, and Gaillard; coincident with these changes was a substitution among the inhabitants of the creed of Calvin for the faith of Rome. In 1590, Charles Emmanuel Duke of Savoy, had wrested from the Genevese this antient portion of his duchy, and his first care was to attempt to bring back the inhabitants to their former religion. (De Thou, *Hist. Univ.*, l. xcix.) For this purpose he applied to the titular bishop of Geneva, Claude de Granier, to send missionaries over the conquered country. Francis de Sales, and his relation Louis, the canon of Geneva, were among the first to undertake an enterprise in the prosecution of which much opposition and some personal danger were to be apprehended.

On the 9th September, 1594, the two missionaries arrived at the frontiers of Chablais, where they dismissed their servants and equipages and determined to travel on foot, in order more nearly to conform to the example of the Apostles. The town of Tonon, the capital of the Chablais [CHABLAIS, P. C.], which contained only seven Roman Catholics, was the first place in which they exercised their mission; the fruit of it may be judged of from the fact that on the Christmas-eve of 1597 eight hundred persons were admitted to the communion of the Eucharist in the church of St. Hippolytus in that town. But the most important object Francis had in view was the conversion of the leaders of the Calvinistic party. To effect it he first solicited an interview with Theodore de Beza [BEZA, P. C.], who was then fast sinking under the weight of age and infirmities; several conferences took place between them at Geneva, and the result of them is very differently related according to the religious persuasion of the narrators. Whatever change however took place in the mind of Beza through his intercourse with Francis, it is certain that it was accompanied by no public profession.* Michelet, without however citing his authority, remarks, that the Roman Catholic missionary added to his spiritual inducements the weight of temporal advantages, and made him an offer of a pension of 4000 crowns if be would conform to his church.

On the return of Francis to Annecy, in 1596, he was appointed coadjutor to Claude de Granier, the bishop of Geneva, with the title of Bishop of Nicopolis 'in partibus infidelium;' this dignity he for a long time refused to accept, and only yielded on the earnest solicitation of the pope, Innocent IX.

In 1602 he visited the court of France for the purpose of obtaining permission from the king, Henry IV., to pursue his missionary labours in the territory of Gex, which had been given up to France by a treaty of peace concluded between Henry and the Duke of Savoy. A course of Lent sermons, which he preached in the chapel of the Louvre, is said to have created considerable sensation, and to have become the means of recalling several of the most influential of the Calvinistic nobility to a belief in their antient faith. The king, desirous of retaining him in France, made him the offer of the first bishopric which might become vacant and the immediate enjoyment of a considerable pension. These offers however he declined, declaring that his chief wish was to be permitted to live and die among those whom Providence had intrusted to his care.

On his return to his native country, after a residence of nine months in Paris, he was, by the death of De Granier, a prelate who appears to have been worthy of so illustrious a colleague, appointed to the bishopric of Geneva. He prepared himself by a close retirement of twenty days at the castle of Sales, for his consecration to this important office. In this retirement he framed for himself a rule of life by which he was in future to be guided; the details of it are given with elaborate minuteness by his biographers, and are so far interesting as they show that he considered the faithful fulfilment of duty of greater importance in the sight of God than the exercise of bodily mortifications or the display of an ascetic austerity. On the 8th December, 1602, he was consecrated bishop of Geneva. His first care was to introduce a uniformity of usage among the clergy of his diocese, and to reform various abuses which time had gradually introduced; these measures he chiefly effected by the issue of mandates in which the most judicious advice was conveyed in the language of Christian charity. In short, he showed himself a worthy disciple of St. Charles Borromeo, whom he professed to take as his model in the discharge of his episcopal duties. [BORROMEO, ST. CHARLES, P. C.] In 1605 he devoted himself effectually to the task of reforming the monasteries in his diocese. The following year be preached during Lent at Dijon, in France, where he was again successful in making several converts from Calvinism. On this occasion, likewise, he refused the repeated offers of advancement from the French king, while at the time he gave proof of his consistency in declining the proffered honour of a cardinal's hat from the pope, Leo XI. In 1607 he was applied to by the reigning pontiff, Paul V., to express his opinions on the extent of the efficacy of Divine Grace on the free will of man. It was principally on this question that the Dominicans and Jesuits were divided [BLACK FRIARS, P. C.; JESUITS, P. C.]. His answer is expressed with so much caution that it is difficult to discover from it his real sentiments; they are, however, more clearly shown in his other writings, especially in his treatise on the Love of God. About this period was published his 'Introduction to a Religious Life,' a book which still maintains a merited popularity. The style, though perhaps too full of metaphor for modern taste, is devoid of affectation, and breathes throughout the genuine spirit of Christian simplicity. 'Everywhere we find, as it were, living fountains springing up, flowers after flowers, rivulets meandering as in a lovely spring morning after a shower. It might be said that he amuses himself too much with flowerets; that his nosegay is no longer such as shepherdesses gather, but such as would suit a flower-girl: as his Philothea would say, he takes them all and takes too many; there are some colours among them badly matched, and have a strange effect.' (Michelet, *transl.* by Cocks.)

In 1609, Jean Pierre Camus was named Bishop of Bellay, and he wrote to the Bishop of Geneva to request him to perform the ceremony of his consecration. Between these two remarkable men, whose habits and dispositions were very dissimilar, the closest friendship ever after subsisted. It is to Camus that we are indebted for a most interesting work, 'The Spirit of St. Francis de Sales,' which, more than any other, developes the private excellences of the saint. The following year Francis founded a religious order for females, called the Order of the Visitation, and placed it under the superintendence of a pious lady, Madame de Chantal, sister of the Archbishop of Bourges, with whom he had become acquainted on his visit to Dijon. The fervent admiration of this lady for the qualities of the Bishop of Geneva, to whom she had intrusted the guidance of her spiritual life, the letters of perhaps too impassioned piety which she so frequently addressed him, and which may be seen in the collection published at Paris in 1660, have been malignly dwelt upon by some writers who have hazarded to attack the church in the persons of such men as Bossuet, Fenelon, and De Sales. The increasing infirmities of the Bishop of Geneva, arising from the constant application to the duties of his office, obliged him, in 1618, to seek for the assistance of a coadjutor bishop; and, at the suggestion of Cardinal Frederick Borromeo, his brother, John Francis de Sales, was consecrated to that charge with the title of Bishop of Chalcedon. In 1619 he accompanied to Paris the Cardinal of Savoy, to whom the mission had been intrusted of soliciting for the Prince of Piedmont the hand of Christina, sister of Louis XIII. On the marriage of this princess he was appointed her almoner, an office which he at first declined, and only accepted on condition that it should not be allowed to interfere with the discharge of his other duties. But the undiminished energy of such a spirit was too overpowering for so feeble a frame. In 1622 he foresaw his approaching end, and prepared himself for it by severer mortifications and a closer communion with God. He preached for the last time on the Christmas-eve of that year; the next day he was seized with a paralytic attack, under which he succumbed on the 28th December, 1622. He was buried in the Church of the Visitation at Lyon, but his remains were afterwards transferred to Annecy. In 1665, his memory was canonized by the pope, Alexander VII., who appointed the 29th of January, the day on which his body was conveyed to Annecy, as his festival in the Roman calendar.

* 'La veine poëtique de Bèze,' says Bayle, 'n'étoit point tellement tarie l'an 1597, qu'il ne fit de vers pleins de feu contre les Jésuites, à l'occasion du bruit que l'on fit courir qu'il étoit mort, et qu'avant d'expirer il avoit fait profession de la foi Romaine.' (Bayle, *Dict. Hist.*, art. 'Bèze.' See also Jacob Spon, *Hist. de Genève*, liv. 3, p. 313. Utrecht, 1685.)

The claims of St. Francis de Sales as a devoted servant of the church have never been disputed, though they have been differently esteemed and represented. Humility and zeal were the two prominent virtues by which he was distinguished; the former taught him to forget himself, the latter to be ever mindful of the wants of others. Between him and Fenelon a closer comparison might perhaps be made than with any other name celebrated in the annals of sanctity. They possessed in common noble birth and a high station, with the tone and manner which these advantages are calculated to produce; the same talent in captivating the attention and winning the sympathies of those among whom they laboured; in the discharge of their pastoral duties they were alike successful, and by the use of the same means, a careful adaptation of advice to the temper and disposition of the advised. While, however, it must be admitted that Fenelon was superior to De Sales as a writer and a theologian, he was probably inferior to him in genuine disinterestedness and the practice of self-denial: he loved rather to labour among the rich and great than, like De Sales, to abandon the court in order to mingle with the crowd of the poor and suffering. Fenelon, it is true, performed with zeal those essential duties of a pastor when he was banished to his diocese; De Sales was continually separating himself from the court in order to perform them. [FENELON, P.C.]

The most known of his writings, which are not very numerous, have been noticed in this article; the best edition of them is that of Paris, 1641, 2 vols. folio.

His principal biographers are his nephew, Charles Augustus De Sales, Henri De Maupas, Bishop of Evreux, Le Père Goulu, Mad. De Bussy Rabutin, and the Jansenist Binet. See also Alban Butler's *Lives of the Saints*; Moreri, *Dict. Historique*; and the *Biographie Universelle*.

SA'MARA. [SIMBIRSK, P. C.]

SAMEN or SEMIEN MOUNTAINS. [ABYSSINIA, P. C. S.]

SAMENESS or IDENTITY. This term is generally applied to what is called personal identity, or the sameness of a living and intellectual being, as man. There are some remarks on this subject by Bishop Butler in his 'Dissertation of Personal Identity.'

The sameness of objects which are external to a man consists in the perception of a variety of circumstances as to these external objects and at different times, from which arises an opinion of sameness in a certain sense. A man sees a tree growing in a certain place, and he may have remembered it for many years. But in the mean time the tree may have increased a hundred-fold in bulk, and therefore its substance is not the same as that of the tree which he first saw there; and besides this, there may not be a single particle of matter the same in the tree at two remote times of his observation. The tree then is by the supposition not the same in a strict sense; but for all practical purpose it is called and is the same. A man can no more believe that all the change that the tree has undergone belongs to some other tree, than he can believe that the growth of his own body belongs to another being than himself.

When sameness is applied to a living and intellectual being, it includes both the matter of the body and something else. A man can have no doubt that his body is not entirely the same in youth, in middle age, and in old age. He can view his body as he does any thing external, and he has a belief that it undergoes changes, and is therefore not the same in the strict sense. But yet he considers himself the same person; person here including something besides the body, whether that something be a property of an organized body or something else. 'The ground of the doubt,' says Locke, as quoted by Butler, 'whether the same person be the same substance, is said to be this—that the consciousness of our own existence, in youth and in old age, or in any two successive moments, is not the same individual action, *i. e.* not the same consciousness, but different successive consciousnesses.' Butler's answer to this vague talk is sufficient. But more may be said. How is consciousness of our personal identity, or if this form of words be objected to as a way of begging the question, how is the thing called 'consciousness of our existence' at any two successive moments shown to be 'not the same consciousness, but different successive consciousnesses?' What are successive moments in a man's consciousness of his own existence? It is more consistent with that consciousness which we have, to say that the consciousness of our personal identity is one and the same always; and if it is allowed that there is in man a belief that he is at different times the same being, in some sense which he cannot otherwise explain than that he feels that he is, it follows that this consciousness of personal identity is one indivisible thing, that it is as continuous as the personal identity itself which it presupposes. Nor is it any objection that a man's faculties may be temporarily impaired by illness, and he may lose the exercise of his reason and recover it; or an accident may befall him, which for a time renders his bodily and mental powers inactive, though he may finally recover both. On his recovery he does not doubt that he is the same person that he was before his illness or accident, and therefore his consciousness is one. The division of consciousness by successive times, corresponding to certain external signs, and the making that supposed succession a ground of objection to personal identity, is to confound things that are unlike, and to apply a measure to both that does not fit one of the things.

'Every person,' says Butler, 'is conscious that he is now the same person or self he was, as far back as his remembrance reaches.' This cannot be disputed. It is a bare fact that this consciousness does exist in us. We have not this consciousness from the time of our birth up to manhood and old age: it does not go further back in its particular manifestations than our remembrance does; yet we doubt not that we, the man, were once that particular child of our parents rather than any other child of these parents or of any other parents. But this belief is derived from evidence: our consciousness in its particular manifestations does not extend farther back than our remembrance. Yet remembrance does not make personal identity, as Butler remarks: 'Consciousness of personal identity presupposes, and therefore cannot constitute personal identity, any more than knowledge, in any other case, can constitute truth, which it presupposes.'

The remembrance of particular things is a very different thing from the consciousness of personal identity. When this consciousness begins, when it ends, how its activity is suspended, we know not: but we know that it is a law of our nature that, in the ordinary state of a man's bodily and intellectual faculties, he has a perception, whatever it may be and however it may arise, whenever he reviews certain acts of his own or events in his life, that he the perceiver, and no other person, is the agent or is the person affected by these events. The remembrance then merely makes the consciousness of personal identity active; and this consciousness of personal identity is not constituted of the remembrance of different acts or events, but is as permanent and uninterrupted as the animal life itself, which nobody supposes to consist of successive lives, but to be one life. And it should be observed that the question of personal identity only arises upon the suggestion of the memory. Every man all through his life feels that he is in some sense or in some way, which he expresses by that term 'is.' And he is never without this present consciousness of existence. There is therefore an uninterrupted consciousness, which, as already observed, is one, and not divisible by a measure of time. The remembrance of any particular act of a man's own or of any event in his own life, is a present act, and the consciousness of such present act of memory accompanies the act of memory as it does any other present act; and as the act of memory is retrospective, so is the consciousness of that act of memory retrospective, but only incidentally, according to the nature of the act. The memory merely directs the conscious agent to an act of the kind called passed, and to a passed act of such a kind that the consciousness of sameness in the agent is inseparable from the notion of the act that is remembered.

SA'MOLUS, a genus of plants belonging to the natural order Primulaceae. It has a 5-parted calyx, its tube adhering to the lower half of the germen. The corolla is salver-shaped with a short tube and a 5-parted limb with interposed converging scales. The stamens, 5 in number, are inserted near to the base of the tube of the corolla. The capsules half covered by the persistent calyx, many-seeded, and opening with reflexed teeth.

S. valerandi, brook-weed, has obovate or roundish blunt leaves, the upper leaves blunt with a point, the racemes many-flowered ultimately elongated, the capsules subglobose. It is found in damp, watery places in Great Britain.

(Lindley, *Vegetable Kingdom*; Burnett, *Outlines of Botany*; Babington, *Man. Brit. Bot.*)

SAND-EEL. [AMMODYTES, P. C. S.]

SANDARAC. [THUJA, P. C.]

SA'PIUM, a genus of plants belonging to the natural order Euphorbiaceae. The flowers are monœcious, the calyx bifid and 3-toothed, the style trifid, and the capsule 3-coccous.

S. aucuparium is a tree 30 feet high, with oblong lanceolate, acute, serrate leaves, with an intermixture of larger and rounder teeth, coriaceous, shining, and about 6 inches long. The spikes are terminal, lax, thick, green, and about 6 inches long; the male above, the female below. The calyx of both of a dark purple. It is native of the woods of Carthagena.

S. indicum has alternate stalked leaves somewhat pendulous, broad, lanceolate, serrate, smooth, and of a deep shining green, from 2 to 4 inches long, and broad in proportion; the stipules small and deciduous. The calyx is 3-parted, the divisions somewhat cordate and expanding. The filaments longer than the calyx, the anthers ovate. The female flowers at the base of the catkins often solitary. The capsule or nut is globular, of the size of a nutmeg, 3-celled, 6-valved, thick, and exceedingly hard. The seed is solitary, affixed by the apex, oval, and smooth. The juice of this species, like the former, is highly poisonous.

(Lindley, *Flora Medica;* Burnett, *Outlines of Bot.*)

SAPONA'RIA (from the Latin '*sapo*,' 'soap,' so called because the bruised leaves are said to produce a lather like soap when agitated in water), a genus of plants belonging to the natural order Caryophylleae. It has a 5-toothed calyx naked at the base, 5 clawed petals, 10 stamens, and 2 styles. The capsules are 1-celled, opening at the top with 4 valves. The seeds are globular or reniform.

S. officinalis, soap-wort, has fasciculate corymbose flowers, a cylindrical slightly downy calyx, retuse crowned petals, elliptic lanceolate-ribbed leaves, and an erect stem. It is native of many parts of Europe by the road-side, and in Britain in meadows by river-sides and under hedges. The flowers are either single or double, of a rose or pink colour, seldom white. The double variety of this plant is esteemed as an ornament to the flower-border, but is found inconvenient, unless planted in pots, from the spreading nature of the roots, which extend under-ground like those of couch.

S. vaccaria has panicled flowers, pyramidsl, smooth, fine-angled calyxes; membranaceous acute bracteas; ovate, lanceolate, sessile leaves. It is native among corn in many parts of Europe, particularly Germany, Switzerland, and the Levant. It derives its specific name from the idea that it increases the lacteal secretion in cows.

All the species of this genus are very ornamental. *S. ocymoides* is one of the most elegant plants we have in our gardens, and is well adapted for rock-work. It has red or pink flowers and is a trailing plant. A mixture of sand, loam, and peat is best adapted for all the species, and they are easily propagated by dividing at the root, or by seeds; the young cuttings taking root freely under a hand-glass.

(Don, *Gardener's Dict.;* Babington, *Man. Brit. Bot.;* Burnett, *Outlines of Botany.*)

SARCOSTE'MMA (from σάρξ, flesh, and στέμμα, a crown, in reference to the leaflets of the inner corolla being fleshy), a genus of plants belonging to the natural order Asclepiadaceae. It has a rotate corolla, a coronet of double stamens; the outer one cup-shaped or annular crenated, the inner one 5-leaved, higher than the outer one, with fleshy segments. The stigma is nearly blunt. The follicles slender and smooth, and the seeds comose. The species of the genus are natives of New Holland and the East Indies as well as of South America.

S. glaucum, glaucous-leaved Sarcostemma, is a lactescent smooth twining herbaceous plant. The leaves are lanceolate, short-stalked, slightly revolute, membranous, being with the midrib prominent on the under side, which is glaucous. The umbels are many-flowered between the petioles, on very long peduncles. The segments of the calyx lanceolate, ciliated, and acuminate. The corolla white with a large fleshy annular wavy coronet; the segments of the corolla fringed and spreading.

S. Brownii is a twining glabrous plant, with lanceolate acuminated glabrous leaves, and interpetiolar umbels; the pedicels, calyxes, and corolla downy; the segments of the corolla ovate, bluntish, concave, and glabrous inside; the outer corona an entire narrow ring; the leaflets of the inner corona ovate, bluntish, and glabrous a little higher than the gynostegium. The lower leaves are large and ovate oblong, the upper ones becoming gradually narrower with revolute edges; painted with white on the nerves, and greenish blue on the veins. The calyx is small; the pollen masses oblong, a little curved, hairy, hanging by short pedicels rising from blackish glands These plants thrive best in a mixture of peat, sand, and vegetable mould; cuttings of them root readily in sand, if placed in heat without any hand-glass over them. They should have little or no water when in a dormant state, particularly the tuberous-rooted kind.

(Don, *Gardener's Dictionary;* Lindley, *Flora Medica.*)

SAROTHAMNUS, a genus of plants belonging to the natural order Leguminosae. It has a 2-lipped calyx, the upper lip with 2, the lower with 3 teeth. The style is long, curved, thickened upwards, and channelled within. The stigma terminal, capitate, and small. The pod is flat.

S. scoparius, broom. The only British species is a well-known plant, with a stem 2 or 3 feet high, angular, and glabrous. The leaves are ternate or simple, the leaflets obovate. The flowers are axillary, solitary, or in pairs, shortly stalked, large, and of a bright yellow. The pods are dark brown, hairy at the edges, and have numerous seeds. It is found on dry hills and heaths.

(Babington, *Man. Brit. Bot.*)

SATURNI'NUS, a name of several Roman jurists.

Claudius Saturninus is the name of a Roman to whom two Rescripts of Antoninus Pius are addressed (Dig. 20, tit. 3, s. 1, § 2; 50, tit. 7, s. 4); and a person of the same name was praetor under the Divi Fratres, the successors of Pius. He is generally considered to be the author of a work in a single book, 'De Poenis Paganorum,' which in the Florentine Index is attributed to Venuleius Saturninus. There is a single excerpt from this work in the Digest (48, tit. 19, s. 16).

Quintus Saturninus is cited in the Digest (34, tit. 2, s. 19, § 7) as the author of a work 'Ad Edictum,' in ten books at least. Whether he is the same as Claudius or Venuleius, or is a third person, is uncertain.

Venuleius Saturninus, a Roman jurist, who is simply called Venuleius in the Florentine Index, though in the titles of the Excerpts in the Digest he is often called Venuleius Saturninus. Lampridius (*Alexander Severus*, 68) says that he lived under Alexander Severus; but there is some doubt about his period. His writings mentioned in the Florentine Index are, Ten Books of Actiones, Six of Interdicta, Four on the Office of Proconsul, Three on Publica Judicia, and Nineteen of Stipulationes. The book De Poenis Paganorum has been already mentioned.

(Grotius, *Vitae Jurisconsultorum;* Zimmern, *Geschichte des Röm. Privatrechts*, pp. 354, 379.)

SAURI'CHTHYS, a fossil genus of fishes from Axmouth. (Agassiz.)

SAUROCE'PHALUS, a fossil genus of fishes from the chalk series of England and America. (Harlan.)

SAU'RODON, a genus of fossil fishes from the chalk series of England and America. (Hays.)

SAURO'PSIS, a genus of fossil fishes from the oolite and lias strata. (Agassiz.)

SAURUREA, a genus of composite plants belonging to the sub-order Cynarocephaleae. The florets are all hermaphrodite and tubular. The anthers with ciliated setae at the base. The involucre is imbricated and unarmed, the receptacle scaly. The pappus in 2 rows, the outer oue consisting of short, rough bristles, the inner one feathery.

S. alpina has a stem from 3 to 12 inches high, erect, downy, and simple, terminating in a small corymb of heads with pinkish florets and purple anthers. The leaves are nearly glabrous above, cottony beneath, the lower ones ovate lanceolate, the upper ones sessile lanceolate, all distantly-toothed, the heads in a dense corymb, the involucre sub-cylindrical, with depressed hairy scales. This is the only British species: it is found in alpine situations.

(Babington, *Man. Brit. Bot.*)

SAUSMAREZ, DE, JAMES, ADMIRAL LORD, was born at St. Peter Port, in the island of Guernsey, on the 11th of March, 1757. His family name, De Sausmarez, bears evidence of Norman extraction, and mention of it is to be found in the earliest records of the Channel Islands. From early youth he manifested a strong inclination for the naval service, in which several members of his family had distinguished themselves. When thirteen years of age he entered as a midshipman on board the Montreal, and afterwards served in the Winchelsea and Levant frigates, under the respective commands of Admirals Goodall and Thompson. On his return to England in 1775, he joined the Bristol, of 50 guns, under the command of Sir Peter Parker, and was present at the attack on Charlestown, in America: the courage he displayed on that occasion was rewarded by promotion to the rank of lieutenant. From that period to 1779 he was actively employed in America, and was enabled to render considerable service to the expedition under Lord Cornwallis. He was afterwards appointed second-lieutenant to the Fortitude, Admiral Sir Hydo Parker, and he was in the engagement which took place with the Dutch fleet under Admiral Zoutman, off the Dogger Bank, on the 5th of August, 1781. His behaviour in this action, in which he was wounded, caused him to be promoted to the rank of commander, and appointed to the Tisiphone fire-ship.

In the month of December following, Captain Saumarez was ordered to place himself under the command of Admiral Kempenfelt who, with twelve sail of the line, was commissioned to intercept the French fleet, commanded by the Comte de Guichen, and which was destined to assist tho Comte de Grasse in the capture of Jamaica. To inform Sir Samuel Hood, the English Admiral in the West Indies, of the sailing of this fleet, became a matter of the highest importance, and Captain Sausmarez was selected for this service. While at Jamaica he was enabled, through an exchange, to obtain post rank and the command of the Russell, a ship of the line. In this ship he greatly distinguished himself at the memorable battle of the 12th April, 1782. [HOOD, P. C.; RODNEY, P. C.] On the 29th July following, he returned in the Russell to England, and from thence to his native island, where he enjoyed in the society of his friends the peace which was soon after proclaimed. On the breaking out of the war of the French revolution (January 1793), Captain Sausmarez was appointed to the command of the Crescent, of 36 guns. In this frigate he captured off Cherbourg, after a warm action of nearly two hours and a half, the French frigate 'la Réunion,' of 36 guns, but of larger size and with a much more numerous crew. Though the French had 120 men killed and wounded, the Crescent had only one man wounded, and that by the recoil of a gun. The success of this action procured for him the honour of knighthood, and he was presented by the merchants of London with a valuable piece of plate. In the month of November following, Sir James Sausmarez was placed under the orders of Admiral Macbride, who gave him the command of a squadron consisting of the Crescent and Druid frigates, a brig, and a cutter, destined to assist the attempts made by the French Royalists to join the rising of the Vendéans. On the 5th of June, 1794, an opportunity was presented him of displaying his skill and intrepidity: whilo proceeding from Plymouth to Guernsey with the Crescent, Druid, and Eurydice frigates, he was attacked by a French squadron of more than double his force. A running-fight ensued, the brunt of which was borne by the Crescent and the Druid, to cover tho escape of the Eurydice, which, on account of its inferior sailing, ran considerable risk of being captured. This object being effected, he closed in with the enemy in the Crescent, and thus enabled the Druid also to take refuge into the roads of Guernsey. He effected the escape of the Crescent by his cool intrepidity and a perfect knowledge of the difficult coast in which he was engaged. As soon as the other ships were secure, he bore up as if to run the Crescent on the rocks to avoid being taken, ordering the pilot, a native of Guernsey, to steer through a narrow passage between the rocks, which had never before been attempted by a ship of her size; he thus reached in safety an anchorage where he was enabled to defy every effort of the enemy to take his vessel.

In March, 1795, Sir James was appointed to the Orion, 74, and placed under the orders of Lord Bridport, in which ship he opened the memorable battle which took place on the 23rd of Juno. In 1797 the Orion was attached to the squadron sent to reinforce the fleet of Sir John Jervis off Cape St. Vincent, and took a prominent part in the glorious engagement with the Spanish fleet. [JERVIS, JOHN, P. C.] He was after this battle employed till the end of April, 1798, in the blockade of Cadiz, and then selected by Lord St. Vincent to join the squadron under Sir Horatio Nelson destined to watch the operations of the French armament at Toulon. At the important victory of the Nile, Sir James, as senior captain, was the second in command, and his ship was the third which entered into action; the courage which ho displayed on this occasion was enhanced by his humano endeavours to save the remnants of the unfortunate crew of the Orient. [NELSON, P. C.]. A wound which he received during the action was so severe as to prevent his leaving the Orion, after the victory, to present his congratulations to Lord Nelson. Shortly after his return to England, on the 14th of February, 1799, Sir James Sausmarez was promoted to one of the vacant colonelcies of marines, and to the command of the Cæsar, of 84 guns, in which he sailed with a detachment of the Channel fleet, under Sir Alan Gardner, to bring home from Lisbon the ships captured at the battle of the Nile. During the winters of 1799 and 1800 he was entrusted with the command of the squadron which was commissioned to watch the French fleet in Brest. The difficulties to be encountered in this arduous service, particularly during the winter season, were very great; and it is no small praise to the careful vigilance of this commander to remark, that, during the whole time he remained on that station, not a single vessel sailed from or entered tho port of Brest.

At the commencement of the year 1801, he was promoted to the rank of rear-admiral of the blue, and in the month of June following was appointed to the command of a squadron to watch the movements of the Spanish fleet at Cadiz. On this occasion he was created a baronet. On his arrival at Cadiz, information was given him that three French line-of-battle ships and a frigate were in the bay of Algeziras, and he immediately determined upon attacking them. The position of the French was one of great strength, defended by the batteries in the bay and fourteen large gun-boats. The action commenced on the morning of the 6th of July, in which he had the misfortune to lose the Hannibal, 74, which accidentally grounded, and, after a long and sanguinary engagement, Sir James found himself compelled to repair to Gibraltar. The failure of his first attempt on the French fleet did not discourage him. Expecting that the enemy's squadron at Cadiz would make use of the first opportunity which the weather might afford of rescuing the French ships at Algeziras, he hastened to put his vessels in a state of repair. This object was effected in a remarkably short space of time. On the 10th of July, a French and Spanish fleet, consisting, with the captured Hannibal, of ten sail of the line and four frigates, was seen steering for Algeziras, with a squadron of not more than half the strength of the enemy; the admiral determined to attack them, for the purpose of preventing their return to Cadiz, and, on the 12th, sailed out to meet them. The enemy formed their line-of-battle off Cabrita. Shortly after the commencement of the engagement two of the enemy's ships were discovered to be on fire, and about midnight blew up with a tremendous explosion. An accident which occurred at daylight to the Venerable, Captain Brenton, the disabled state of the English ships, and the sudden failing of the wind, prevented the admiral from attaining his object, which was to prevent the French and Spaniards re-entering Cadiz; they did so, however, with the loss of three sail of the line, and upwards of 3000 men, blown up, killed in action, and taken prisoners. An important result of this victory was the preservation of a large fleet of British merchantmen, which it was the object of the French to seize. A most unfounded imputation has been attempted to be cast on the military character of Sir James Sausmarez by a well-known modern French historian, who has asserted that, contrary to the rules of war, red-hot shot was used by him in that engagement, and that it was owing to these means that the burning of the Spanish ships occurred. This assertion has been indignantly refuted by the concurrent testimony of several who were present at the action. The admiral was rewarded by receiving the Order of the Bath. On the meeting of parliament, a motion made by the Earl St. Vincent, and seconded by Lord Nelson, was carried, in which Sir James received the thanks of the House for his gallant conduct in his late actions with the combined fleets of France and Spain. Lord Nelson remarked that 'a greater action was never fought.' The thanks and freedom of the City of London were also voted to him, with a valuable sword.

At the peace of Amiens, Sir James Sausmarez returned to England, and, in 1803, a pension of 1200*l.* a year was conferred upon him. On the renewal of hostilities, he was appointed to the naval command of Guernsey, which he held till 1806, when he was promoted to the rank of second in command of the Channel fleet under Earl St. Vincent. On the breaking out of the war with Russia, he was intrusted with the important command of the Baltic fleet. He there displayed considerable diplomatic talent, and, by his firm but conciliatory conduct, he was powerfully instrumental in detaching Russia from her alliance with France. The judicious policy he pursued towards the Northern States has been clearly detailed by his impartial biographer Sir John Ross in the work referred to at the end of this article. As an expression of gratitude for the services rendered by Sir James to the court of Sweden, the Grand Cross of the Military Order of the Sword was conferred upon him by the king, Charles XIII. His influence with the king of Sweden was also the chief means by which the neutrality of Sweden was preserved on the accession of Marshal Bernadotte as crown prince. [CHARLES XIV. of Sweden, P. C. S.]

The changes which took place in the aspect of affairs on the Continent having rendered the presence of a British fleet in the Baltic no longer necessary, Sir James was recalled, and his recal accompanied by a letter from the Lords Commissioners of the Admiralty, in which they expressed 'their marked approbation for the zeal, judgment, and ability evinced by him during his late command.'

At the peace of 1814 he was raised to the rank of full admiral; on the visit of the allied sovereigns to England he received their personal thanks for the services which he had rendered to their cause, and, having accompanied them to Oxford, he obtained the honorary degree of Doctor of Civil Law. In 1819 he was appointed rear-admiral, and in 1821 vice-admiral of Great Britain. In 1824 he was preferred to the command of port-admiral of Plymouth, which he held till 1827, and with it may be said to have closed his professional career. At the coronation of William IV. in 1831, he was raised to the peerage of the United Kingdom, with the title of Baron de Sausmarez, of Sausmarez, in the island of Guernsey—a reward which his long and important services had merited, and which it was expected he would have received at an earlier period. He was shortly afterwards made general of marines, and in 1834 an elder brother of the Trinity House. In the same year he was presented by the King of Sweden with a full-length portrait of himself, accompanied by a most gratifying letter, which showed that time had not effaced from the mind of tho king the services rendered by Lord de Sausmarez to Sweden. The remainder of his life was for the most part spent in the enjoyment of quiet and repose on his country estate in Guernsey. His religious zeal, charity, and affable demeanour had endeared him to his countrymen; and his death, which occurred on the 9th of October, 1836, was lamented as a public loss. He was succeeded in his title by his eldest son, James, the present peer, who is in holy orders.

(*Memoirs and Correspondence of Admiral Lord de Sausmarez*, by Sir John Ross, 2 vols. 8vo., London, 1838; *Biographical Sketch of Lord de Sausmarez*, appended to Dnncan's *Hist. of Guernsey*, London, 1841; James's *Naval History*, London, 1822.)

SAVINGS' BANKS. The 5 and 6 Wm. IV. c. 57, passed in September, 1835, extended the provisions of the 9 Geo. IV. c. 92, and of 3 Wm. IV. c. 14, to savings' banks in Scotland, and enabled existing banks to conform to the said acts by preparing and depositing their rules pursuant to these acts.

Military or Regimental Savings Banks were established by warrant dated October 11, 1843. Tho following is the amount of all sums deposited in them within the year onded March 31, 1844; of all sums withdrawn during the same period; and of the interest allowed upon such deposits; and also of the nnmber of depositors on the 31st of March, 1844:—

	£	*s.*	*d.*
Amount of sums deposited . .	15,069	8	2
Amount of deposits withdrawn	316	11	$5\frac{1}{4}$
Amount of interest allowed .	96	10	$1\frac{3}{4}$
Balance due by the public . .	14,849	1	$11\frac{1}{2}$

Number of depositors, 1890.

SUMMARY of the 577 SAVINGS BANKS in ENGLAND, SCOTLAND, WALES, and IRELAND, on the 20th Nov. 1844.

	ENGLAND.			SCOTLAND.			WALES.			IRELAND.			TOTAL.		
	Number of Depositors.	Amount of Investments.	Average Amount invested by each Depositor.	Number of Depositors.	Amount of Investments.	Average Amount invested by each Depositor.	Number of Depositors.	Amount of Investments.	Average Amount invested by each Depositor.	Number of Depositors.	Amount of Investments.	Average Amount invested by each Depositor.	Number of Depositors.	Amount of Investments.	Average Amount invested by each Depositor.
		£	£		£	£		£	£		£	£		£	£
Number and Amount of Individual Depositors in Savings Banks.	813,601	23,469,371	28	68,791	966,149	14	18,007	518,348	28	90,144	2,685,68	29	990,543	27,639,566	28
Number and Amount of Charitable Institutions in account with Savings Banks . . .	9,789	511,073	52	630	28,880	45	205	12,063	58	477	41,233	60	11,301	593,249	52
Number and Amount of Friendly Societies in account with Savings Banks	8,900	1,132,421	127	403	48,154	119	478	69,385	145	422	22,086	52	10,203	1,272,046	124
Total	832,290	25,112,865	306	69,824	1,043,183	14	18,690	599,796	32	91,243	2,749,107	30	1,012,047	29,504,861	29
Number and Amount of Friendly Societies in direct account with the Commissioners for the Reduction of the National Debt													428	1,770,775	. .
Gross Total													1,012,475	31,275,636	. .

On the 9th of August, 1844, the royal assent was given to an act (7 & 8 Vict. c. 83) entitled 'An Act to amend the Laws relating to Savings' Banks, and to the Purchase of Government Annuities through the Medium of Savings' Banks.'

The first clause of this act reduces, from and after the 20th of November, 1844, the interest of all moneys invested by the trustees of savings' banks in the national funds, to the rate of 3*l.* 5*s.* per cent.; and s. 2 declares that the maximum of interest to be allowed to depositors shall not exceed the rate of 3*l.* 0*s.* 10*d.* per cent.

From the same date every depositor, on making his first deposit (s. 3), shall sign a declaration as provided by previous acts, a copy of which is to be annexed to the deposit-book; and once in every year at least this book (s. 5) is to be produced at the institution for the purpose of examination.

Any actuary, cashier, or other person holding a situation at a savings' bank (s. 4), receiving deposits and not paying over the samo to the managers, is declared guilty of a misdemeanor; but no trustee or manager to be liable (s. 6) for any deficiency unless they have declared in writing their willingness to be so responsible, and this responsibility may be limited, except in cases of money actually and personally received by them.

When deposits are made in trust for another (s. 7), the sum is to be invested in the names of the trustees and the person on whose account the same is so invested; and repayment is not to be mado without the receipt of both, or of their trustees, executors, or agents appointed by power of attorney.

Annuities under the 3 and 4 Wm. IV. c. 14, are not to exceed (s. 8) the sum of 30*l.* in the whole, but separate annuities to that amount may be granted to a husband and wife; but instead of the charges nnder the former act, the charges are to be now (s. 9), for an annuity under 5*l.*, the sum of 5*s.*; 5*l.* and under 10*l.*, 10*s.*; 10*l.* and under 15*l.*, 15*s.*; 15*l.* and under 20*l.*, 20*s.*; 20*l.* and nnder 25*l.*, 25*s.*; 25*l.* and not exceeding 30*l.*, 30*s.*

Where deposits exclusive of interest do not exceed 50*l.* (s. 10), if a will or letters of administration are not produced within a month, the money may be paid to the widow, or the person entitled to the effects of the deceased; if a depositor be illegitimate and die intestate, the managers (s. 11), with the sanction of the barrister appointed to certify the rules, may pay the same to such persons as wonld be entitled to the same under the statute of distribution, if all the parties were legitimate; and where married women have made deposits it is lawful for the managers (s. 12) to repay such woman, unless the husband give notice to the contrary.

The time for issuing the half-yearly receipts for interest is extended (s. 13) to sixty days from and after the 20th of May and 20th of November; and the time for transmitting the annual statement is extended to nine weeks after the 20th of November in each year.

Any disputo between the depositors and the managers is to be settled (s. 14) by arbitration of the barrister appointed under the previous acts, whose award is to be exempt from stamp-duty; the barrister is empowered for this purpose

(s. 15) to inspect the books of the institution, and to examine witnesses on oath or affirmation: false evidence to be punished as perjury.

Bonds given as security under previous acts (9 Geo. IV. c. 92, and 3 & 4 Wm. IV. c. 14) are to be deposited with the Commissioners for the Reduction of the National Debt (s. 16), to be delivered up on the application of not less than two trustees and three managers when required to be cancelled. Every officer trusted with the receipt or custody of money (s. 17) is to give sufficient security, such security, when given by the treasurer, actuary, or any other officer receiving a salary, shall be by bond, which is exempted from stamp-duty.

The direction for depositing the rules of a savings' bank with the clerk of the peace (s. 18) is repealed; but two written or printed copies of them are to be transmitted (s. 19) to the barrister for his certificate, who, on approval, is to return one copy to the institution, and transmit the other to the commissioners.

Payments to the relations of intestate depositors (s. 20) are to be made to the next of kin by the law of Scotland, in the case of deposits in that country.

The act is declared (s. 21) to extend to societies for purchasing annuities as well as to savings' banks, and (s. 22) to Great Britain and Ireland, Berwick-upon-Tweed, Guernsey, Jersey, and Isle of Man.

SCABIO'SA (from *scabies*, the Latin word for scab or itch, which disorder the common sort is said to cure), a genus of plants belonging to the natural order Dipsaceæ. The inner calyx consists of 5 bristles, the outer one is membranous and plaited. The receptacles scaly. The fruit nearly cylindrical, with 8 excavations. The corollas 4 or 5-cleft with 4 stamens. The species are perennial or suffruticose herbs with variable leaves.

S. succisa, Devil's-bit, has an abrupt root appearing as if it were bitten off at the end, the heads of the flower and fruit nearly globose, the outer calyx hairy, 4-cleft, the lobes ovate acute, the inner calyx consisting of 5 bristles. The corolla is 4-cleft, the lower leaves toothed, the upper ones entire. The stem and both sides of the leaves hairy or glabrous. The flowers are dark violet or purple, varying to flesh-colour and white. It is native of Europe to the Caucasus, and is very plentiful in Britain. In cultivation the plant becomes much more branched than in a wild state. In days of superstition it was fabled that the devil, envying the good this plant might do mankind, bit away part of the root, and hence its common specific name. According to Bergen, the root is astringent, and an infusion of it is bitter but not unpleasant. A strong decoction of it was formerly an empirical secret for gonorrhœa. Linnæus says the dried leaves are used to dye wool yellow or green. It is usually regarded as the πυκνόκομον of Dioscorides, 4, 173, but Fraas thinks the plant of Dioscorides is the *S. Ambrosioides*.

S. Columbaria has the outer calyx membranous, plaited, and notched, the inner one of 5 nerveless bristles; the corolla 5-cleft, the radical leaves oblong, stalked, crenate, entire, or lyrate, the upper leaves pinnatifid, with linear segments. The flowers are purplish, the involucres narrow. It is native of Europe, Caucasus, and Siberia, and is very common on chalky soil in Britain. It is a very polymorphous plant.

S. grandiflora has a branched downy stem, with rather villous leaves, the radical ones oblong crenated, the cauline ones pinnatifid, with lanceolate, linear spreading segments. The corollas amply radiant, of a cream colour or white, with reddish tubes. The calyx consists of 5 reddish brown bristles. It is native of Barbary, Italy, and Sicily in fields, and is worth cultivation.

Many of the species of this genus are well adapted for garden borders. The perennial and herbaceous kinds are easily increased by seed or by dividing at the root. The seeds of the annual kinds only require to be sown in the open ground. The shrubby species are increased by cuttings under a hand-glass or by seed.

(Don, *Gardener's Dictionary*; Lindley, *Vegetable Kingdom*; Babington, *Manual of British Botany*.)

SCAE'VOLA, QU. CERVI'DIUS, a Roman jurist, probably gave responsa in the time of Antoninus Pius (Dig. 34, tit. 1, s. 13); but he was certainly employed by Marcus Antoninus as a legal adviser (J. Capitolinus, *Marcus*, 11; Dig. 36, tit. 1, s. 22); and in his writings he speaks of the constitutions of Marcus and Verus, in terms which imply that they were then alive. Septimius Severus, afterwards emperor, and Papinian, were pupils of Cervidius, who probably died in the reign of Severus (Spartianus, *Caracalla*, 8). His responsa were often very brief, expressed in a single word (Dig. 17, tit. 1, s. 62); but the facts on which the opinion is given are clearly stated. His style has been blamed as obscure; but there is evidence of his great capacity, and he left a name behind him.

There are excerpts in the Digest of Justinian from his forty books of Digesta, six books of Responsa, twenty Libri Quaestionum, four Libri Regularum, and one book Quaestionum publice tractatarum, probably a book of decided cases. The Florentine Index also mentions a single book 'De Quaestione Familiae,' but there is no excerpt from it in the Digest. There are 307 excerpts from the writings of Scaevola in the Digest.

Many of the Responsa of Scaevola appear twice, both in the Responsa and the Digesta. Conradi, followed by Blume, supposes that the Digesta contained a fuller statement of the matters which are briefly indicated in the Responsa, and were a kind of commentary to the Digesta. Puchta says that the passages in the Digesta do not show this; and that this relation is rather that of the Quaestiones to the Responsa: 'the Quaestiones were devoted to the complete examination and justification of the opinions.'

Claudius Tryphoninus and Paulus commented on Scaevola; and he is often cited by Marcianus, Tryphoninus, Ulpian, Paulus, and Modestinus. Scaevola commented on Julian and Ulpius Marcellus.

(Grotius, *Vitae Jurisconsultorum*; Puchta, *Cursus*, *&c.*, i. 453; Zimmern, *Geschichte des Röm. Privatrechts*, p. 361.)

SCALE, MUSICAL, of the GREEKS. [MUSIC, P.C., p. 24.]

SCAPHI'TES, a remarkable cephalopodous fossil genus, irregularly convoluted at both ends, and occurring in the lower parts of the cretaceous system. (Parkinson.)

SCA'PHODUS, a genus of fossil fishes from the oolite of Stonesfield. (Agassiz.)

SCARLET FEVER. [SCARLATINA, P. C.]

SCARLETT, RIGHT HON. SIR JAMES, LORD ABINGER, was a native of Jamaica, where his family was wealthy and of long standing. He was the second son of Robert Scarlett, Esq., and was born in or about the year 1769. His mother's name was Elizabeth Anglin. The family estates went, it may be presumed, to the eldest son; a third son, who also remained at home and followed the profession of the law there, became Sir William Anglin Scarlett and Chief Justice of Jamaica, and died not long ago after having held that office for many years; James was at an early age sent to England. Having finished his elementary education, he was, about the year 1786, entered a Fellow Commoner at Trinity College, Cambridge; and he was also, a year or two after, admitted a student of the Inner Temple. He took his degree of B.A. in 1790; was called to the bar 8th July, 1791; and graduated M.A. in 1794. His success at the bar was very decided from the first, and every year added to his reputation and his emoluments. It was soon discovered that, from whatever cause, no young barrister gained so large a proportion of verdicts. Even while he was still a junior counsel, he was very frequently entrusted with the sole conduct of important cases. At last, in 1816, he received a silk gown; and from that date he was recognised as the leader of his circuit (the Northern), and as occupying also a foremost place in Westminster Hall.

He had made an attempt to be returned to parliament for the borough of Lewes at the general election in October, 1812, but was defeated by Mr. George Shiffner, who was brought in, as second member, by a majority of 164 to 154; and he failed also in a second attempt on the same borough when a vacancy was occasioned in 1816 by the death of the other member, Mr. T. R. Kemp, being then defeated by Sir John Shelley. He was first introduced to the House of Commons in 1818, as one of the members for the city of Peterborough, under the patronage of Earl Fitzwilliam. He did not, however, make a figure in parliament corresponding to his eminence at the bar; nor was he a frequent speaker, although he both supported Sir Samuel Romilly and Sir James Macintosh in their efforts to mitigate the severity of the criminal law, and also occasionally took part in debates on financial subjects.

He was returned again for Peterborough at the general election in 1820; but he resigned his seat in 1822 to stand for the University of Cambridge, when, however, he was left at the bottom of the poll. Upon this he was re-elected for Peterborough, but not till after a contest with Mr. Samuel Wells. Up to this time he had been considered as distinctly belonging to the Whig party, although to the most moderate section of it; but his opinions gradually assumed more of a

Conservative complexion, and when the new Tory or mixed administration of Canning came into power in April, 1827, Mr. Scarlett, having been again returned for Peterborough at the general election in the preceding year, accepted the office of attorney-general. He was at the same time knighted. Having been once more returned for Peterborough he retained his place throughout the administration of Lord Goderich; was succeeded by Sir Charles Wetherell when the Duke of Wellington became premier in January, 1828; but was reinstated in May, 1829, upon the dismissal of Sir Charles for his opposition to the Roman Catholic Emancipation Bill; and, having been returned for Maldon at the general election in 1830, he remained attorney-general till the accession to office of the Whigs in November of that year, when he was succeeded by Mr. (now Lord) Denman.

At the general election in May, 1831, Sir James Scarlett was returned to parliament for Cockermouth. At the next, which took place after the passing of the Reform Bill, in December, 1832, he was returned, after a contest, for Norwich, along with Lord Stormont (now Earl of Mansfield). When this parliament was dissolved in December, 1834, on Sir Robert Peel being appointed premier, Sir James Scarlett was made Chief Baron, and a peer by the title of Baron Abinger, of Abinger, in the county of Surrey, and of the city of Norwich.

Lord Abinger died of a sudden attack of illness at Bury St. Edmunds, while on the circuit, on the 7th of April, 1844. He had been twice married; first in August, 1792, to the third daughter of Peter Campbell, Esq., of Kilmorey, in Argyleshire, who died in March, 1829; secondly, in September, 1843, to Elizabeth, daughter of Lee Steere Steere, Esq., of Jays, Surrey, and widow of the Rev. H. J. Ridley, of Ockley. By his first wife he had three sons and two daughters, by the eldest of the former of whom he is succeeded in his title and estates. His eldest daughter married Mr. (now Lord) Campbell in 1821, and was created a peeress in 1836 by the title of Baroness Stratheden.

Lord Abinger was a skilful and dexterous rather than an eloquent advocate, and while on the bench he was more distinguished for the clearness with which he summed up a case to a jury than for the profoundness or subtlety of his legal views. Yet he was considered also a sound and good lawyer. In the great art of gaining verdicts he was unrivalled; and no practitioner at the bar had ever before received so large sum in fees in any year as he drew in the height of his practice. His conduct as attorney-general under the Tories in 1829, when he filed a number of criminal informations against the opposition newspapers, naturally exposed him to some severe animadversions from those who still continued attached to the more democratic political creed which he had originally been accustomed to profess.

(*Gent. Mag.* for June, 1844.)

SCHEELE'S GREEN. [COPPER, P. C., p. 504.]

SCHEEMAKERS, PETER, a Flemish sculptor who obtained great celebrity in England. He was born at Antwerp in 1691, and he was the pupil of his father and a sculptor of the name of Delvaux. While still young he visited Denmark, where he worked as a journeyman. About the year 1728 he walked to Rome, and he was then so poor that he was forced to sell a considerable portion of his clothes to obtain subsistence. From Rome, after only a short stay, Scheemakers journeyed again on foot to England, and here he obtained considerable employment; but he paid a second visit to Rome, and after a two years' residence there he settled about 1735 for many years in England. He lived in Old Palace-yard, Westminster, until 1741, when he removed to Vine Street, Piccadilly, when he became the rival of Rysbrack and Roubiliac, and executed many important works, including some of the principal monuments in Westminster Abbey. The time of his death is not known, but according to his pupil Nollekens, as related by Smith, he returned to Antwerp in 1770, and there soon after died. Two sales, however, of his effects took place in Covent Garden in 1756 and 1757. Among the articles sold was a beautiful small copy in marble of the Laocoon, which was bought by the Earl of Lincoln: a good mould was taken from it by a figure-maker of the name of Vevini, from which excellent casts were made. Scheemakers' works are very numerous; they are elaborate in design and costume, but rather effective than grand; the marble is always remarkably well worked. There are monuments by him in Westminster Abbey to Shakspere; Dryden; George, Duke of Albemarle; John Sheffield, Duke of Buckingham; Admirals Watson, Sir C. Wager, and Sir J. Balchen; Commander Lord Aubrey Beauclerk; and Doctors Chamberlin, Mead, and Woodward. He made also the statue of Sir John Barnard in the old Royal Exchange; the statues in the India House of Admiral Pocock, Major Lawrence, and Lord Clive; the bronze statue of Guy in Guy's Hospital; and the bronze statue of Edward VI. in St. Thomas's Hospital. He executed also some busts, and many other sculptures for the gardens of Stowe.

(Smith, *Nollekens and his Times*, &c.; Immerzeel, *De Levens en Werken der Hollandsche en Vlaamsche Kunstchilders*, &c.)

SCHEUCHZE'RIA, a genus of plants belonging to the natural order Alismaceæ and the sub-order Juncagineæ. The perianth is composed of 6 leaves; it has 6 stamens with slender filaments. The ovaries with 2 ovules. The stigma adnate to the ovary and downy. The capsules compressed and inflated, one or two seeded.

S. palustris is the only known species of this genus. It has a stem from 6 to 8 inches high, the leaves are distichous, few, alternate, semicylindrical, obtuse, and with a minute pore on the upper side at the apex. The raceme is terminal, and consists of about 5 greenish flowers. The capsules about 3, and much inflated. It is found in England and Scotland in bogs.

(Babington, *Manual British of Botany*.)

SCHEUFFELIN or SCHAEUFFELEIN, HANS LEONARD, commonly called Hans Scheuffelin, a very celebrated old German painter and wood engraver, was born at Nürnberg about 1490. His father Franz Scheuffelin was a merchant of Nördlingen who settled in Nürnberg. Young Hans was placed with Albert Dürer, with whom he was a great favourite. He remained in Nürnberg until 1515, when he removed to Nördlingen, where he died in 1539 or 1540; probably the former year, as his widow was married again in 1540 to the painter Hans Schwarz.

There are several of Scheuffelin's paintings in Nördlingen, of which the principal is the Taking down from the Cross in the church of St. George; it is a picture with two revolving wings, and was painted in 1521. There are several good paintings by Scheuffelin also in Nürnberg, Tübingen, Stuttgart, Oberdorf, and other neighbouring places; and there are some in the galleries of Munich and Berlin.

There are also many woodcuts by Scheuffelin, and both woodcuts and pictures are sometimes attributed to Albert Dürer, to whom however Scheuffelin was inferior in all respects.

(Bartsch, *Peintre Graveur*; Nagler, *Neues Allgemeines Künstler Lexicon*.)

SCHINKEL, KARL FRIEDRICH, in the opinion of his own countrymen the great architectural artist of his age, and whose name has obtained European and permanent celebrity, was born March 13, 1781, at Neu-Ruppin, in Brandenburg, where his father was 'super-intendent.' When only six years old he lost his father, and was placed by his mother in the 'Gymnasium' of his native town, where he remained till the age of fourteen, when he removed to Berlin. Soon afterwards an opportunity presented itself of becoming a pupil of the elder Gilly (David Gilly, born 1745, died 1808), a clever practical man in his profession, and author of several works on subjects relating to it. Hardly could he have been more fortunately placed; for about a twelvemonth afterwards, the younger Gilly (Friedrich) returned from his travels with an imagination warmed by his recent studies, and from him it was that Schinkel derived his best instruction, and together with an ardent relish for his art, more liberal and enlightened idea of its powers as a fine art than were generally entertained in those days, when a system of mere routine both in theory and practice prevailed almost universally. Friedrich Gilly was a truly genial mind, who was ambitious of elevating architecture to the level of the other arts of design, and to bring it into immediate contact with them, whereas it was then, and perhaps now is, too much regarded as one entirely apart from and independent of them. What Gilly himself would have achieved in his profession can only be conjectured, for he died within two years after his return, August, 1800, before he had completed his thirtieth year, leaving Schinkel to inherit the fame that might else perhaps have been divided between them.

Although so young, Schinkel had been intrusted by Gilly to superintend the execution of some of his buildings, and after his death, he continued the engagements. Having acquired such proficiency in practice it would not have been difficult for him to have adhered to that course under others in the profession, and in the course of time establish himself in business: but he preferred pursuing his theoretical and artistic studies; during which time he turned his exercises in them to account by making designs of various ornamental articles for modellers, metal-workers, and other artizans of that class. Out of such earnings he laid by sufficient to enable him to accomplish his cherished scheme of a pilgrimage to the 'holy land of art.' In 1803 he set out for Italy, first visiting Dresden, Prague, and Vienna; and after extending his route to Naples and Sicily, returned to Berlin in the spring of 1805. But there the state of things was at that juncture anything but propitious to art, more especially architecture, to which the state of public affairs in 1806 and following years threatened a complete stoppage. He turned to landscape-painting, therefore, as an occupation and a resource, making use of the studies of scenery which he brought home from Italy, and embellishing his compositions with architectural accessories, or else making the architecture the principal and the landscape the accessorial portion of the subject. One work of note and which gained him distinction with the public was a large panorama of Palermo; and he also designed for the theatre many sets of scenes, a collection of which, including those for the Zauberflöte, Die Braut von Messina, &c., were afterwards published in a series of coloured engravings, whereby they are rescued from the usual fate of similar productions of the pencil. His various artistical labours during this period were beneficial to him in his after-career, serving as they did to call forth and exercise those two faculties in which those who are otherwise able architects are generally deficient—taste and imagination. Even had they been serviceable to him in no other respect, they were eminently so in recommending him to the king, who, as soon as restored tranquillity in public affairs permitted him to turn his attention to the improvement and embellishment of his capital, began to employ Schinkel on those structures which have stamped a new aspect on Berlin, and conferred on it a high architectural character. One of the earliest commissions of importance which he received from the king (who was then at London with the allied sovereigns) was to make designs for a national cathedral intended to commemorate the pacification of Europe; but though the architect's ideas excited great admiration, the scheme itself was dropt. Whatever the disappointment may have been at first, he had no time to dwell upon it, for from the period of 1815 he was incessantly and most actively engaged. Among his earliest buildings were the Hauptwache, Theatre, and Museum at Berlin, all of them treated in a pure Hellenic style—a style which had only been hinted at in such previous attempts at correct Grecian architecture as Langhans's once celebrated 'Brandenburg Gate.' The façade of the Museum more especially displays, together with severe simplicity of outline, a fulness of refined ornateness unknown to and unthought of for any previous modern example which is called Greek. The external elevation consists of merely a single line of eighteen columns in antis (Erechtheum Ionic) raised on a lofty stylobate, in the centre of which is a flight of steps, enclosed by pedestal walls (in continuation of the stylobate) and forming the ascent to the colonnade. Taken by itself, however, there would be nothing very remarkable in the general idea, whereas an extraordinary degree and kind also of variety and effect are given to the whole by the inner elevation or background behind the outer row of columns; which presents in the centre portion of it a second colonnade (four columns in antis), with a screen-wall rising about half its height, and above and beyond that the upper part of the open staircase, whereby the whole composition acquires singular movement and play both of perspective and light and shade; besides which the wall forming the rest of this inner elevation, instead of being left a blank surface, or nearly so, is completely decorated from top to bottom, or rather was intended to be so, the upper division of it on each side of that inner colonnade being to be filled up by a single large fresco, the cartoons or designs for which were prepared by Schinkel himself, and have been extolled as masterly compositions. There is reason, however, to suppose that either they or similar decorations will yet be executed, Cornelius being spoken of as the artist to whom the task is to be confided; and only when the frescos shall have been added, will Schinkel's idea and the effect contemplated by him for the building have been realized. Neither is the Museum the only one of his works which have not been completed—not yet, at least, according to his designs; for the two other buildings above mentioned have not received their full complement of sculpture, which, though it may be dispensed with for them as structures, is essential to them as works of architecture. It is fortunate, therefore, that in any case we have Schinkel's own ideas exhibited to us in his 'Entwürfe,' an unusually full and extensive series of designs of all his principal buildings, some of which are illustrated and explained far less sparingly than is the custom in similar collections; for besides ornamental details, many of them strikingly original as well as tasteful, perspective views interior as well as exterior, and different ones of the same building are given; besides which, the engravings themselves are illustrated by the information contained in the letter-press. The publication of his designs contributed no doubt to spread Schinkel's fame much more rapidly than would otherwise have been the case; and it is one that forms a very complete gallery of his unusually numerous and no less varied architectural productions. With such ready materials, a descriptive catalogue of his buildings might be easily drawn up, but we can merely mention a few of them: the Werder Kirche (Gothic), Bauschule, and Observatory, at Berlin; the Theatre at Hamburg; Schloss Krzescowice, Charlottenhof, and the Nicolai Kirche at Potsdam, which last would have been a most imposing structure had the design been carried out, instead of being cut down altogether by the omission of the cupola. His 'Entwürfe' also contains his design for the Sing-Academie at Berlin—one of his happiest ideas, which was unfortunately set aside for that by Ottmer [OTTMER, P. C. S.]; and six several designs for a monument to Frederick the Great, in which he gave free scope to his imagination, and indulged in luxuriant architectural pomp. Another publication, entitled 'Werke der Höheren Baukunst,' gives us a series of designs by him for the Palace at Athens, which he proposed to erect upon the Acropolis, forming an irregular assemblage of courts, colonnades, and buildings, some of which, especially one magnificent saloon, would have been marked by originality of character as well as by striking effect. His design was much superior to that by Klenze, which is also published among those of the latter architect's; but, as has been said already elsewhere [ATHENS, P. C. S.], neither of them was adopted. Another remarkable project of Schinkel's, his latest though not his least poetical conception, was a design for a summer palace at Orianda, in the Crimea, for the Empress of Russia, surrounded by terraces and hanging gardens on a lofty eminence, commanding a prospect of the Black Sea. That was in 1839, the same year in which was conferred upon him the highest rank in his profession—that of Ober-Landes-Bau-director; but it was to him a mere honour, for his career was closed: his health immediately afterwards began to decline, and in the autumn of the following year, on his return from the baths, by whose waters he had hoped to benefit, he was attacked by an organic affection of the brain, which reduced him to a state of almost complete insensibility to all external objects; and in that deplorable condition he remained upwards of a twelvemonth, till released from it by death on October 9th, 1841.

Schinkel has been called by some of his countrymen the Luther of Architecture; and he certainly gave a fresh impulse to the art: and if he himself did much, his example and influence have perhaps accomplished more; for by venturing to think for himself, he has led others to do the same. Yet with all his freedom and originality, he was, perhaps, rather too timid than too bold in his reforms, adhering in many respects too strictly to the original letter of Grecian examples, particularly in regard to the orders. As to Gothic, it would have been better had he abstained from it entirely, and given his undivided attention to the other style, first eliciting and then maturing new ideas from it. With all his invention, too, he exercised none upon such important features as doors and windows, for which he repeats the very same design again and again in different buildings.

Schinkel has been made the subject of biographical notice and of criticism more than any other modern architect. Of two separate publications relative to him, one entitled 'K. F. Schinkel, Eine Characteristik,' &c., 1842, is by Dr. Kugler; the other by O. F. Gruppe; and both of them have portraits of him, the former from Rauch's bust of him, the other represents him in his usual dress, and with his hat on, and therefore conveys a better idea of his personal appearance.

SCHIʹZODUS, a fossil genus of conchifera, proposed to include species of Axinus of Sowerby.

SCHIZOʹPTERIS, a genus of fossil ferns (Brongniart) in the shales of the Yorkshire coast.

SCHIZO'STOMA, a fossil genus of fossil gasteropoda (Bronn). Included in Euomphalus, or Pleurotomaria by other writers. Found in the palæozoic strata.

SCHLEGEL, AUGUST WILHELM VON, was descended from a family in which learning and literary fame had been hereditary during several generations, in Germany as well as in Denmark, where a branch of the family settled early in the past century. His father was John Adolphus Schlegel, D.D., who died in 1793, as Superintendent General of the Lutheran Church of Hanover. John Adolphus had four sons, Charles Augustus Maurice, superintendent-general at Harburg, in Hanover, who died in 1826; John Charles Fürchtegott, one of the councillors at the Ecclesiastical Court at Hanover, and well-known as the author of 'Hanoversches Kirchenrecht' (The Ecclesiastical Law of Hanover), 3 vols. 8vo., 1801-1805, and 'Das Kirchenrecht von Nord-Deutschland,' (The Ecclesiastical Law of Northern Germany), 3 vols. 8vo., 1828-32, &c., who died in 1831; Augustus William, the subject of this sketch; and lastly Frederic Charles William, who obtained a fame still more solid though less brilliant than his eldest brother.

Augustus William was born at Hanover on the 8th of September, 1767, and after having received a careful education was sent to Göttingen to study divinity, which he soon abandoned to devote his time to philology. Though young, he was no common classical scholar, for his Latin dissertation on the geography of Homer was highly thought of by Voss, the most competent judge of his age on that subject, and Heine intrusted him with making an index to his edition of Virgil. For some years Schlegel lectured at the university of Göttingen: his contributions to Bürger's 'Akademie der Schönen Künste' (especially his poem 'Ariadne,' and his essay on Dante), and to Schiller's 'Musen-Almanach' and 'Horen,' especially his translations from Dante with commentaries, secured him an honourable rank among the best writers of Germany. In 1797 he published the first volume of his translation of Shakespere. In the same year he was appointed professor of Humaniora in the university of Jena, and continuing his literary activity he soon placed himself among the leaders of German literature. He remained at Jena till 1802, a friend of Schiller, and an admirer of Göthe then at Weimar, who, however, did not return the sentiment. Pushed by ambition, Schlegel left the little town of Jena, and repaired to Berlin, where he gave public lectures to a mixed but highly intelligent public on literature and the fine arts. He remained there till 1805, having meanwhile imbibed that puerile passion for little court distinctions, titles, and crosses, which in later years proved such a severe drawback on his real merits. Among the specimens of his literary activity in the period from 1797 to 1805, may be mentioned, besides the continuation of his translation of Shakespere's plays, the 'Athenæum,' a critical review, which he edited with his brother Frederic, and which did a great deal of good towards purifying the taste of the public; 'Gedichte' (Poems), Tübingen, 1800; 'Musen-Almanach,' which he edited together with Tieck, and in which he first betrayed his growing tendency towards Romanism and mysticism; 'Vorlesungen über Literatur und Kunst des Zeitalters,' (Lectures on the Literature and the Fine Arts of the Age), which appeared in the 'Europa,' a review edited by Frederic Schlegel. In 1805 he made the acquaintance of Madame de Stael-Holstein. Surprised at finding so rare a combination of deep learning, uncommon poetical talents, and the manners of a courtier as Schlegel presented, she became his sincere friend, and he henceforth accompanied her during several years on her travels through various parts of Europe. The reciprocal influence of these two distinguished persons upon each other was very great, and may be traced in their works: the result was, that he made her popular in Germany, and she brought him out in France, where his vanity afterwards met with so much gratification. At her suggestion he published in French a comparison between the Phèdre of Racine and the Hippolytus of Euripides, and this work was the foundation of his subsequent fame among the French. In 1808 Schlegel delivered at Vienna a course of lectures on dramatic art which are an everlasting monument of his genius. They were published under the title 'Vorlesungen über Dramatische Kunst und Literatur,' Heidelberg, 1809-1811, 3 vols. in 8vo.; 2nd edition, 1817. A new collection of his poems appeared in 1811, 2nd edition, 1820, among which are his masterpieces, Arion, Pygmalion, Saint Lucas, and others. At that time Schlegel and his brother Frederic had already succeeded in founding, in opposition to the models commonly called classical, the modern romantic school of poetry and fine arts which had its origin, in a great measure, in the depressed state of Germany and the deep wishes of the people for a moral, religious, and political regeneration. The brothers Schlegel were considered as enthusiastical patriots, and Augustus William having ventured to depreciate the French drama and to call Molière a mountebank, at a time when such liberties met with punishment or cruel persecution from the French invaders, his name became popular to a degree which he would perhaps not have enjoyed at another time. 'Das Deutsche Museum,' a review which the brothers Schlegel founded in 1812, was the chief organ of tho new school, and the middle ages became the inexhaustible source where the reformers quenched their thirst for piety, sentimentality, and chivalry, and whence they drew forth everything except that rude power softened down by uncorrupted feelings which forms the true character of that age. Göthe, who never called himself a romantic poet, but was nevertheless the first of all, knew that character much better than the devout Frederic, or the effeminate Augustus William Schlegel. The excitement of 1813 produced a strange effect upon Augustus William: he accepted a secretaryship from Bernadotte, the crown-prince of Sweden, and wrote political essays. No sooner however was Paris taken than he repaired to the country-seat whither Madame de Stael had retired, and kept her company till her death in 1818. She remembered him in her will. About that time he was placed among the titular nobility of Germany, the privilege of which consists in putting the preposition 'Von' between the Christian and the family name of the person thus distinguished.

In 1819, Augustus William von Schlegel was appointed professor of history in the university of Bonn, which had just been founded by the king of Prussia: it is not known why he was made professor of history, for he had never written on history. He had now ceased to be a poet, but still ambitious of tho honour of being a European author, he published several critical essays—of undoubted merit, however—in foreign languages. Such are, 'Le Couronnement de la Ste. Vierge, et les Miracles de St. Dominique: Tableau de Jean de Fiesole; avec une notice sur la Vie du Peintre,' Paris, 1817, fol.; an essay on the famous Venetian horses, which he declared to be of Greek workmanship, in Italian, in the 'Biblioteca Italiana;' 'Réflexions sur l'Etude des Langues Asiatiques, adressées à Sir J. Macintosh, suivies d'une Lettre à Mr. H. H. Wilson,' Bonn, 1832, &c. To such minor works, however, he devoted only part of his time, for even provious to his appointment at Bonn, and at the suggestion of his brother Frederic, he had made up his mind to study Sanscrit. He soon attracted a small number of students round him, and thus became one of the principal promoters of the study of that language in Germany: the Sanscrit printing-office at Bonn owes its foundation to Schlegel, who, it is said, purchased the types at his own expense. Although he did not attain the exact knowledge of that difficult language by which Bopp and Lassen have distinguished themselves, he was yet no contemptible Sanscrit scholar, and surpassed Bopp and others in his general views: and it may be said that his principal merit consisted in encouraging students and aiding them in pursuing tho study of the Sanscrit, Zend, Pehlvi, and other Indo-Persian languages. Schlegel in his turn was assisted by tho superior learning of Professor Lassen. As early as 1820 he founded the 'Indische Bibliothek,' a review exclusively devoted to Indian languages and antiquities. Specimens of Schlegel's Sanscrit scholarship are, 'Ramâyana,' with a Latin translation and critical notes, Bonn, 1829; 'Bhagavad-Gîta,' an episode of the celebrated Indian epic 'Mahabharata.' It is especially to his endeavours to promote the study of the Indian languages, as well as to some of his critical essays on subjects connected with the fine arts and poetry that Schlegel owes the great esteem which he enjoyed in this country. Some time before his death, which took place in May, 1845, he published 'Essais littéraires et historiques,' Bonn, 1842, 8vo.

Schlegel ranks high among the lyric poets of Germany. 'Arion' is a wonderful romance or ballad, if the expression can at all be applied to such a production; and his sonnets are little pieces of perfection. The smoothness of his style, and his elegant clearness, have not been surpassed in Germany. But as a genius he stands far below the great leader of German literature; he could appreciate the grand and sublimo, but he was unable to create it, as his tragedy of Ion shows. He must have felt his own comparative weakness when he called Göthe a god. Next to Count Platen, Schlegel was the most perfect metrist; but feeling his superiority in this respect he made too much of it, and sometimes produced most musical sonnets, embodying feelings of such an exquisite delicacy as to leave no impression whatsoever upon the mind of less gifted mortals than the author. His translation of Shakespere, which was continued hy Tieck, is the best among the numerous German translations of the great bard, but Tieck's translations are still better than those of Schlegel, whose version is too elegant, too elaborate, too smooth; his Falstaff, and the like characters, leave an impression as if previous to appearing in public they had received some private lessons from the accomplished translator to behave with decency in his and his equals' company. The work which does him most credit is the Lectures on Dramatic Art and Literature, which have been translated into all the modern languages: into English by John Black, London, 1840, 3 vols., 8vo In his criticism on the French drama he is however one-sided. His appointment as professor of history at Bonn was a mistake: he ought to have remained at Berlin or Vienna, lecturing before an elegant puhlic of fashionable ladies and gentlemen. Vexed at seeing in Niebuhr, then likewise at Bonn, a star still brighter than his own, he endeavoured to darken him since he could not outshine him, and wrote his critique of Niebuhr's Roman History, which appeared in the 'Heidelberger Jahrhücher,' of 1828; and he likewise began to lecture on Roman history in the university. But his critique msde him ridiculous among the learned, and his lectures added nothing to his reputation.

(*Conversations-Lexicon*; Menzel, *History of German Literature*, translated hy Gordon, Oxford, 1840, 4 vols., 8vo.)

SCHLEICHE'RA, a genus of plants belonging to the natural order Sapindaceæ. It has a 5-toothed calyx. Petals absent; the disk occupying the bottom of the calyx. The stamens from 6 to 10, inserted between the margin of the disk and the ovary. The ovary is 3-celled, with one erect ovule in each cell. The stigma 3-cleft. The fruit is an indehiscent drupe, with 1, 2, or rarely 3 cells. The seeds are solitary in each cell, and covered with a pulpy arillus; the embryo much curved. The species are trees; the leaves abruptly pinnate, the leaflets nearly opposite. The flowers are small, disposed in spike-like racemes.

L. trijuga has abruptly pinnate leaves from 8 to 16 inches long, the leaflets from 2 to 4, opposite, sessile, broad, lanceolate or oblong entire, rather smooth on both sides the lower pairs, the smallest from 3 to 8 inches long. The petioles are a little downy, the stipules wanting. The racemes are axillary, or below the leaves round the base of the young shoots, solitary, in the male simple, in the hermaphrodite often compound, from 2 to 4 inches long. In the male flowers the calyx is cup-like, and 5-toothed. The corolla wanting, the filaments from 6 to 10 erect, and many times longer than the calyx. The anthers oval and erect; the pistil a mere rudiment. The hermaphrodite flowers on a separate tree. The calyx, corolla, and stamens as in the male flower. The disk a fleshy yellow ring, surrounding the insertions of the filaments. The ovary superior, ovate, 3 celled, with one ascending ovule in each cell. The style short, stigma 3-cleft, recurved, slender, and downy. The drupe about the size of a nutmeg, a little pointed, covered with a tender grey dry pericarp. The seeds are oblong, and surrounded with a whitish pulpy aril, which is of a pleasant acid taste, and most grateful during dry weather. It is a native of insular and continental India, where the astringent bark, mixed with oil, is used as a remedy for the itch.

(Lindley, *Flora Medica*; Lindley, *Vegetable Kingdom*.)

SCHMIEDELIA (in honour of Casimer Christopher Schmiedel, once a professor at Erlangen), a genus of plants belonging to the natural order Sapindaceae. It hss a 4-parted unequal calyx, 4 petals, the 5th or superior one wanting. The disk incomplete, with 4 glands opposite the petals, 8 stamens inserted in the receptacle, and connate around the ovary at the base. The fruit is indehiscent, 1- 2- or rarely 3-lobed. The lobes roundish, fleshy, or dry, and 1-seeded. The seeds with or without an arillus. The species are trees or shrubs, usually with trifoliate, rarely with simple exstipulate leaves, and racemose white flowers. The racemes are axillary.

S. serrata has ternate leaves, the leaflets ovate, pointed, serrate, generally blistered, smooth on the back, and from 2 to 3 inches long. The racemes axillary, single, and erect. The flowers small, white, and polygamous. In the hermaphrodite flower the calyx is 4-leaved, and the petals 4, unilateral. The filaments very woolly near the base. The fruit is small, red, and succulent, and is eaten by the natives of Coromandel. The root is astringent, and is employed by the native practitioners in diarrhœa.

S. cochinchinensis has its leaves on long petioles, with serrated leaflets, terminal racemes, pilose small petals. The flower is small and white. It is native of Cochin-China, on the banks of rivers. The leaves are used as cataplasms in contusions. The species of this genus are not worth cultivation unless in general collections. A mixture of loam and sand suits them best.

(Don, *Gardener's Dictionary*; Lindley, *Flora Medica*.)

SCHOBE'RIA, a genus of plants belonging to the natural order Chenopodiaceae. It has a 5-parted perianth, without appendages, 5 stamens springing from the receptacle, and from 2 to 3 stigmas. The pericarp is membranous, the seed horizontal, the testa crustaceous.

S. fruticosa has an erect shrubby stem, with obtuse semicylindrical leaves, 3 styles, and smooth shining seeds. It is found on the south and east coasts of Great Britain.

S. maritima is found on the sea-shore in England. It has a procumbent stem, with numerous spreading branches, acute semicylindrical leaves, 2 styles, with reticulate, striate, shining seeds. (Babington, *Manual of British Botany*.)

SCHOEN or SCHONGAUER, MARTIN, one of the most celebrated of the early German painters and engravers, was, according to recent discoveries, born at Ulm of a family which produced many artists in the early part of the fifteenth century; his name occurs in Ulm documents from 1441 to 1461. The inscription therefore upon the back of his portrait in the gallery at Munich, though probably authentic, is apparently erroneous. He settled about 1461 in Colmar, and died there in 1485 or 86, Sandrart says 86, and various incidents which are recapitulated by Nagler tend to establish this date. The time of this painter's death has until very lately been a matter of much dispute.

Martin appears to have been chiefly an engraver in his youth, and to have devoted his attention principally to painting after a visit to the Netherlands, where he became acquainted with the excellent works of the Van Eycks and their scholars. He probably resided some time at Antwerp, as he was sometimes called by the Italians Martino d'Anversa; and from a letter of Lambertus Lombardus to Vasari dated April 27, 1565, and published by Gaye in his Carteggio Inedito d' Artisti, iii. 177, it is supposed that he studied under Roger Van Bruges, now from good evidence considered to be the painter of the portable altar of Charles V., which has been hitherto attributed to Memling. [MEMLING, P. C. S.]

The best works of Martin Schön are still at Colmar in the college library, but there are many which are attributed to him in the collections of Munich, Vienna, Nürnberg, and Schleissheim, and in other places, as Ulm, Stuttgart, Basel, Berlin, &c. His pictures are in all respects similar to those of other pupils of the Van Eyck school, but are inferior in colour to those of his master Roger Van Bruges; they are notwithstanding among the best works of their style. Many of the pictures of an inferior painter, Martin Schaffner, have been and still are ascribed to Martin Schön. None of his pictures are signed with either a name or monogram, but his prints are generally marked with a monogram.

Schön's prints, though crude in light and shade, aro among the very best of the early productions of the Germans in this class. Bartsch enumerates and describes 116. Seventeen others bear his monogram, but are supposed not to be by him; and twelve very douhtful prints are enumerated by Heineken: the list is reprinted in Nagler's 'Künstler Lexicon.' Schön, which in German signifies excellent and beautiful, is supposed to be a nickname of this artist, whose real name was Schongauer; he was formerly called Hübsch Martin by tho Germans, and Bel Martino and Buon Martino by the Italians. There was an earlier painter and wood engraver of the name of Msrtin Schoen at Ulm, who was active from 1394 until 1416. Some of his works still exist, bnt they are in a ruinous condition.

(Sandrart, *Deutsche Academie, &c.*; Bartsch, *Peintre Graveur*; Grüneisen und Mauch, *Ulms Kuntsleben im Mittelalter*; Von Quandt, *Kuntsblatt*, 1840; Waagen, *Kuntswerke und Künstler in Deutschland*, vol. iii.; Nagler, *Neues Allgemeines Künstler Lexicon*.)

SCHOENUS, a genus of plants belonging to the natural order Cyperaceae. The spikelets are 2-ranked, from 2- to 4-flowered. The glumes from 6 to 9, the lower ones small and empty. Bristles few or wanting.

S. myricans is found on turfy bogs in Great Britain. It has a round naked stem, from 5 to 10 spikelets, collected into a terminal roundish head, overtopped by the lower bract; the glumes scabrous at the keel. The stem is clothed at the base with dark-brown smooth shining scales, some of which terminate in setaceous erect leaves, which are shorter than the stem. The glumes are dark-brown or black. This is the μελάγκρανις of Theophrastus, *Hist. Plant.* 4. 18.

(Babington, *Manual of British Botany*; Fraas, *Synopsis Plantarum Florae Classicae*.)

SCHOOLS, INFANT. In the article SCHOOLS, P. C. p. 38, in speaking of the foundation of the Infant Schools at New Lanark, it is said that Robert Owen 'was aided in forming the idea by the wife of the Rev. William Turner, of Newcastle-on-Tyne, who, in the year 1818, when in conversation with Mr. Owen, remarked that in her attention to the education of girls, she had frequently wished some means could be adopted for getting poor children taken out of the hands of their parents at an earlier age, before they had formed bad habits at home and among the idle children around them. Much was said on both sides on the desirableness of infant-schools, which Mr. Owen immediately established on his return to Lanark.'

The author of the article SCHOOLS has informed the editor of the P. C. that his authority for this statement was a written communication from the Rev. William Turner before-mentioned. The statement however is proved to be erroneous by the evidence which Mr. Owen gave before a committee of the House of Commons in 1816. Henry Brougham, now Lord Brougham, was chairman of the committee, and the evidence is printed in the 'Report from the Select Committee of the House of Commons on the Education of the Lower Orders in the Metropolis, June 1816.'

Mr. Owen stated before the committee that he had paid particular attention to the education of children for twenty-five years, but that he had no opportunity of putting any of his plans into execution till after he went to New Lanark. He stated that he had been upwards of sixteen years in the superintendence of the cotton-mills there, and that there were 444 children in his schools at the time when he was examined (1816) of from three to ten years of age, inclusive. As to the origin of these schools he says, 'I have been led in the establishment at Lanark, to receive children at the age of three years, principally for the purpose of preventing them from acquiring bad habits, which they would have done if they had been permitted to ramble in the streets among children who were ill instructed, and whose habits were bad; and also for the purpose of giving them good habits, and for settling the knowledge they acquire more firmly in their minds. They are continued in the school upwards of seven years.'

Mr. Owen gave the following account of the management of the schools:—

'The children are received into a preparatory or training school at the age of three, in which they are perpetually superintended, to prevent them acquiring bad habits, to give them good ones, and to form their dispositions to mutual kindness and a sincere desire to contribute all in their power to benefit each other. These effects are chiefly accomplished by example and practice, precept being found of little use, and not comprehended by them at this early age. The children are taught also whatever may be supposed useful that they can understand, and this instruction is combined with as much amusement as is found to be requisite for their health, and to render them active, cheerful, and happy, fond of the school and of their instructors. The school in bad weather is held in apartments properly arranged for the purpose; but in fine weather the children are much out of doors, that they may have the benefit of sufficient exercise in the open air. In this training school the children remain two or three years, according to their bodily strength and mental capacity. When they have attained so much strength and instruction as to enable them to unite without creating confusion with the youngest classes in the superior school, they are admitted into it; and in this school they are taught to read, write, account, and the girls, in addition, to sew; but the leading object in this more advanced stage of their instruction is to form their habits and dispositions. The children generally attend this superior day school till they are ten years old; and they are instructed in healthy and useful amusements for an hour or two every day during the whole of this latter period.'

In the year 1819 Henry Brougham, the Marquis of Lansdowne, Joseph Wilson, John Smith (who had seen the schools at New Lanark five years previously), Joseph Wilson, and other gentlemen, established, by subscription among themselves, a school in Brewer's Green (now Vincent Square), Tothill Fields, Westminster, on the plan of Mr. Owen's schools at New Lanark; and James Buchanan, an experienced teacher in those schools, came to London, with Mr. Owen's approbation, to superintend the new school.

On the 24th of July, 1820, an Infant school was opened in Quaker Street, Spitalfields, London. This school was established at the sole expense of Joseph Wilson, above mentioned. Samuel Wilderspin and his wife were engaged to manage the school, and their salaries were fixed and paid by Mr. Wilson. Mr. Wilderspin had been previously a clerk in a mercantile house in the city. He remained in this situation some years, and published a small work 'On the Importance of educating the Infant Poor from the age of eighteen months to seven years, containing an account of the Spitalfields Infant School, and the new System of Instruction there adopted. By S. Wilderspin, master of the above school. 12mo., 2nd edition, with considerable additions, Lond., 1824.' The first edition was probably published in 1823, but we have no evidence. Mr. Wilderspin was afterwards employed in delivering lectures on infant education, in assisting in the establishment of new schools, and in otherwise promoting the cause of infant education in all parts of Great Britain as well as in London. Mr. Buchanan was master of the Westminster infant school about twenty years, and then went to America.

A pension of 100*l.* a year was granted (August, 1846) to Mr. Wilderspin by the Queen; and Lord Brougham having, on the 3rd of August, 1846, in the House of Lords, made some remarks on Robert Owen's right to be considered the founder of infant schools, in which the Marquis of Lansdowne coincided, Mr. Wilderspin published in the 'Times' newspaper, August 6, 1846, two letters, one to Lord Brougham and another to the Marquis of Lansdowne, in the former of which Mr. Wilderspin says—'With regard to Robert Owen and the system which Buchanan brought from Lanark, your Lordship must be aware that the room at Brewer's Green was called *an asylum*, as was also the one afterwards established in Vincent Square, and that both contained a mere assemblage of children of all ages from two to fourteen, and were in fact what they purposed to be, mere asylums as a refuge for destitute children, but not infant schools conducted on the system now called the Infant school system. Buchanan did not become an infant teacher, nor did his school become an infant school until it had been re-organized by me, and he himself had been instructed by me at the express desire of the committee. The system therefore which Buchanan taught was not Mr. Owen's, nor his own, but mine. If therefore your Lordship means to state that Oberlin, Fellenberg, or Robert Owen, was the founder or inventor of the present infant school system, with its various arrangements, details, and implements, I must demur to your Lordship's decision,' &c. Dated Barton-upon-Humber, August 6, 1846.

In the year 1824, Mr. Wilderspin, in the preface to the book before mentioned, says, 'I do not know with whom the idea [of establishing infant schools] originated, nor do I think it of much importance to know this.' 'The first infant school that we heard of in this country was established at Westminster, in the year 1819. The master of that institution is J. Buchanan, who came from Mr. Owen's establishment at New Lanark.' That Mr. Wilderspin made alterations, and also improvements in some respects, in the system, will be readily admitted; but from the evidence which has been quoted, it is obvious that the leading principles of infant education had been developed and the establishment of infant schools accomplished before Mr. Wilderspin was engaged in the pursuits for which the British public are so much indebted to him. His labours in the cause of infant education are described and highly praised in the 'Journal of Education,' vol. v., p. 131, &c. Of the infant schools established by Oberlin in the Ban de la Roche an account is also given in the 'Journal of Education,' vol. i., p. 362, &c. [OBERLIN, P. C.]

SCIÆNU'RUS, a genus of fishes fossil in the London clay. (Agassiz.)

SCIENOIDES, a family of Acanthopterygious osseous fishes, of which the genus *Sciaena* is the type. They are closely allied to the perches, and resemble them in their general characters, but differ in having no teeth on the vomer and palatines. The preoperele is denticulated; the opercle is armed with spines; the bones of the face and head are often cavernous, forming a protruding snout.

The *Scienoides* are divided into those having two dorsal fins and such as have only one. In the first section we find the genus *Sciaena*, of which a single species, the maigre, *Sciaena aquila*, occasionally wanders from the seas of Southern Europe into our own. *Haemulon*, *Pristoma*, *Diagramma*, and *Amphiprion* are among the many genera belonging to the second section.

SCINA', DOME'NICO, born at Palermo in 1765, studied in his native town under Rosario Gregorio and other good masters, and became a proficient in classical erudition. He afterwards applied himself to the study of the mathematical and physical sciences, and to these the remainder of his life was chiefly devoted. In 1796 he was appointed Professor of Physics in the University of Palermo. He was repeatedly sent by the government to various parts of Sicily to explore the natural phenomena of the island, and he published the results of his observations. He gave an account of the eruption of Ætna of 1811, in two letters: 'Lettere scritte da Catania à Monsignor Grano in Messina.' He wrote on the currents of the straits of Messina: 'Memoria sù i Fili Refluì, e i Vortici apparenti dello Stretto di Messina,' in which he gave a better explanation of them than either Spallanzani or Brocchi has done. In 1818 he published an interesting 'Topografia di Palermo e de' suoi Contorni,' in which he describes the physical geography of the tract, its geological and mineral formation, its vegetable and animal productions, and its meteorology, the whole accompanied by a map. In the following year he was sent to explore the mountainous group called Monti Madonie, the ancient Nebrodes, which rises in the centre of the island, especially with regard to the frequent earthquakes to which that region is subject, 'Rapporto del Viaggio alle Madonie, intrapreso per Ordine del Governo,' Palermo, 1819. In 1823 he went on a like mission to the district of Ogliastro, near Termini, where an earthquake had made ravages, and among other things had affected the springs of the mineral waters from which the town of Termini takes its name. He wrote two reports on the subject, which were inserted in the Sicilian 'Giornale di Scienze, Lettere, ed Arti.' In 1830, on the occasion of some fossil remains found in the neighbourhood of Palermo, Scinà wrote a 'Rapporto sull' Ossa Fossili di Mardolce e degli altri Contorni di Palermo,' which attracted much attention. When a volcanic island arose suddenly off the southern coast of Sicily, Scinà was sent to examine the new phenomenon, and he wrote a 'Brevo Ragguaglio del novello Vulcano.' Scinà was not neglected by the Sicilian government. Both King Ferdinand and his successor King Francis bestowed their favour upon him. In 1815 he was appointed historiographer of Sicily. In 1822 he was made chancellor of the university of Palermo, and a member of the commission of public instruction and education for the whole island. In 1823 he was made curator of the public library of Palermo, and also rector of the 'Educandario dello Nobili Donzelle,' or 'House of Education for young Ladies of Rank.' In 1828 King Francis presented him to the abbacy of S. Angelo di Brolo, and in the following year gave him the decoration of his own order. Scinà was also the author of the following works: 1. 'Introduzione alla Fisica Sperimentale,' 1803, a work which established his reputation as a man of science. 2. 'Elementi di Fisica.' 3. 'Elogio di Francesco Maurolico,' a distinguished mathematician of Messina in the sixteenth century. 4. 'Memorie sulla Vita c Filosofia di Empedocle, Girgentino,' in 2 vols. 8vo., Palermo, 1813, a work more concise but not less accurate and interesting than that of F. W. Sturz, Leipzig, 1805, on the same subject. Scinà's book is divided into four parts: the first treats of the time in which Empedocles lived; the second is a biography of the Agrigentine philosopher; the third treats of his philosophy; and the fourth is a collection of the fragments of his works translated into Italian. 5. 'Discorso intorno ad Archimede.' 6. 'I Frammenti della Gastronomia d' Archestrato,' Palermo, 1823, with a biography of that antient and little-known Sicilian poet. 7. 'Prospetto della Storia Letteraria di Sicilia.' This is one of Scinà's most esteemed works, although it bears a very modest title. 8. 'Lettera al Padre Piazzi intorno a Girolamo Settimo, Matematico Palermitano.' 9. 'Esperienze e Scoverte sull' Elettro-magnetismo.' Scinà died of the Asiatic cholera, which afflicted Palermo in July, 1837. He was one of the most learned men that modern Sicily has produced.

(Tipaldo, *Biografia degli Italiani Illustri*; Mortillaro, *Sulla Vita e sù le Opere dell' Abate Domenico Scinà*, Palermo, 1837.)

SCINK (*Reptilia*). [SCINCOIDEANS, P. C.]

SCIOPTIC BALL is a globe of wood about five inches diameter, with a cylindrical perforation 2½ inches diameter passing centrally through it, and having at one extremity of the perforation a glass lens. The globe or ball is, by means of screws, fixed in a socket, which is made in a board about 8 or 10 inches square, in such a manner that while it cannot fall out, it is capable of being turned on its centre, to a small extent, in any direction.

The board being screwed to a window-shutter, or to the vertical face of a building in which an aperture has been made for the reception of the globe; the rays of light from external objects, after being refracted in the lens, form pleasing images of those objects on the opposite wall of the apartment, or on a white screen placed in a vertical position to receive the light; the apartment being darkened in order that the images may be distinct. The images on a vertical screen being inverted, two arms generally project from the board, within the room, and carry a plane mirror which turns on an axis so as to allow the rays of light, after passing through the lens, to fall on a screen placed in a horizontal position: by this means the spectators are enabled to see the images in erect positions. [CAMERA LUCIDA AND CAMERA OBSCURA, P. C.]

When the construction of the building is such as to allow the ball and lens to be fixed at an aperture in the roof, a plane mirror being placed above it at an angle of 45 degrees with the horizon, so as to reflect the rays from external objects down on the lens, the images formed on a screen within the darkened apartment are more distinctly formed and more conveniently seen. An apparatus of this nature was formerly applied to the roof of a building connected with the astronomical observatory at Greenwich, Edinburgh, and Glasgow, for the amusement of visitors.

SCIRPUS, a genus of plants belonging to the natural order Cyperaceae and the tribe Scirpeæ. It has fertile nearly equal glumes; the lower ones are perhaps the largest, and one or two of them empty. The bristles are either absent, or about six in number. The nut is plano convex or trigonous, tipped with the filiform not dilated base of the style.

S. maritimus has stalked or sessile spikes in a dense terminal cluster, several foliaceous bracts, bifid glumes, with an intermediate point; acute segments and a trigonous smooth nut. The stem is from one to three feet high and leafy. It is found in salt marshes in Great Britain, and is much relished by cattle. Withering says that the roots of this species are esculent, and have been ground down and used instead of flour in times of scarcity.

S. lacustris, Bullrush, has a round stem from four to six feet high, naked, with one or two long sheaths at the base, the spikes in a terminal twice compound panicle; the glumes are emarginate, mucronate, glabrous, and fringed. The nut obtusely trigonous and obovate; stigmas three. The panicle is not lateral, although the bract closely resembles a continuation of the stem. It is found in rivers and ponds in England. The root is astringent and diuretic, and was once used in medicine. The leaves are employed for making matting, chair bottoms, and many other domestic purposes.

S. triqueter has a stem acutely triquetrous throughout, flat or concave between the angles, with one or two long sheaths at the base, the upper one terminating in a very broad triquetrous leaf. The spikes are in a small cymose panicle, the glumes emarginate, mucronate, glabrous, and fringed, the lobes rounded obtuse, and the nut roundish obovate, plano-convex, and smooth. This species is found on the muddy banks of the Thames, near London, and the Arun, near Amberly, Sussex.

S. Holoschœnus is the ὁλόσχοινος of Theophrastus.

S. tuberosus is the Pi-tsi, or water-chesnut, of the Chinese, and is cultivated by them for food in large tanks, which are regularly manured and the water at intervals drawn off. The tubers are eaten both raw and cooked, and are esteemed both as food and medicine. There are fourteen British species of *Scirpus*, none of which however are worth description on account of any qualities they possess.

(Babington, *Man. Brit. Bot.*; Lindley, *Veg. King.*; Burnett, *Outlines of Bot.*)

SCLERANTHUS (from σκληρὸς, hard, and ἄνθος, a flower, in reference to the dry juiceless calyx), a genus of plants belonging to the natural order Paronycheae. It has a permanent 5-cleft calyx, with an urceolate tube contracted at the mouth with a glandular ring. The petals are absent; the stamens inserted in the throat of the calyx; the fruit membranous, one-seeded, indehiscent, included in the hardened calyx. The species are small herbs with opposite linear leaves which are rather connate at the base. The flowers are small, greenish white, and sessile in the axils of the forks of the branches.

S. annuus, Annual Knawel, has subdecandrous flowers, segments of the calyx of the fruit, patent acute, with a very membranous margin as long as their tube. The styles are longer than the stamens, the stem green and repeatedly dichostomous. The flower green, often solitary. It is found in sandy fields in Great Britain. The Swedes and Germans inhale the vapour arising from a decoction of this plant as a cure for the toothache.

S. perennis has decandrous flowers, the lobes of the calyx of the fruit closed, obtuse, with white and membranous edges. The styles are usually shorter than the stamens. The stem nearly simple, or irregularly branched, procumbent, and glaucous. The flowers green and white variegated. It is found in sandy places in Europe, the Levant, and in England. The Polish cochineal (*Coccus Polonicus*) is frequently found on the roots and leaves of this plant in the summer months. The seeds of these plants only require to be sown in the open border. None of the species are worth cultivating except in botanical collections.

(Don, *Gardener's Dict.*; Babington, *Man. Brit. Bot.*)

SCLERO'CHLOA (from σκληρὸς 'hard,' and χλόη 'grass'), a genus of grasses belonging to the tribe Festucineae. It has unequal acute membranous glumes. The outer palea with 5 faint but distinct and parallel nerves, membranous, cylindrical below, unarmed, often keeled at the tip or with a very minute mucro. The styles are terminal.

S. maritima has a branched panicle, the lowermost branches in pairs or simple, the branches alternately erect, the spikelets linear, adpressed, from 4 to 8 flowered, the rachis terete, the outer palea obtuse, apiculate, the midrib not reaching the apex, the root stoloniferous, fibrous, with rooting or ascending scions. It is found on sea-coasts and damp places in Great Britain.

S. distans is the *Glyceria* of Smith. It has a branched panicle, the branches elongated, ultimately spreading or deflexed, the lowermost in fours or fives, the spikelets linear, from 3 to 6 flowered, the outer palea obtuse, the midrib not reaching to the apex, the root fibrous without rooting scions. It is found on sandy sea-shores in England.

S. procumbens is known by its ovate lanceolate compact panicle, linear lanceolate spikelets of about 4 flowers, the rachis terete, angular, the outer palea obtuse, with an apiculus formed by the extremity of the dorsal nerve; the root is fibrous; the flower large. It is found in salt marshes in Britain.

There are six British species of this genus.

SCLERODERMI, the second family of Plectognathous fishes (such as have incomplete and soldered jaws). The *Sclerodermi* are distinguished by their conical or pyramidal snouts, ending in a small mouth, with distinct teeth in each jaw. The skin is rough, or covered with large hard scales.

The first division of *Plectognathi* is named *Gymnodontes*. The fishes included in it have no true teeth, but a substitute in a lamellated substance resembling ivory, which covers the jaws. It includes the *Tetrodon*, the *Diodon*, the *Orthagoriscus*, or sun-fish, and other genera.

The *Sclerodermi* are mostly tropical fishes, and are remarkable for their brilliant colours. One genus only occurs in the British seas, and that but very rarely; the *Balistes*, or file-fish, is the one alluded to. The *Ostracion* is remarkable for having its body clothed in an inflexible armour of hard plates, the tail-fins, mouth, and gill-openings passing through holes in its coat of mail.

SCLE'RODUS, a genus of fossil fishes from the upper Silurian strata of Ludlow, &c. (Agassiz.)

SCLOPE'NDRUM, a genus of ferns belonging to the tribe Aspleneae. The sori elongate, straight, and two together. The indusia of each pair opening towards each other.

S. vulgare, Hart's tongue, is a particularly handsome and ornamental fern, and very different from every other British species. It is universally and abundantly distributed throughout the British isles. It is very commonly found on old walls and ruins. It is also found in Europe, sparingly towards the North and in the United States. It is not however described as growing in Africa, Asia, or South America. The roots are black, stout, and very long and strong, the rhizoma is tufted, blackish, scaly, almost spherical, the young fronds make their appearance in April, growing in an erect position; by degrees they become horizontal, and at last pendulous. They arrive at maturity at the end of September, and continue in full vigour throughout the whole winter. The form of the frond is linear, elongated, and quite undivided, acute at the apex, and cordate at the base. This fern is the *Phyllitis* of Ray and all older botanists. It was once much in vogue as a medicine; Ray mentions it as an astringent, and speaks of its healing powers, applied as an ointment to wounds and ulcers. Lightfoot says it is used by the country people in Scotland as a vulnerary for burns and scalds, and we learn from the Flore Français that it is used in France as an astringent in cases of diarrhœa and hæmorrhage.

(Newman, *British Ferns*; Babington, *Manual of British Botany*.)

SCORPÆNA, a genus of Acanthopterygious osseous fishes of the family *Loricati*. Their heads are large, compressed, and more or less armed with spines or tubercles; the body is oblong and scaly. On the back is a single dorsal fin; the branchiostegous membrane has seven rays; and the jaws and palatines are armed with velvety teeth. They reside mostly on rocky grounds, feeding on crustacea and small fish. One only inhabits our seas, and is very rare, the Bergylt, or Norway haddock, a fish resembling the perch and attaining a length of two feet and more. In the Mediterranean are some beautifully-coloured species of this genus.

SCOTLAND, CHURCH OF. The constitution of this church has been considered under the heads of GENERAL ASSEMBLY, P. C., and SESSION, KIRK, P. C. An important portion of its history, throwing light on its present position, is narrated under the head FREE CHURCH, P. C. S. It remains only chronologically to mention the chief events in the history of the church. The main struggles of the reformation in Scotland date at the middle of the sixteenth century. On 1st August, 1560, a convention parliament abolished the Romish hierarchy, and on 20th December of the same year, the first general assembly was held in Edinburgh. In the ensuing year, the 'First Book of Discipline,' still an important part of the ecclesiastical code of the established church and the various sects into which the Presbyterians of Scotland are now divided, was compiled. The fundamental principles of the reformed church were passed into an act of parliament in 1567 (Act 1567, c. 3), with the title: 'The Confession of the Faith and Doctrine believed and possessed by the Protestants of Scotland, exhibited to the Estates of the same Parliament, and be their publick Votis authorized, as a Doctrine grounded on the infallible Word of God.' This constitution however had more reference to doctrine than to church polity. It condemned some of the more prominent features of the system of the abjured hierarchy, but did not contain any announcement of the new system of church government. The early constitution of the church as approved of by Knox and his friends, admitted of a difference of grades, certain clergymen being called 'Superintendents' of Provinces, which actually or nearly corresponded with the bounds of the old bishoprics. The Presbyterian polity was at length established by the act of 1592 (c. 114), called 'Ratification of the Libertie of the trew Kirk: of Generall and Synodall Assemblies: of Presbyteries: of Discipline.' In the mean time, those who had been the zealous clerical supporters of the reformation expected that the temporalities of the Roman Catholic church, or at least a considerable portion of them, would be applied to ecclesiastical purposes under the new system. They found however that the powerful laymen who assisted in the demolition of the old system had very different views. They spoke of this notion as 'a devout imagination,' and kept by far the larger portion of the spoil to themselves. After some hard struggles, in which the national feeling in favour of Presbyterianism was driven very nearly to an outbreak, Episcopacy was re-established by the parliament of 1612. In 1637, the celebrated Liturgy, concocted by Laud and West, on principles nearer approaching to the Roman Catholic forms than those of the English Liturgy, created the convulsions which ended in the civil war and the re-establishment of Presbytery. On this occasion, great part of the assistance which the Covenanters received from the landed gentry was owing to their dread of a plan for restoring church lands to the hierarchy. On the restoration of Charles II., all the acts of the previous reign subsequent to the year 1623 were 'rescinded' or repealed, and consequently the Episcopal form of church government was restored. The persecutions that arose out of the attempt to enforce this system on a people who abhorred it the more, the more stringently it was enforced on them by penal laws, is well known in history. These laws were relaxed, but not in a manner to satisfy the Presbyterians, by the indulgences of James to all who differed with the established Episcopal church. At the revolution the presbyterian form was re-established. The followers of this system, who through the times of the hottest persecution did not ask to be *tolerated* but to be made an exclusive establishment, now thought that the hour was come for the 'extermination' of their opponents; but they were told by King William that that was a word not in his vocabulary. In 1699 lay patronage was abolished by an act of the Scottish parliament. It was re-established by an act of the British parliament in 1710. This act created many disputes in the church; it occasioned the secession of 1736, elsewhere mentioned [Erskine, P. C. S.], and it was the cause of the great severance in 1843 [Free Church, P. C. S.]. In the same year with that severance an act was passed for modifying the right of patronage, called 'Lord Aberdeen's Act,' (6 & 7 Vict. c. 61, passed 17th August, 1843): a measure said to have been passed for the purpose of satisfying the scruples of some clergymen who would not remain in the church as it was, but would be content with a less comprehensive measure than the Veto Act. The difference between these two systems was, in the first place, that the Veto Act bore to be passed by authority of the church, its supporters denying that they required the interposition of any lay legislature. By that measure, the simple objection, of a certain number of the male communicants without any reason given, was a cause of disqualification to a presentee. By Lord Aberdeen's Act, any members of the congregation may object to the presentee, stating their objections: and the church courts, if they think them good, whether in their general tenor, or with respect to the particular circumstances of the charge, may give effect to them by rejecting the presentee.

SCOTT. [Eldon, Earl of, P. C. S.]

SCOTT. [Stowell, Lord, P. C. S.]

SCREW-PILES. [Sea-Lights, P. C. S.]

SCREW-PROPELLER. [Steam-Vessel Screw, P.C.S.]

SCROPHULA'RIA (so named from its supposed use in cases of scrofula), a genus of plants belonging to the natural order Scrophularineæ. It has a 5-parted nearly equal calyx, a globose corolla, with a short 5-lobed limb, the segments of which are rounded, and the uppermost united into an upper lip. The style is simple thickened at the apex, the stigma emarginate. There are four fertile didynamous declinate stamens, with the rudiment of a fifth appearing. The species are herbs or under shrubs with an unpleasant smell.

S. peregrina, Figwort, has cordate shining glabrous leaves, alternate peduncles from 2 to 5 flowered, the lobes of the calyx not membranous, glabrous and acute. The stem is acute-angled at the base, but obtuse angled at the apex, and of a dark purple. The leaves are full of pellucid dots. The corollas small, purple, and veiny, the lobes all denticulated. This species is the γαλιόψις of Dioscorides, 4. 95.

S. nodosa has a nearly smooth herbage, which when bruised smells like elder. The root is whitish, tubular, and beset with fleshy knots. The leaves are stalked ovate oblong, acute, sharply and unequally serrated, heart-shaped at the base, where they are cut away as it were to the two small lateral ribs. The flowers are a little drooping, the corollas of a dull green, with a livid purple lip, the calyx is smooth, the capsule ovate oblong. The leaves and roots are said to be purgative and emetic. They have a bitter taste and a disagreeable smell. A decoction is used by farmers to cure the scab in swine. Wasps greatly resort to the flowers. Goats eat the plant, but all other animals refuse it. It is native mostly throughout Europe.

S. aquatica has an entirely fibrous root. It is a smooth plant of a deep shining green colour, the stem is quadrangular downy, the leaves copiously and finely serrated, heart-shaped at the base. The flowers are in clusters, their tube is green, the corolla of a deep red. The capsule globular. This plant is called ***Water Betony***, ***Bishop's leaves***, and ***Broadwort***. Its medicinal properties are the same as those of *S. nodosa*. It is called by the French herbe du siége, because during the siege of Rochelle by Cardinal Richelieu the garrison supported themselves in extremity by eating the roots.

M. Marchant has reported, in his memoirs of the French Academy, that the plant is identical with the *Equetaia* of the Brazilians, celebrated as a corrective of the unpleasant flavour of senna. The Edinburgh college, in their common infusion of that drug, formerly sanctioned its use, but as they have discontinued it, we infer that it was not found to exercise the desired effect. The disagreeable smell of the plant causes cattle to reject it as food. Bees collect much honey from the flowers.

There are 73 species of Figwort, of these six are recognised British plants. They are of very easy culture and propagation, but prefer a moist situation. They are all readily propagated by seeds. The shrubby species require protection during the winter in a frame.

(Don, *Gardener's Dictionary*; Babington, *Manual of British Botany*; Burnett, *Outlines of Botany*.)

SCUTELLA'RIA (from the Latin 'Scutella,' 'a little saucer,' in reference to the form of the calyx), a genus of plants belonging to the natural order Labiatae. It has a campanulate bilabiate calyx, the lips entire, the upper one with a concave scale on its back. The tube of the corolla, much exserted, 2-lipped, the upper lip concave. The filaments simple; the anthers of the two longer and inferior stamens 1-celled, of the shorter and superior one 2-celled. The species are annual or perennial herbs, rarely shrubs.

S. galericulata, Skullcap, has branched divaricate stems, leaves on short petioles, oblong, lanceolate, cordate below, crenate, serrate; flowers axillary, opposite, and on short pedicels. The corolla is large and blue. The whole genus is remarkable for being provided with a curved, elongated support to its nut. This species was once considered efficacious in certain fevers. It is plentiful in Europe, Asia, and North America, in humid places, and in Britain.

S. minor, smaller Skullcap, is a humble glabrous plant, with its leaves on short petioles, the lower ones broadly ovate, the middle ones ovate-lanceolate with the base cordate, the upper ones lanceolate, rounded at the base; the flowers axillary, opposite, secured; the corolla almost glabrous, with the throat hardly dilated. It is native of Europe and Siberia, in damp places, and of Great Britain.

S. lateriflora has erect fleshy stems, petiolate ovate lanceolate acuminated leaves rounded at the base; the upper floral leaves hardly exceeding the calyxes, the racemes axillary and terminal, the flowers opposite and secund. It is native of North America, on the margins of ponds, and was once extolled as a remedy for hydrophobia, but on no good grounds. Most of the species of *Scutellaria* are very pretty ornamental plants, and will grow in any common soil.

(Don, *Gardener's Dictionary*; Babington, *Manual of British Botany*; Lindley, *Flora Medica*.)

SCYLLI'ODUS, a genus of fossil fishes. (Agassiz.) From the chalk.

SCYPHIA, a fossil genus of Spongiadæ. Chiefly in the chalk. (Goldfuss.)

SEA-LIGHTS. Since the publication of the article Light-Houses, P. C., p. 478, some changes have been effected in the management of the coast-lights and beacons of the United Kingdom, and many important inventions for increasing the efficiency of sea-lights have been introduced. Our brief notice of these will be chiefly founded upon the Report of the Select Committee of the House of Commons on Light-Houses, in the session of 1845, and upon two papers on 'Recent Improvements in Light-Houses,' published in the 'Penny Magazine' for 1842, pp. 286 and 294.

The Select Committee of 1845, having directed their attention chiefly to the alterations made in the lights and light-house establishments of the British Islands subsequently to the date of the Report of the Committee of 1834 (extracts from which are given under Light-Houses), report that by an act of 1836 (6 & 7 Will. 4, c. 79), all light-houses and sea-marks on the coasts of England were vested in the corporation of the Trinity House [Trinity House of Deptford Strond, P. C., p. 245], which was empowered by the act to purchase the private light-houses of Harwich, Dungeness, Winterton, Hunstanton, and Orford, which were held by individuals under leases from the crown; the Smalls and Long-ships, which were held on leases under the Trinity House itself; and the Skerries, Spurn, and Tynemouth lights, which were held by private parties in perpetuity under acts of parliament. The purchase of these ten lights was effected (the last in September, 1842), at an expense, by way of payment for the interests of individuals, of 1,182,546*l.*; and the rights of the crown on the five first were surrendered 'on condition that the Possessions and Land Revenues of the Crown should be released from a debt of 300,000*l.* advanced by the consolidated fund' on their security. Thus, at a very large cost, the recommendation of the Select Committee of 1834 'to have all public lights placed under one board, and free from private claims' has, so far as England is concerned, been carried into effect, and, as the Committee of 1845 observe in their Report, 'parliament will thereby be enabled to legislate freely respecting them, in such manner as shall be considered best for the public interest.'

Sea-lights are commonly divided into two principal classes, of which the first, called in the Committee's Report *Public General* Lights, embraces such as are of use to all vessels passing the coasts; while the second, called *Harbour or Local* Lights, includes such as are intended specially for the use of vessels resorting to particular ports. The first class, or Public General Lights, are now, if in England, all under the management of the Trinity House; if in Scotland, under the Commissioners of Northern Lights; and if in Ireland, under the Ballast Board of Dublin. [BALLAST OFFICE CORPORATION, P. C., p. 330.] The second class, or Harbour or Local Lights, are 'managed, under powers given by the legislature, or emanating from other authorities, by corporations and local trustees,' who collect the dues necessary for their support; but, under the act of 1836, the Trinity House has a general superintendence over those of England, their sanction being necessary to the establishment of new lights, and they giving directions as to the kind of light to be used, to avoid interference with the general coast lights. In Ireland, all the harbour lights, with the exception of one at Belfast, are managed by the Ballast Board, who receive the dues and pay the expenses of maintenance in the same way as for the public general lights.

From returns laid before the committee of 1845, it appears that the number of lights of all kinds has been greatly increased within a few years, as will be evident from the following details. The comparative number of lights of various kinds in England in 1834 and 1844 was as follows:—

	1834.			1844.		
	Fixed.	Floating.	Total.	Fixed.	Floating.	Total.
Public General . .	57*	14†	71	65	26‡	91
Local or Harbour .	51	4	55	75	9	84
Totals . .	108	18	126	140	35	175

In Scotland (where, from the returns, all appear to be fixed lights), the numbers were—

	1834.	1844.
Public General	25	29
Local or Harbour	28	38
Totals	53	67§

In Ireland, at the same periods, the numbers were

	1834.			1844.		
	Fixed.	Floating.	Total.	Fixed.	Floating.	Total.
Public General .	23	3	26	27	3	30
Local or Harbour	14	0	14	30	0	30
Totals . .	37	3	40	57	3	60

in which returns are included 5 local lights which, in 1834, were not under the management of the Ballast Board, and, in the second division, 1 such (that at Belfast) which was still, in 1844, out of their jurisdiction.

The aggregate statement, without distinguishing floating from fixed lights, stands thus for the two periods:—

	1834.			1844.		
	Public General.	Local or Harbour.	Total.	Public General.	Local or Harbour.	Total.
England . . .	71	55	126	91	84	175
Scotland . . .	25	28	53	29	38	67
Ireland . . .	26	14	40	30	30	60
Totals . .	122	97	219	150	152	302

showing an increase in little more than ten years (for the returns dated 1834 refer, at least in some cases, to 1833, while those given under 1844 appear to be actually for that year), of 83 lights, classified as follows:—

	Public General.	Local or Harbour.	Total.
England . .	20	29	49
Scotland . .	4	10	14
Ireland . . .	4	16	20
Totals	28	55	83

* 42 belonging to the Trinity House, 1 under their management, and 14 in private hands: viz. 3 on lease from the Trinity House, 7 on lease from the crown, and 4 held by patent and act of Parliament.

† 13 belonging to the Trinity House, and 1 onder their management.

‡ Including 1 at the Plymouth Breakwater, which is given separately in the Committee's Report.

§ There were, at the date of this return, only 25 poblic general lighthouse stations, but as four of these, viz. the Isle of May, Pentland Skerries, Pladda, and Girdleness, were *double*, that is, had two light-houses each, the number of lights was as given in the text. Three new light houses, not included in the return, were stated to be in preparation. In addition to the 38 permanent local or harbour lights reported, there were some used in the fishing season only.

In addition to the above there were, in 1844, 7 local lights belonging to the Isle of Man, which, not having been included in the returns for 1833, we have omitted in those for 1844. These raise the number of local lights for the United Kingdom to 159, and the gross number of lights to 309.

Of the 94 fixed general lights in England and Scotland 76 were, in 1844, *catoptric* lights, with an aggregate number of 1098 burners, which gives an average of nearly 14½ burners to each light, and 18 were *dioptric*, of power equal to an aggregate of 258 burners, which gives an average power of 14⅓ burners to each light. The aggregate illuminating power of the fixed general lights in England and Scotland was, therefore, equal to 1356 burners, while that of the 25 English floating general lights (exclusivo of that at Plymouth breakwater) was 288 burners, giving an average power of 11½ burners to each light. In Ireland the 27 fixed general lights had an aggregate power of 583 burners, which gives an average of rather more than 21½ per light, and the 29 harbour lights under the Ballast Board an aggregate of 216 burners, which gives an average of rather less than 7½ per light.

From the evidence laid before the committee of 1845 it would appear that the public general lights of the United Kingdom are in an efficient state, and, according to a witness who had ample opportunities of comparison, on the whole superior to those of the United States of America; but while no complaints were made of their want of brilliancy or general efficiency, many were laid before the committee, both by petitions and from witnesses, of the high charge for light dues, the mode of levying them, or the irregularity of their rates. How greatly the gross amount levied upon commerce in the shape of light dues has increased since the date of the Report of 1834, will be seen from the following comparative statement of dues levied in each division of the United Kingdom in 1832 and 1843. The return for England and Scotland appears to apply solely to general coast lights, no complete account being given of the dues from harbour lights; but that for Ireland embraces such, they being, as before stated, in the hands of the Ballast Board. Of the dues levied in England in 1832, only 83,041*l.* belonged to the Trinity House, and 79,676*l.* to private individuals; but in 1843 the whole fell into the hands of the Trinity House.

	1832. £.	1843. £.	Increase. £.
England	162,717	257,776	95,059
Scotland	35,526	43,840	8,314
Ireland	42,061	55,289	13,228
Totals . . .	240,304	356,905	116,601

From the statements laid before the committee of 1845, it appears that these charges, which, in consequence of the general reduction of freight and the competition to which ship-owners are increasingly subject, are becoming more and more oppressive to trade, are not only far higher than is necessary for the mere maintenance of the lights, but are also levied in such a manner as to press with peculiar severity upon particular branches of the shipping interest. Steam-packet companies especially complain of the amount of the dues as compared with the advantages derived. The Peninsular and Oriental Steam-packet Company state that four of their vessels employed on the Peninsular line, of an average tonnage of 368 tons, and making fifty-two voyages in the year 1844, paid 12*l.* 7*s.* 4*d.* per voyage for light dues, or 643*l.* 1*s.* 4*d.* in the course of the year; and that two others, plying between Southampton and Alexandria, averaging 888 tons each, and making twelve voyages in the year, paid 29*l.* 14*s.* per voyage, or 356*l.* 8*s.* per annum. One case that appears of peculiar hardship is that of a small steamer plying between Granton, in the Firth of Forth, and Dundee, completing its voyages entirely by daylight, and therefore deriving no benefit whatever from the lights, but which, nevertheless, paid dues to the following amount in one year, during which it was at work for forty-nine weeks, and three weeks refitting:—

Thirteen weeks of double voyages, at 16*l.* 13*s.* 9*d.* per week	212*l.* 18*s.*
Thirty-six weeks of single voyages, at 10*l.* 10*s.* per week	489*l.* 6*s.*
Total for forty-nine weeks . .	702*l.* 4*s.*

On the coasting trade also the light dues are found very burdensome, especially where the competition of railways is felt. One vessel employed in the coal-trade, of which particulars were laid before the committee, made in the years

1843 and 1844 thirteen voyages, with an average load of 400 tons, earning a gross freight of 2007*l.* 18*s.* 1*d.*; out of which 69*l.* 10*s.* 7*d.*, or more than 3½ per cent., had to be paid for light dues; and Mr. Ogilby, a London shipbroker of forty years' standing, stated in evidence 'that the traders to the principal ports of Ireland have paid on the average 5*s.* 1½*d.* per ton on the average of the year; that vessels from the Mediterranean and the South of Europe, making a less number of voyages, pay 3*s.* 6½*d.* per ton; and ships to India and China, making one voyage in the year, 1*s.* 1¾*d.* per ton; and that the coasting trade, now in the greatest depression, would consequently benefit the most by the abolition of the light dues.' The following table, compiled from the returns given in the Committee's Report, show what proportion of the light dues of each division of the United Kingdom is derived from each class of ships.—

	England. £.	Scotland. £.	Ireland. £.	Total. £.
Coasting trade . . .	126,673	27,743	19,991	174,407
British over-sea vessels	97,454	11,601	24,718	133,773
Foreign vessels . .	33,648	4,496	18,580	48,724
Totals . . .	257,775*	43,840	55,289	356,904*

The light-dues are, it should be observed, charged upon the whole tonnage of a vessel, however small may be the cargo actually on board; 'indeed,' observes the Report, 'if one ton, or one box, or one passenger paying freight be on board from port to port, light-dues for the whole ship's tonnage is invariably charged; and consequently the ships often are sent in ballast from port to port rather than take a small quantity of cargo; a course of proceeding which, in the corn-trade of Ireland, operates very injuriously on the merchants, and on the consumers in the smaller ports to which the vessels go for corn.'

Of the recommendations of the Committee of 1845 for removing the evils complained of we need say very little, especially as nothing has, down to the close of the session of 1846, been done to give them legislative effect. Their principal features are the proposed transfer of the management of all public lights, buoys, and beacons, on the coasts of England, Ireland, and Scotland, to one central board, which it is suggested should be the Corporation of the Trinity House, with some modifications in its constitution; the defraying by government of the heavy debt incurred by the Trinity House in buying up private lights; and the future maintenance of public lights, buoys, and beacons either out of the public revenues of the country, or by a small tonnage-rate on all the registered tonnage of the United Kingdom, and all colonial and foreign vessels entering its ports: such rate being made only sufficient for the purpose, instead of producing, like the present light-dues, a large surplus revenue for pensions and charitable purposes. They suggest that it may deserve to be considered whether the ships of the Navy, and those in the Customs, Excise, and Preventive Service should continue to be, as they now are, exempted from the payment of light-dues; and they conceive that a more economical mode of collection, by the agency of the officers of Customs, might be substituted for the present.

One interesting department of the investigations of the late parliamentary Committee is that relating to the cost of various modes of illumination. Their Report states that for many years past the French have used colza or rape-seed oil, which costs about 3*s.* 8*d.* per gallon, while the best sperm oil, which is usually burnt in English light-houses, costs from 6*s.* to 8*s.* per gallon. It is admitted that a greater quantity of colza than of sperm oil is necessary to produce the same effect, yet some of the witnesses examined expressed an opinion that one-half of the expense of the oil consumed might be saved by its use, and how seriously any such saving would affect the general cost of maintaining light-houses may be perceived from the statement that, out of 701*l.*, the total expense of the Flamborough light in 1843, 303*l.* was expended upon oil, and that in the Dungeness light-house the same item amounts to 229*l.* in a total expenditure of 532*l.* Mr. Alexander Gordon, however, in his evidence, objects to rape-seed oil because, in common with all other vegetable oils, it wastes by burning to overflow, and occasions increased labour in trimming the lamps. He greatly prefers sperm oil, notwithstanding its cost, and places next to it some of the South Sea whale oils, and then cocoa-nut and palm oils. In the United States, where the cost of maintaining light-houses is far less than in this country, experiments have been made on the comparative economy of various substances, from which it appears that, burning for the whole night, and giving the same degree of light,

3·05 burners using	lard-oil	cost	32·49	cents.
5·00 ,, ,,	resin-gas	,,	88·47	,,
and 10·00 ,, ,,	sperm-oil	,,	105·95	,,

The following statement shows the average total cost per burner and per light-house of the public general lights of each division of the United Kingdom, and of the harbour-lights of Ireland, in 1843 or 1844. It indicates an important reduction on the returns of 1832, the average cost for the United Kingdom being 459*l.* per annum in 1843-44, and 508*l.* in 1832:—

	Per burner. £.	s.	d.	Per light-house. £.	s.	d.
England (1843) . .	31	14	6	409	0	0
Scotland (1843) . .	29	13	0	516	0	0
Ireland (1844) . .	22	13	9	454	0	0
Ditto, harbour-lights	26	4	0	195	0	0

We may conclude our statistical returns for England by noticing the number of buoys and beacons maintained by the Trinity House, and add, for the sake of comparison, some figures relating to the sea-lights of France and America.

The beacons in charge of the Trinity House in 1834 were 33, and in 1844, 48, showing an increase of 15. In 1833 the number of buoys under the same management was 227, and in 1844, 299, being an increase of 72. The beaconage and other dues levied by the Trinity House in 1843 for beacons and buoys amounted to 14,207*l.* 0*s.* 10½*d.* No corresponding dues are charged in Scotland and Ireland by the Northern Lights Commissioners and the Ballast Board, and the Light-houses Committee of 1845 recommended the abolition of such in England.

In France the light-houses and harbour-lights are all under a public board, and their expenses are paid out of the treasury, and met by levying a port-charge of 10*d.* per ton upon shipping instead of light-dues. There were, in 1834, 23 light-houses and 51 harbour-lights, making a total of 74; of which 29 were provided with lenticular apparatus, the nature of which is explained under LIGHT-HOUSES, P. C. The establishment of new lights has there proceeded more rapidly than with ourselves, the number having more than doubled in about ten years. In April, 1845, it was reported as 52 general coast light-houses and 101 harbour-lights, making a total of 153; of which 98 have lenticular apparatus. Some of these lights being grouped in twos and threes, the total number of light-house stations or separate establishments is only 108.

In the United States of America, where the lights are supported by the general government, there were, on the 1st of July, 1842, 242 fixed and 30 floating lights, having an aggregate power of 2671 burners.

In adverting to some of the more important mechanical improvements recently introduced in the construction of light-houses, we may first notice the construction of such buildings wholly of iron or other metal. Though first carried into effect by Mr. Alexander Gordon, this improvement would appear, from the first of the papers already referred to in the 'Penny Magazine,' to have been previously suggested by the ingenious Captain (afterwards Sir) Samuel Brown, who is best known for his share in the introduction of suspension-bridges and piers, and who proposed to erect a light-house of either iron or bronze upon the Wolf Rock, near the Land's End. His plan was to construct a tower 90 feet high, 14 feet in diameter at the bottom, and 4 at the thinnest part, composed of several truncated conical pieces of cast metal, fitting one another like the joints of a telescope. Within the body of this metallic column were to be sleeping-berths for the attendants, and store-rooms for provisions, fuel, water, and oil; and at the top was to be the keeper's house, surrounded by an open over-hanging gallery, and surmounted by the lantern. Captain Brown conceived that such a structure would possess the advantages of being much less costly than a stone light-house; of requiring much less time for its erection; of presenting a much narrower surface for the sea to act against; and of greater security and stability, seeing that it was intended to have but eight joints from the ground to the lantern, while a stone structure would have many thousands, and that, the whole circumference of each stage or story being cast in one piece, it would be capable of resisting enormous pressure.

Captain Brown's simple and ingenious design was not carried

* The discrepancy of 1*l.* between these sums and those in a preceding table arises, we presume, from the omission of fractions. The *items* given above are as in the Report.

into effect, but a cast-iron lighthouse on a somewhat different plan was erected in 1842, by Mr. Alexander Gordon, upon an unhealthy lagoon in Jamaica, where, owing to local difficulties, it was computed that a tower of masonry could not have been constructed for less than 20,000*l.*, or in a less period than six years, with the almost inevitable loss of many lives. For this locality Mr. Gordon designed an iron tower formed on the model of the antient Celtic round towers of Ireland. The erection was determined on by the commissioners in Jamaica on the 8th of March, 1841; eight months after that date it was ready for shipment; and it was ready for lighting early in August, 1842, though not actually lighted until November. The cost of the tower and lantern, including the fitting up in London, taking to pieces, packing, and shipping for its destination, was 3,500*l.*, and the putting up (exclusive of the excavation of the coral rock upon which it stands) cost about 600*l.* additional. The diameter of the tower is 18 feet 6 inches at the base, and diminishes regularly to 11 feet at the top; and instead of being formed, as in Captain Brown's plan, of a few large castings, each embracing the whole circumference, it is formed of nine tiers of cast-iron plates, each 10 feet high, from 4 feet to 5 feet wide, and nearly an inch thick, the circumference being composed of eleven such plates at the base of the tower, and nine at the top. These are cast with flanges all round their inner edges, and, when put together, these flanges form the joints, which are fastened together with nut-and-screw bolts, and caulked with iron cement. The cap or top of the column consists of ten radiating plates, which form the floor of the light-room, these being secured to the tower upon twenty pierced brackets, and finished above by an iron railing. The lantern is also of iron, glazed with plate glass, and it is supplied with a revolving light, consisting of fifteen Argand lamps and reflectors, five in each side of an equilateral triangle; so arranged as to produce a continuous light, but with periodical flashes. The tower rests upon a coral rock, upon which is laid a grooved course of granite to receive the flange of the lower plates, from which lightning conductors extend into the sea. The base is also encased with granite, to protect the iron from the action of such sea-water as might filter through the stratum of sand which covers the coral rock; and the protection is increased by coating the exterior of the iron with tar. The interior of the tower, to about one-fourth of its height, is filled up with masonry and concrete so as to form a solid core, which imparts great stability to the structure; and above this are the necessary rooms. Of the precise nature of the arrangements actually adopted for securing comfort in this singular habitation we are not informed, but it is stated in the 'Penny Magazine,' on the authority of a paper in the 'Civil Engineer's Journal,' published while the structure was yet in progress, that in order 'to preserve as low a temperature as the circumstances and climate will permit, the iron shaft or tower is to be lined with a non-conducting material, such as slate or wood, leaving an interstice through which a constant ventilation will be effected, so as to carry off the excessive heat.' In his evidence before the parliamentary committee of 1845 Mr. Gordon stated that a taller and better lighthouse of similar construction was in progress for Bermuda, which would weigh about 120 tons, and would contain in its base about 450 tons of masonry and concrete. Among the numerous advantages of this kind of lighthouse may be mentioned their superior safety in thunder-storms, the whole structure constituting a great unbroken conductor for the lightning; and the safety arising from the whole being virtually in a single piece, and therefore far better able than a tower of masonry to resist the shocks of earthquakes, to which, as well as to violent thunder-storms, the Jamaica lighthouse has been repeatedly exposed. The iron-work is so constructed as to be readily put together from inside, without any external scaffolding; and these, in common with other iron lighthouses and beacons, have the convenient property of being easily removable, in case the shifting of sands or any other circumstance should render a change of position desirable; a contingency which, as will be seen by reference to SUNDERLAND, P. C., p. 295, has already occurred, and which is very likely to recur as the substitution of fixed for floating lights in the vicinity of shifting sands, and the general extension of harbour lights, proceeds.

A somewhat similar construction of lighthouse was proposed in 1836 to a Select Committee of the House of Commons on Shipwrecks, by Mr. Bush, as suitable for erection on the Goodwin Sands, where the extreme difficulties of the locality have hitherto deterred the Trinity House from establishing any other than a floating light or light-ship. Mr. Bush's plan, as then proposed, was to construct, on land, a wooden truncated cone 100 feet high, 60 feet in diameter at the base, and 20 feet at the top, surrounded by another similar cone which should be in contact with it at the base, but, diminishing less rapidly as it rose, should gradually recede from it towards the upper part. The interveuing space between the two was to be filled with sand or other heavy materials after the structure was floated to the required position, so as to sink it in the sea until it found a firm bottom. The sand included in the inner cone was then to be drawn out, leaving the double cone as a kind of cofferdam, and its place supplied with a solid mass of masonry or concrete, which might form a secure foundation for an iron lighthouse. The outer cone might, it was suggested, be eventually removed without endangering the structure. Since 1836 Mr. Bush has, at his own expense, partially carried out his scheme in a modified form, using a cylindrical caisson of iron 64 feet high and 30 feet in diameter in lieu of the proposed timber cone; but it appears by the evidence laid before the Lighthouse Committee of 1845, that the Trinity House refused to sanction the lighting of his unfinished structure, and that some of its officers deemed Bush's plan to be impracticable. Mr. Bush proposed not merely a lighthouse, but an extensive asylum for shipwrecked sailors, and even the construction of a harbour of refuge at the Goodwin Sands. In connection with this scheme we may notice, though not strictly falling within the limits of our subject, the experimental safety-beacon erected in 1840 upon another part of the same dangerous sands by Captain Bullock. This beacon, which is intended simply as a refuge for shipwrecked sailors, and not for a light, nor even as a beacon of direction, consists of a strong mast or spar about 40 feet high, surmounted by a flag-staff 10 feet high, and supporting, near its upper extremity, a gallery 9 feet in diameter, constructed principally of sail-cloth, and capable of holding forty persons, to which access may be obtained from below by means of ropes and cleats or notches in the mast. The mast or shaft is secured to a massive platform of oak, sunk several feet below the surface of the sand, and loaded with upwards of three tons of iron ballast; and it is further supported by oblique bars of iron and chains. The mainmast or shaft of the beacon stands 30 feet above the dry sand at low water, and 17 feet 6 inches above high water at spring tides. In the gallery is placed a barrel of fresh water and a bag containing a blue flag, which is to be hoisted when assistance is required from the land, which is seven miles distant; and to render the beacon available to all who are likely to make use of it, directions to 'hoist the flag' are painted in eight different languages on the sides of the gallery.

Perhaps the most curious recent invention connected with our subject is that of Mr. Alexander Mitchell, of Belfast, for constructing lighthouses and beacons entirely supported by piles, which, instead of being driven into the ground like ordinary piles, are screwed in by the aid of a peculiar kind of screw attached to their lower extremities. These screws, which were first employed instead of mooring-anchors, are of cast-iron, and consist of a broad thin plate or share winding round, and attached by its edge to an axis or shaft, the diameter of the screw being from two to five feet, and the thread or share taking only one turn and a half round its axis, and having its outer edge sharp, so as to cut its way readily, when the axis is turned round by suitable means, into sand or earth, while its broad surface offers great resistance to any attempt to pull it out of its place. The great success of this invention, as applied to moorings, led to the attempt to apply it to the erection of lighthouses upon sands, for which purpose it bids fair to become highly important, as such lighthouses may be erected where there is not sufficient depth of water to moor a light-ship, and fixed lights are always more secure and less expensive to maintain than floating lights. The first screw-pile lighthouse was commenced on the Maplin sands, at the mouth of the Thames, in 1838, by screwing into the sands eight wrought-iron shafts, arranged so as to form an octagon of about 40 feet diameter, with a slight inclination inwards at the upper extremities, and a ninth perfectly upright, in the centre. These shafts were about 25 feet long, and were screwed 20 feet into the sand; and to their upper ends were secured a series of cast-iron pillars, strongly braced and bound together, supporting a massive timber framework upon which is built the lighthouse, comprising store-rooms and apartments for the keepers. This lighthouse was not completed until February, 1841; but in

November, 1839, a similar stru ture, supported upon seven instead of nine piles, was commenced at the mouth of the river Wyre, to facilitate the entrance of shipping into the new port of Fleetwood, which was completed in June, 1840, at a cost of about 3500*l.* In both these structures the supporting framework is left open to a considerable height above the highest water-line, so that they present no extended surface for the waves to beat against, and are thus protected from the violent shocks to which other lighthouses are subject. A third lighthouse of similar character was erected in Carrickfergus Bay in 1844, at a cost, for materials and labour only (Mr. Mitchell giving his services as engineer gratuitously), of only 1300*l.*, although the building, being used also as a pilot station, is large enough for the residence of twelve or more men, and has accommodation for suspending to the framework two heavy pilot-boats. Economy of maintenance appears to be as striking a feature of this kind of lighthouse as economy of construction, that at Fleetwood having, in the five years between its erection and the date of Mitchell's evidence before the committee of 1845, cost nothing for repair beyond occasional painting. It has been suggested that life-boats might be kept suspended to such lighthouses, like the pilot-boats at Carrickfergus Bay. The parliamentary report of 1845 refers to another mode of inserting piles in sand for the purpose of supporting lighthouses, the invention of Dr. Potts, as being under experiment by the Trinity House. It is stated to consist in the sinking of hollow cylinders by pumping out the air from their interior, and thus forcing them into the sand by atmospheric pressure.

Some ingenious suggestions of Mr. Alexander Gordon, which are fully explained and illustrated in the Committee's report, relate to the use of a kind of hollow iron tower or funnel in light-ships, through which the lanterns might be hoisted and lowered for trimming more safely and conveniently than when attached to a mast, and through which men might ascend when necessary to attend to the lights, secure from the effect of rough weather; and also to a plan for distributing in foggy weather, by means of revolving paraboloids or parabolic reflectors, the sound of a powerful whistle, constructed like the steam-whistle of a railway locomotive.

The second of the two papers above referred to in the 'Penny Magazine' contains a notice of an important suggestion made by Captain Basil Hall in a letter to the 'United Service Journal,' in reference to revolving lights. A fixed light, if required to be seen in one direction only, may be readily mounted with a parabolic reflector, so as to show at a very great distance; but where the light is required to be seen in all directions a difficulty arises, because, even supposing twenty-four distinct lamps, each having its own reflector, to be arranged in a circle, they will, owing to the light being reflected forward in parallel rays, only light so many points of the horizon, leaving the intervening portions in darkness, while at the same time the light will, from being so divided and scattered, be less efficient than if it were concentrated upon a smaller number of points. Hence arises one of the greatest advantages of revolving lights, for if, as the case is put by Captain Hall, instead of twenty-four lamps arranged at equidistant intervals round the circle, six be directed, by their reflectors, due north, six due south, six due east, and six due west, and then that part of the lighthouse upon which the four sets of lamps is mounted be caused to revolve upon a vertical axis, the four concentrated blazes of light, instead of illuminating only the four points to which they were originally directed, will light up, in succession, every part of the horizon, and that with a blaze of light six times more powerful than in the case first described. As, however, variety is essential to prevent one light being mistaken for another, it frequently happens that a fixed light must be adopted for the sake of distinction, notwithstanding its inferiority. Captain Hall suggests, therefore, that a revolving light might be made to rotate on its axis with such rapidity as to exhibit an unbroken line of light along its path, on the principle of a burning stick whirled round so as to produce the appearance of a circle of fire. If this could be accomplished, the resulting light would, with the superior brilliancy of the revolving light, be continuous in every direction.

An important improvement has recently been introduced by Professor Faraday in the ventilation of lighthouse lanterns, upon which a paper was read before the Institute of Civil Engineers on the 27th of June, 1843. The want of proper ventilation in ordinary lanterns occasions the production, by the combustion of the oil, of water and carbonic acid. The water condenses upon the glass windows and dims them, while the carbonic acid often renders the air in the lantern so irrespirable as to render it very difficult for the keepers to attend to their duties. Owing to the exposed position of lighthouses generally, ordinary means of ventilation, by allowing the free admission and egress of air, are inapplicable; but Mr. Faraday, having his attention directed to the subject by the Trinity House, has devised a kind of chimney which has answered well, and which does not endanger the lights by permitting gusts of wind to get into the cowl. The contrivance is pretty fully described in an abstract of the paper referred to, in the 'Athenæum' for 1843, p. 637.

SEA-NETTLE. [ACTINIA, P. C.]

SEAMEN. *Employment, Wages, &c., of Merchant Seamen.*—The 5 & 6 Wm. IV. c. 19 repealed all former acts which regulated the hiring of seamen; and the 5 & 6 Wm. IV. c. 19 has been repealed, (except so far as such act repeals the acts thereby repealed, and except so far as relates to the establishment, maintenance, and regulations of the office called 'The General Register Office of Merchant Seamen'), by the 7 & 8 Vict. c. 112, which contains the present law relating to merchant-seamen and for keeping a Register of them. This act contains sixty-four sections: s. 2, &c. regulate the agreement of hiring seamen; s. 6, &c. assign the punishment of seamen for refusing to join the ship, or absenting themselves from it; s. 9 fixes the forfeiture for desertion; s. 11 the periods within which wages must be paid; s. 15 provides a summary mode of recovering wages not exceeding twenty pounds; s. 17 provides for seamen being sent home when the ship is sold in a foreign port; s. 18 regulates the supply of medicines, lime or lemon juice, and other things necessary for the health of the crew, and declares in what cases there shall be a physician, surgeon, or apothecary on board; s. 19, &c. provide for a general register and record office of seamen; s. 31 provides for the disposal of the effects of seamen who die abroad elsewhere than on board a British ship, and leaving money or effects not on board such ship; s. 32, &c. provide for apprenticing parish boys to the sea-service; s. 46 provides against masters of ships discharging seamen at any of her Majesty's colonies or plantations, or at any other place abroad, except as herein provided; s. 50 provides for seamen being at liberty to leave any ship and enter the naval service of her Majesty; s. 58 provides for offences against the property or person of any subject of her Majesty, or of any foreigner, committed at any port or place, either ashore or afloat, out of the dominions of her Majesty, by the master and crew; s. 61 declares in what cases this act shall not apply.

Seamen in the Royal Navy and *Impressment.*—It is stated by Blackstone, on the authority of Foster, 'that the practice of impressing and granting power to the admiralty for that purpose is of very ancient date, and hath been uniformly continued by a series of precedents to the present time, whence he concludes it to be a part of the common law.' As impressment is effected by the king's commission, the power of impressment belongs to the crown. Barrington, in his 'Observations on Ancient Statutes,' p. 334, 5th ed., shows that the king used once to exercise the power of impressing men for the land service also, and even for his own private service, as in the case of goldsmiths. The legality of impressment is fully established, though the practice cannot be defended even on the ground of the safety of the state, until it has been shown that seamen for the royal navy cannot be procured by other means. The general rule is that all seamen are liable to impressment. There are several legal decisions as to the question who are seamen, and who may be privileged.

Volunteer seamen are induced to enter the royal navy by higher wages; and every foreign seamen who shall have served in a ship of war, a merchant-ship, or privateer for two years during a war, is thereby naturalized. The 7 & 8 Vict. c. 112, s. 32, enacts that overseers of the poor, or other persons having the authority of overseers of the poor, in and for any district, union, parish, township, or place in the United Kingdom, may put out as an apprentice in the British merchant sea-service, any boy who is twelve years of age and of sufficient health and strength, with his consent, who, or his parent or parents is or are chargeable to or maintained by such district, &c., or who shall beg for alms therein: the apprenticeship is to last till such a boy attain the age of twenty-one years, or shall have served seven years as an apprentice, whichever shall first happen. Section 33 of the same act provides for turning over, with their consent, of parish apprentices, who shall have been bound to a service on shore, to the sea-service, to be employed as is provided in the case of apprentices to the sea-service under s. 32, for the period then remaining unexpired of their apprenticeship. Section 37 provides that all British ships of the burden of eighty tons and upwards, except pleasure-yachts, shall have apprentices in proportion to their tonnage, as in this section provided; all which apprentices must at the time of being bound to British subjects be above twelve and under seventeen years of age, and be duly bound for four years at least. Section 50 provides, 'That nothing in this Act, or in any agreement contained, shall prevent any seaman or person belonging to any ship or vessel whatever from entering or being received into the naval service of her majesty, nor shall any such entry be deemed a desertion from the ship or vessel, nor shall such seaman or other person thereby incur any penalty or forfeiture whatsoever either of wages, clothes, or effects, or other matter or thing.'

The commerce of Great Britain gives regular employment to a vast body of seamen, and the habits and occupation of a large number of people on the sea-coast give them a relish and a capacity for sea-service. With the great increase of the commercial navy of Great Britain which has taken place of late years, and the prospect of still greater increase of commerce by the restrictions on trade being removed, we may always reckon on a sufficient number of seamen in the commercial navy to make up the deficiency in the royal navy in case of a sudden war. The apprenticeship system also is well devised to keep up a regular supply of young seamen. It is probable that ten or twenty thousand men might be at once drawn from the commercial navy for the royal navy on any emergency by offering them better wages, and thus the necessity of impressment might be removed. The amount of inconvenience that may be sustained by the merchant-service by the withdrawal of a great number of seamen at once, is the same, whether the seamen are impressed or go as volunteers; but to the inconvenience arising from the actual withdrawal of seamen by impressment must be added the loss and inconvenience to the merchant-service which may arise from seamen keeping out of the way in order to avoid being impressed.

SEDITION (from the Latin *seditio*). It is stated that in many of the old English common law writers treason is sometimes expressed by the term Sedition; and that when law proceedings were in Latin, *seditio* was the technical word used in indictments for treason, till it was superseded by the word *proditio*.

Sedition does not appear to be very exactly defined. It is stated to comprehend contemptuous, indecent, or malicious observations upon the king or his government, whether made in words only, or in writing, or by tokens (which last term must comprehend pictures or drawings), calculated to lower him in the opinion of the subjects or to weaken his government. All these offences fall short of treason; but they are considered crimes at common law, and punishable by fine and imprisonment.

There are also statutes against particular acts of sedition, such as seditious libels. [Law, Criminal, P. C. S., p. 176, No. 40.] There are also various acts against societies established for seditious and treasonable purposes, and against seditious meetings and assemblies.

The Roman sense of Seditio (*sed* or *se*, and *itio*, a going apart, a separation) is properly a disunion among the citizens, a riot, or turbulent assemblage of people for the purpose of accomplishing some object by violence or causing fear. It was included among other forbidden acts in the Lex Julia de Majestate. (Dig. 48, tit. 4.) It is often used in connection with 'tumultus' and 'turba;' and the three terms seem to have the same signification. (Rein, *Römisches Criminalrecht*, p. 522.)

SELIM III., son of Sultan Mustapha III., was born Dec. 24, 1761. Mustapha III. was succeeded by his only brother Abdu-l-Hamid, and Selim was shut up in the seraglio among the women and eunuchs. Abdu-l-Hamid died April 7, 1789, and Selim then became sultan. The principal events of his reign are related in the article Turkey, Turks, P. C., p. 404. He was deposed May 29, 1807, and Mustapha IV., son of Abdu-l-Hamid, was elected in his place. Selim was put in confinement, and was strangled by order of Mustapha, July 28, 1808. Mustapha was deposed immediately afterwards, and was succeeded by Mahmud II. [Mahmud II., P. C. S.; Mustapha IV., P. C.]

SELVA, GIANNANTONIO, was born of respectable parents, at Venice, June 13, 1753, and had for his earliest instructor his uncle the Abbate Gianmaria Selva, a man of considerable literary and scientific attainments. His inclination leading him to make choice of art as his future profession, he was placed under Pietro Antonio Novelli (a painter who died in 1804, aged 75); but after he had grounded himself in drawing and the elements of painting, he passed to the study of architecture, and became a pupil of Temanza [Temanza, P. C.]. In 1778 he set out for Rome, where besides studying the various architectural monuments of that capital, he became intimately acquainted with Pindemonte, Piranesi, Battoni, Quarenghi, and others, who either then were, or afterwards became distinguished names, for among them was Canova, with whom he visited Naples, Pompeii, Caserta and Pæstum. While at Rome, he also obtained the notice and favour of his countryman the noble Girolamo Zulian, who was there in quality of ambassador from the republic, and who was a liberal encourager of art. By him Selva was commissioned to embellish and fit up a saloon in his palace expressly for an entertainment given to the Archduke Ferdinand of Austria and his bride; before which he had been similarly employed by the Senator Rezzonico to decorate an apartment for him, which was to have been done by Quarenghi, but that architect was then obliged to depart for Russia. [Quarenghi, P. C.] On quitting Rome Selva visited France and England, in both which countries he diligently collected information of every kind bearing upon architecture and building; and returned to Venice at the close of 1780. There, as opportunity offered, he introduced various practical improvements, and among them greater attention to internal convenience and disposition of plan, setting also the example of a more sober taste in design. Among the private mansions on which he was employed, are the Casa Mangilli, that of Count Guido Erizzo, and the Palazzo Manin, which last, however (a work of Sansovino's), he only restored and altered in the interior, though it was at first intended to greatly enlarge the whole edifice according to fresh designs by him, and a model which is still in existence. He also rebuilt the Palazzo Pisani at Padua. The public work to which he owes his chief reputation is the celebrated Teatro della Fenice, erected 1790-91, his design for which was selected from among those sent in by twenty-nine other architects [Theatre, *Table*, P. C.]. Another structure of the same class designed by him was the theatre at Trieste, but in the execution of the work very great liberties were taken. A third theatre planned by him was never executed, but when he was some years afterwards at Florence, he found that parts of his design had been adopted for a theatre then lately erected there. To the above may be added the façade of the Casa Vigo d' Arzeri, and a Casino at Padua; the Casa Vela at Verona; the façade of the church Spirito Santo at Udine; the façade of San Maurizio at Venice, begun by Zogari, and left unfinished by Selva, after whose death it was completed with some modifications by Diedo. The same fate attended his last and most favourite work, the small church Del Gesù, which was finished after his death by Diedo (author of many of the architectural descriptions in Cicognara's 'Fabbriche piu cospicue di Venezia,') and Giuseppe Borsato. Selva died rather unexpectedly, at the beginning of 1819, and therefore could not have erected, as Nagler says he did, Canova's church at Possagno, the first stone of which was not laid till July 11th in that year. Two years before, indeed, he made a journey to Rome expressly to visit his friend the illustrious sculptor, and he may probably have then given the latter some hints and ideas, but beyond that he certainly had no share in the structure. Selva was also a writer upon subjects of his art; he as well as Diedo contributed to Cicognara's work abovementioned; and also translated Perrault's treatise on the orders, and Chambers's 'Civil Architecture.' There is a portrait and short notice of Selva in Gamba's 'Galleria de' Litterati.'

SEMIONOTUS, a fossil fish from the lias. (Agassiz.)

SEMITIC LANGUAGES. [Arabia, P. C., p. 218; Aramæan or Aramaic Language, P. C.; Hebrew Language, P. C.]

SENEBIERA (in honour of John de Senebier, of Geneva, a vegetable physiologist), a genus of plants belonging to the natural order Cruciferae. The pouch is somewhat kidney-shaped, entire at the end, or notched above and below, and almost 2-lobed, not bursting. The cells one seeded.

S. *coronopus*, common wart-cress, has an undivided uniform crested pouch with little sharp points, the pouches large in dense clusters. The leaves pinnate lobed. The stem much branched and prostrate. The sepals roundish, with white membranous margins. This plant was formerly gathered and eaten as a salad, but it has since been reasonably neglected, as it is acrid and unpleasant, and must require much boiling to render it eatable. It is native of Europe, North America, and England. It is the γλαύξ of Dioscorides, 4. 139.

S. didyma, has a pouch notched by two wrinkled lobes, an extremely short style, and pinnatifid leaves. The stem is spreading, about a foot in length. The flowers small and white in long lax clusters. It is found on waste ground near the sea in Great Britain.

S. nilotica is eaten as a salad in Egypt. As these plants possess no beauty, they are not worth cultivating except in botanical gardens.

(Don, *Gardener's Dictionary*; Babington, *Manual of British Botany*.)

SENTENCE. [Judgment, P. C. S.]

SEPARATION. [Wife, P. C.]

SEPTA'RIA, a genus of acephalous mollusks, belonging to the family Tubicolées in the arrangement of Lamarck, who defined the shell thus:—Tube testaceous, very long, gently attenuated posteriorly and divided internally by arched, incomplete partitions. Anterior extremity terminated by two slender tubes, which are not chambered in the interior. The *Septaria arenaria* is the type. It is the same shell described and figured by Sir Everard Home in the Philosophical Transactions for 1806, under the name of *Teredo gigantea*. It lives in sand in the Indian seas. A second species, unknown to Lamarck, lives in the Mediterranean, and has been described by M. Matheron, who has shown that the animal is similar to that of Teredo. M. Deshayes considers the two genera identical, and his opinion will probably be hereafter adopted by most naturalists.

SEQUESTRATION. [Benefice, P. C. p. 221.]

SEQUESTRATION (Scotland). [Bankruptcy, P. C. S.]

SERAMPORE MISSION. A brief account of the origin of the Baptist Missionary Society, and of the history of this, one of the most important establishments connected with it, having been given under Missions, P. C., p. 270, an article under this head is chiefly required to supply the omission in its proper place of a memoir of William Carey, D.D., its principal founder.

Dr. Carey was the son of the master of a small free-school at the village of Paulerspury, in Northamptonshire, where he was born on the 17th of August, 1761. Even in childhood he was remarkable for his intense love of knowledge and ardour in its pursuit. He was apprenticed to a shoemaker at Hackleton, but becoming early the subject of deep religious impressions, he began to preach about the age of twenty, and, without entirely giving up his business, settled at Moulton, in his native county, as pastor of a small Baptist church, whence, in 1789, he removed to Leicester. It was during his residence in obscurity at Moulton that Carey wrote the work alluded to in the article Missions as having led, in an important degree, to the formation of the Baptist Missionary Society; but it was not published until some years after it was written, it being found difficult to excite even ministers to any feeling of interest in the subject of foreign missions. The circumstances attending the organization of the society need not be repeated here, but we may state, as an indication of the difficulties to be overcome by its first agents, especially in consequence of the opposition of the English East India Company to any efforts for the evangelization of Hindustan, that Carey and his companion, Mr. Thomas, were, before the ship in which they set sail finally left the coast of England, set ashore in consequence of threats held out in an anonymous letter which followed the captain; and were thus compelled to take passage in a Danish ship, which was not under the Company's control. For some months after their arrival at Calcutta the missionaries endured great trials, and they were at length compelled to accept engagements to superintend indigo-factories in the vicinity of Malda, sparing what time and money they could for the promotion of their primary object. In 1795 Carey began the work of Bible translation; and in 1799, in which year he removed to Kidderpore, he bought a press and printing apparatus. A third missionary had been sent out in 1796 to join Carey and his fellow-labourer; and in 1799 four others, with their wives, including Mr. (afterwards Dr.) Marshman, and Mr. Ward, who had been brought up to the printing business, and to whom Carey had, before leaving England, expressed a hope that he might join the mission, in anticipation of the necessity which might arise for his practical knowledge of the art, were sent out. As the East India Company would not allow them to settle as missionaries in their dominions, the mission establishment was, about the time of their arrival, removed from Kidderpore to the Danish settlement of Serampore [Serampore, P. C., p. 259], where for many years the work of translating and printing the Scriptures and other books in the various languages of Hindustan was carried on with surprising energy. It appears from the appendix to a 'Tenth Memoir respecting the Translation of the Sacred Scriptures into the Oriental Languages, by the Serampore Brethren,' which was published in London in 1834, that the translation and printing of the New Testament into Bengali was completed in 1801; and that between that date and the month of July, 1832, the whole of the Bible was rendered into this language, and either the whole or part into at least thirty-nine other Oriental languages or dialects, 212,565 copies of the New Testament and other portions of the Bible having been issued during that time from the Mission press, in addition to many printed for the British and Foreign and some other Bible Societies. During the same period a great number of religious tracts and miscellaneous works were also produced, in several different languages, including a Bengali map of India, a grammar, two dictionaries, a semi-weekly newspaper, and a Youth's Magazine, in Bengali and English; and, in Bengali alone, several large volumes of Government Regulations, a History of India, a translation of Goldsmith's History of England, a Treatise on Anatomy, intended as the first volume of an Encyclopædia of the Sciences, a Treatise on Geography, and a translation of the Pilgrim's Progress. The list of works in Sanscrit, Chinese, and other languages comprises also many important books.

In these great undertakings Dr. Carey was the chief director, while a very large proportion of the actual literary labour also rested upon him, in addition to which he performed the duties of professor of Oriental languages in the college of Fort William, at Calcutta, from its establishment in 1800 until its virtual abolition by the discontinuance of English professors about the year 1830, when he received a pension from government. He died at Serampore on the 9th of June, 1834, in his seventy-third year, leaving some autobiographical memoranda which have been used by his nephew, the Rev. Eustace Carey, in the 'Memoir' of him published in London in 1836, to which a portrait is prefixed. In a biographical sketch by his son Jonathan, incorporated in the memoir referred to, it is observed that in all objects connected with the general good of his adopted country, Dr. Carey took an active part, and that 'he prepared, under the direction of a noble lady then resident in India, the prospectus of an agricultural society in the East, to which was united an horticultural society, of which he was a member, and in the affairs of which he took a lively interest, till his last illness; and he had the gratification to see that the society became at length the most flourishing and interesting society in the East, in which gentlemen of the first respectability, from all parts of the country, united, and which still continues an eminently useful and flourishing institution.' Botany was, indeed, a very favourite study with Dr. Carey, whose share in the publication of Roxburgh's 'Flora Indica' is noticed under Roxburgh, P. C., p. 197. 'In the Asiatic Society,' continues his son, 'he also took an active part; and for many years, up to his death, was one of the members of the committee of papers, and afforded considerable information, and in various ways promoted the general interests of the institution.' 'At his death,' he adds, 'the Bishop of Calcutta, in a speech, passed the highest encomiums on the character and talents of Dr. Carey; and a minute was recorded expressive of the loss sustained by the society, and their regret at the removal of one of its most excellent members.'

From 'Remarks on the Character and Labours of Dr. Carey, as an Oriental Scholar and Translator,' by H. H. Wilson, Esq., Boden Professor of Sanscrit in the University of Oxford, which is also appended to the 'Memoir' by Eustace Carey, we select the following sketch of his more important and legitimate labours. 'At the time,' observes Mr. Wilson, 'when Dr. Carey commenced his career of Oriental study, the facilities that have since accumulated were wholly wanting, and the student was destitute of all elementary aid. With the exception of those languages which are regarded by the natives of India as sacred and classical, such as the Arabic and Sanscrit, few of the Indian dialects have ever been reduced to their elements by original writers. The principles of their construction are preserved by practice alone, and a grammar or vocabulary forms no part of such scanty literature as they may happen to possess; accustomed from infancy to the familiar use of their vernacular inflexions and idioms, the natives of India never thought it necessary to lay down rules for their application; and even in the present day they cannot, without difficulty, be prevailed upon to study systematically the dialects which they daily and hourly speak. Europeans, however, are differently circumstanced. With them the precept must precede the practice, if they wish to attain a critical knowledge of a foreign tongue. But when the Oriental languages first became the subjects of investigation, those precepts were yet to be developed, and the early students had, therefore, as they gathered words and phrases, to investigate the principles upon which they were constructed, and to frame, as they proceeded, a grammar for themselves.' 'The talents of Dr. Carey were,' he adds, 'eminently adapted to such an undertaking.' Mr. Wilson goes on to state that Dr. Carey's Sanscrit grammar was the first complete one published, his Telinga grammar the first printed in English, his Karnate and Mahratta grammars the first published works developing the structure of those languages, his Mahratta dictionary one of the first attempted, and his Punjabi grammar the only authority for the language of the Sikh nation; 'and although,' he remarks, 'he must concede to Halhed the credit of first reducing to rule the construction of the Bengali tongue, yet by his own grammar and dictionary, and other useful rudimental publications, Dr. Carey may claim the merit of having raised it from the condition of a rude and unsettled dialect to the character of a regular and permanent form of speech, possessing something of a literature, and capable, through its intimate relation to the Sanscrit, of becoming a refined and comprehensive vehicle for the diffusion of sound knowledge and religious truth.' Some of the works here referred to were of great extent; the Sanscrit grammar, for example, comprising upwards of 1000 quarto pages, and the Bengali and English Dictionary, published in 1815 and 1825, in three volumes, upwards of 2000 quarto pages, and about 80,000 words. An abridgment of the latter work, prepared by Dr. Marshman under the supervision of Dr. Carey himself, was published in 1827 in one thick octavo volume. One of the extensive literary productions of the Serampore press was 'The Rámáyana of Valmeeki, in the original Sanscrit, with a Prose Translation, and explanatory Notes,' edited by Drs. Carey and Marshman, of which four quarto volumes were published, in 1806 and subsequent years, under the sanction of the Asiatic Society and the Council of Fort William College, but which, unfortunately, was never completed.

It may, at first sight, excite some surprise that the Serampore missionaries should, in some instances, have issued translations in languages or dialects with which none of them were fully acquainted. 'In this department,' observes Mr. Wilson in explanation, 'Dr. Carey took a leading part, and it was in connection especially with his duty of revising the different translations that he added to his great proficiency in Sanscrit and Bengali, a knowledge of those dialects whose elements he first investigated.' 'Possessed in this way,' he states, 'of at least six different dialects, and of Sanscrit, the parent of the whole family, and endowed with a genius for philological investigation, Dr. Carey was peculiarly qualified to superintend the translation of the Scriptures into a number of cognate languages; and it may be granted that, in combination with his colleagues, he carried the project to as successful an issue as could be expected from the bounded faculties of man.'

In the above sketch of the labours of Dr. Carey frequent allusion has been made to Joshua Marshman, D.D., perhaps the most eminent of his colleagues, but of whose particular share in the great undertakings of the Serampore Brethren, as the band of missionaries among whom he and Carey were the most prominent often styled themselves, it is not necessary to give any account. From a statement in the 'Baptist Magazine' for April, 1838, it would appear that he was born in 1767. As before stated, he embarked for India in 1799. In 1826 he visited England on the subject of the disagreement between the Serampore Brethren and the Baptist Missionary Society, which led to their separation in the following year: his son John having previously visited England in 1822 on the same business. In this disagreement, which arose about 1817, the uncompromising and somewhat impracticable spirit of this otherwise excellent man, appears to have had considerable share. He again reached Serampore in June, 1829, and remained there till his death on the 5th of December, 1837, a few days previous to which event arrangements were concluded in London for the re-union of the Serampore Mission with the parent society, and for retaining him in the superintendence. In a sketch of his character at the end of the first volume of Dr. Cox's 'History of the Baptist Missionary Society' he is said to have been possessed of great mental power and diligence, of firmness bordering upon obstinacy, and of much wariness. Dr. Marshman's name is especially known by his controversy with Rammohun Roy [Rammohun Roy, P. C. S., p. 464], who distinguished himself greatly among his countrymen in India by his spirited attacks upon idolatry, and by the publication of a work entitled 'The Precepts of Jesus, the Guide to Peace,' in which, while exalting the precepts, he asperses the miracles of Christ. Dr. Marshman answered this work by a series of articles in the 'Friend of India,' a periodical issued by the Serampore missionaries, which were subsequently republished in London, in 1822, in a separate volume, entitled 'A Defence of the Deity and Atonement of Jesus Christ, in reply to Rammohun Roy, of Calcutta.' In 1824 appeared a second London edition of Rammohun Roy's work, illustrated with a portrait of the author, and containing replies to Dr. Marshman.

Of the history of the Serampore Mission itself little more need be said. The leading facts are given under Missions, P. C., to which we may add, that although Serampore had been selected as an asylum from the opposition of the East India Company, the missionaries were not disturbed when, shortly after their settlement, the place came into the hands of the British government. Since the death of Dr. Marshman the mission establishment has been removed from Serampore to Calcutta, where a handsome printing-office and other premises have been erected. About 1840 the British and Foreign Bible Society withdrew its support from the translations issued by the Serampore mission, public attention having been drawn to the fact that in those versions the words signifying baptism had been so rendered as to distinctly imply the performance of that rite by immersion; and in consequence of this withdrawal of support a new society was formed, under the name of the 'Bible Translation Society,' to provide for the continued maintenance of the Serampore versions, and, in the language of the constitution adopted at its formation, 'to encourage the production and circulation of complete translations of the Holy Scriptures competently authenticated for fidelity, it being always understood that the words relating to the ordinance of baptism shall be translated by terms signifying immersion.' The question which led to the establishment of this new society occasioned a great deal of controversy, in the course of which there appeared a 'Letter to the Rev. A. Brandram, M.A., on the meaning of the word βαπτίζω, and the manner in which it has been rendered in Versions sanctioned by the Bible Society,' by the Rev. E. Henderson, D.D., of Highbury College, in which the whole question, as affecting the Oriental translations, is very fully and learnedly illustrated. This pamphlet was reprinted verbatim in the 'Evangelical Magazine' for June, 1840. From the sixth annual report of the Bible Translation Society, presented at its anniversary in April, 1846, it appears that 30,000 copies of the whole or parts of the Scriptures had been printed, and 54,000 copies distributed, in the preceding year, in the Oriental versions; and that the total number printed since 1838 was 419,205.

SERAPHINE, a musical instrument of the keyed kind, recently invented, and may be described as a small organ, in which very short, thin, and narrow steel bars, or springs, put into vibratory motion by means of a bellows acted on by the foot, are used instead of pipes.

The principle on which this instrument, as well as every variety of it, is constructed, has been explained under the word Accordion, P. C. S., and referred to under the term Concertina, P. C. S. Nothing therefore remains to be added, except that the Seraphine is in the form of a chiffonier, about thirty-seven inches high, forty wide, and twenty-two deep. Its compass is five octaves, including all the semitones, and it is played on in the same manner as any other keyed instrument. It combines the advantages of both organ and pianoforte, by affording the means of prolonging the sounds, and of increasing or diminishing the strength of these by the more or less pressure of the fingers and the bellows: while further power of augmenting the loudness is obtained by a pedal acting on a swell. The effects to be drawn from so small a machine by a tolerably skilful player are as surprising as various; and its convenient form, moderate price, together with its invaluable property of standing in tune—perhaps we might say of never going out of tune—are such additional recommendations of the Seraphine, that, we are persuaded, it only requires to be generally known to get into general use.

SERGELL, JOHANN TOBIAS, an artist for whom may be claimed the high merit of having commenced that reform in modern sculpture in which he was followed by Canova and Thorwaldsen, was born at Stockholm, September 8th, 1740, and was the son of a gold-lace maker and embroiderer. He himself was at first apprenticed to a stonemason, and worked as such at the royal palace at Stockholm, which was then in progress; and his quickness and cleverness attracting the notice of the sculptor Larchevêque, he was taken by him as a pupil. After assisting him in modelling the two statues of Gustava Wasa, and Gustavus Adolphus, Sergell obtained a travelling pension in 1767, and went to Rome, where he remained nearly twelve years, and produced many works that excited general admiration among the professors and patrons of art. On quitting Italy he visited Paris, where his 'Othryades,' a figure of a wounded Greek soldier, half life size (afterwards placed in the Luxembourg) gained him his reception of the Academy of Fine Arts. From Paris he proceeded to London, whence he was almost immediately summoned by Gustavus III., who conferred upon him the appointment of court sculptor. In 1784 he accompanied that monarch in his visit to Rome; and it was by his advice that Gustavus there purchased among many other valuable works of art, the celebrated 'Endymion,' for the royal museum at Stockholm.

Catherine II. was afterwards desirous of securing his talents in her service, and made him the most flattering offers, but though wealth as well as distinction awaited him at St. Petersburg, Sergell's attachment to his sovereign and his native land, and his indifference to riches, induced him to remain in Sweden with the comparatively trifling pension of six hundred rix-dollars. The untimely end of Gustavus, whom he regarded rather as his friend than his master and patron, so affected him that he fell into a deep melancholy, and was for a length of time wholly incapable of doing anything in his profession. It was not till a few years before his death that he regained something like his wonted composure of mind, but it was then almost too late for him to think of retrieving the time that had been lost to art. He died at Stockholm, February 26th, 1814, in his 74th year.

Sergell's works are distinguished by vigour of conception, by energy and grace of style, and by perfect freedom from that mannerism and sickly affectation into which sculpture had fallen in the hands of his immediate predecessors and contemporaries. Among his principal statues are the group of Cupid and Venus, Diomedes carrying off the Palladium, Othryades, a Faun, Gustavus III., Oxenstierna dictating to the Muse of History the deeds of Gustavus Adolphus, Mars and Venus, a Venus Callipyge, most of which are in the royal museum. One of his finest productions, a composition in alto-rilievo for the Adolph-Frederick Church at Stockholm, exists only in the model, having never been executed in marble; as was the case with a number of other subjects. His busts and portrait medallions were highly esteemed, both for fidelity of likeness, and for artistic merit. Byström, the present eminent Swedish sculptor, was a pupil of Sergell's.

(*Conversations-Lexicon der Gegenwart*; *Biographie Universelle.*)

SERPULITES, a genus of annulose (?) fossils from the Silurian strata of Salop, &c. (Murchison.)

SERRAFALCUS, a genus of grasses belonging to the tribe Festucineae. It has unequal herbaceous many flowered glumes, the lower are from 3 to 5 nerved, the upper 7 to 9. The flower is oblong and trifid. The outer palea with a short seta founded on three nerves from below the tip. The styles lateral below the summit of the fruit. The spikelets narrow at the top.

S. secalinus has a loose panicle slightly compound, the simple peduncles about equalling the oblong glabrous spikelets, the flowers at first loosely imbricated, afterwards distinct, about as long as the straight awn, the outer palea not overlapping the next flower. The flower is large and downy, the leaves hairy with nearly smooth sheaths. It is native of Great Britain.

S. racemosus has a close or elongated erect panicle usually simple, the spikelets glabrous ovate and somewhat compressed. The midrib of the glumes and palea scabrous towards the top, the leaves and sheaths slightly hairy. It is a common species in sandy places in the South of Great Britain.

(Babington, *Manual of British Botany.*)

SERRICORNES (Insects), the third family of Pentamerous Coleoptera. They have four palpi, elytra which cover the abdomen, and antennæ, which are for the most part equal throughout, or smaller at the extremity. The Linnæan genera *Buprestis*, *Elater*, *Lampyris*, and *Ptinus* belong to this family, as also do *Melyris*, *Clerus*, and *Cebrio*. The *Ptinus fur* is the little beetle whose larvæ do so much damage among collections of natural history.

SERVITUDES (servitutes). A servitus in the Roman law signifies that the owner of some particular property is bound in respect to some other person, simply as such person, or as being the owner of a particular property, either not to do certain acts to his property, or to allow that other person to do some particular acts to the property. The rights of this kind which one person may have on the property of another are also called servitutes. The thing which is the object of the servitus is said servire, to owe a servitus. It follows from the definition that a man can only have a servitude in another man's property, and in a corporeal thing; and that the owner of the servient property is not required to do any thing in order that the other may enjoy the servitude (*Dig.* 8, tit. 1, s. 15): his duty consists in not doing, and in permitting to do. The servitude must be a thing which gives some profit or advantage to him to whom it is due; and it gives him a right in rem. In case of doubt there is no presumption in favour of a servitude; the terms in which it is established are to be strictly interpreted, and its exercise to be strictly according to the right, and in the way least prejudicial to the owner of the servient property. A man must be the owner of a property, or have a dominium utile in it, in order to be able to encumber it with a servitude.

Servitutes were either a right belonging to some particular person, which ceased with his life, unless they were granted to him and his heirs, and were called servitutes personarum or personales; or they were attached to a piece of ground as the subject, and could be exercised by any person who was in the possession of the ground, and were called Jura, or servitutes praediorum or rerum, and sometimes Servitutes simply. Personal servitudes were comprehended under the heads of Ususfructus, Usus, Habitatio (a lodging in another person's house), and Operae Servorum et Animalium (the use of another person's slaves or beasts). [USUSFRUCTUS, P.C.]

Praedial Servitudes were either Servitutes Urbanae or Rusticae. They were Urbanae if the property which was entitled to the servitude was a building: they were Rusticae, if it was a piece of ground. There was no limit to the number or kind of servitudes of this class which might be established. Those Servitutes Urbanae which were of ordinary occurrence were such as follow: Servitutes oneris ferendi, the right which a man has to let his building rest on the building, the wall, or the pillar which belongs to another; Tigni immittendi, the right of fixing a man's timbers in his neighbour's wall; Luminum, sive luminis excipiendi, the right of a man's making windows or openings in his neighbour's wall, or in a common wall, in order to get light for his own building, or to make holes or windows in a man's own wall, which holes or windows look into his neighbour's property, in such cases as would be unlawful without the existence of the servitude; Ne luminibus officiatur, the right to prevent a neighbour from obstructing the light that comes to a man's buildings, by raising any obstacle in the way; and others of a like kind. The Servitutes Rusticae were rights of road over another man's property, which were of various kinds according to the kind of road, as Servitus itineris, actus, viae; Pascendi sive pascui, right of pasturing a man's animals on another man's ground; and the various servitudes which have for their object the use of water, as servitus aquae ductus, aquae haustus, and others of a like kind.

Servitudes might be established by contract, at least in the case of a negative servitude, that is one by which the owner of the servient property was bound not to do certain things; by testamentary disposition; by prescription in the Roman sense; and in some other ways.

Servitudes might cease by the party entitled to them renouncing them by express words or tacitly: in the case of praedial servitude, by one person becoming owner of the two properties, but not unless the whole of the servient or the whole of the dominant property was acquired; and in some other ways.

The actions that a man might have in respect to servitudes need not be particularly mentioned here, as the Roman forms were peculiar, and the object of this article is simply to show the general nature of these Roman praedial servitudes, which may be compared with some of the easements and rights of the English system. [WAY, P. C.] The personal servitudes of the Roman law do not correspond, except in some few cases, with any thing in the English law, except limited enjoyments of a thing, as for instance an estate in lands for life. [USUSFRUCTUS, P.C.]

The subject of the Roman servitudes would require a long exposition to be treated fully. A good outline is contained in Thibaut, *System des Pandekten Rechts*, i. § 296, &c., 9th ed.; and in Mackeldey, *Lehrbuch*, &c., ii. § 274, 12th ed.

SESLE'RIA, a genus of grasses belonging to the tribe Sesleriæ. It has a spiked panicle, sessile spikelets tiled all round. The glumes are from 2 to 6-flowered, nearly as long as the spikelet. The outer paleæ keeled and membraneous, with a scarious margin ending in 3 or 5 points, the dorsal rib evanescent.

S. cærulea has an ovate slightly one-sided spike, the outer palea terminating in 4 teeth, the dorsal rib rough, with a short excurrent point, the leaves abrupt, with a minute rough point. The roots are tufted, the stem from 6 to 12 inches high. The spike about ½ an inch long, and of a bluish-purple colour. This is the only British species. It is found chiefly on mountains.

S. quitensis is the *Festuca quadridentata* of Humboldt and others. Humboldt tells us that it is very poisonous.

(Lindley, *Flora Medica*; Babington, *Manual of British Botany*.)

SESSION, COURT OF, is the Principal Tribunal of Civil Jurisdiction in Scotland. As at present constituted it dates back to the year 1532; but it was then reconstructed on the basis of institutions which had existed at a much earlier period. The early records of the Scottish Parliament show that the judicial authority, which in those times was mixed with the legislative functions of that body, was often deputed to committees. These were termed Domini Auditores, or Domini ad Querelas, and received other like titles. We find these committees and their functions placed on a more distinct position in 1503, when a permanent body received the designation of 'The Daily Council.' It is worthy of observation that these incidents in the history of the court explain the absence of jury trial as a fundamental feature in the Court of Session, while in early times it is known to have belonged to the courts of the inferior judges. Parliament being the high jury of the nation, it would be an anomaly that a committee of that body should act through the aid of a jury. The number of the court as finally established in 1532 was fifteen, the usual number of a Scottish jury in former times, and still the number of a jury in a criminal prosecution. There was then a Lord Chancellor of Scotland, whose functions in some degree resembled those of the same official in England. He presided over the Court of Session, and his judicial functions gradually came to be absorbed in those of the court. At the union with England it was deemed unnecessary to retain a separate chancellor of Scotland, and the great seal to be appended to private documents for that part of the country being committed to a keeper, the court was presided over by the lord president, who previously presided in the absence of the chancellor. In 1808 the Court of Session was divided into two divisions: the head of the court, the lord president, who is also now lord justice-general or head of the supreme criminal court, presides in the first division, and the lord justice clerk, or deputy head of the criminal court, presides in the second. In 1815, trial by jury in civil cases on the English system was introduced in Scotland. A separate tribunal was established for jury cases, presided over by a Lord Chief Commissioner, but in 1830 the practice of jury trial was united with that of the Court of Session. It is still only adopted in a limited number of cases, and is far from being popular or satisfactory. The Scottish system of pleading is ill adapted to it, and no means have been found of carrying it through with the promptitude and precision which mark the English practice. Its chief benefit has been in enforcing the separation in all pleadings of the facts stated from the law applied to them. In 1830 two separate courts of limited jurisdiction and small practice—the Admiralty and Commissionary Courts—were absorbed in the Court of Session, and the number of judges was at the same time reduced from fifteen to thirteen. By this measure the court was made to assume less the form of a deliberative assembly acting through a majority, which was the particular characteristic of the court before it was divided, and more judicial work was thrown upon individuals. By the act of 1830 (2 Geo. IV., and 1 Will. IV., c. 69), as carried out by a later act (1 & 2 Vict. c. 118), eight of the judges, formed into two courts of four judges each, sit in the two divisions of the Inner house, where each division form a court of second instance. The other five judges are called the Lords Ordinary, and each of them holds a separate court, which, in reference to the court of further resort is called the 'Outer House.' The judgment of a lord ordinary on a closed record is final in the outer house, but it may, within a limited time, be carried by a 'reclaiming note' to which the record is appended, to the inner house, where it may be pleaded again on the record as made up in the outer house. The system of pleading has of late years been much abbreviated and systematised, and this, added to the reduction of the number of judges who sit and give their views on each case, has materially abbreviated the procedure, although it is still the practice for the whole court to be assembled and consulted in difficult cases. The jurisdiction of the Court of Session embraces all questions of civil right. It gives remedy when other courts whose function it is to regulate the rights and duties of certain sections of the public as members of a particular class—such as courts martial and ecclesiastical—exceed their powers. The proceedings before the Court of Session in relation to the church courts, were the cause of the great secession from the Scottish church in 1843 [FREE CHURCH, P. C.]. As every description of civil question between man and man in Scotland can be competently decided before the Court of Session, it is usual in England to speak of it as a court 'both of law and equity;' but this is a distinction proceeding from incidental circumstances in the character of the English courts, and is no necessary or properly systematic division of the administration of the law. The Court of Session have the authority enjoyed by the equity courts in England, in the appointment of guardians, receivers, &c., or otherwise seeing to the protection of property, or of persons where discretional protection or direction are necessary, and there is no person competent in ordinary course of law to act. In 1839 (2 & 3 Wm. IV. c. 36), the judges of the Court of Session were appointed according to a certain rotation to perform the duty of judges of the court of justiciary in matters criminal, and those of judges of the court of exchequer, where the duty is of a very limited character. This change only introduced the system of rotation in the performance of the duty of courts of which certain of the lords of session had previously been permanently appointed the judges. By an old practice in Scotland each 'Senator of the College of Justice,' as the judges of the Court of Session are officially called, takes the title of lord.

SESSIONS. The criminal jurisdiction of justices in general and quarter-sessions is now defined by the 5 & 6 Vict. c. 38, which enacts 'that after the passing of this Act neither the justices of the peace acting in and for any county, riding, division, or liberty, nor the recorder of any borough, shall at any session of the peace nor the adjournment thereof try any person or persons for any treason, murder, or capital felony, or for any felony which, when committed by a person not previously convicted of felony, is punishable by transportation beyond the seas for life,' or for any of the offences mentioned under the 18 heads contained in the first section of the act. The second section provides that any judge of the supreme courts at Westminster, acting under a commission of oyer and terminer and gaol delivery for any county, may issue a writ or writs of certiorari or other process directed to the justices of the peace acting in and for such county, &c., or to the recorder of any court within the same county, commanding the said justices and recorder severally to certify and return into such court of oyer and terminer, &c. all indictments and presentments found or taken by such justices or recorder of offences which after the passing of this act they will not have jurisdiction to try, and the several recognizances, examinations, and depositions relative to such indictments and presentments; and, if necessary, by writ or writs of Habeas Corpus may cause any person in the custody of any gaol or prison, charged with any such offence, to be removed into the custody of the common gaol of the county, that such offences may be tried under the said commission. The fourth section empowers any court of general or quarter-session or adjourned session of the peace to divide such court into two courts, which may sit apart for the better despatch of business, in the manner and subject to the conditions in this section mentioned.

SETTLE, ELKANAH, is remembered, not for his literary merits, but for the extraordinary fact that he, a person of very small talents, was for a time the successful rival of one of the greatest poets of the nation. The particulars of his history, with specimens of his works, may be gathered from various parts of Scott's edition of the works of Dryden. Settle, born in 1648 at Dunstable, was entered a commoner of Trinity College, Oxford, in 1666, but left the university without a degree, and came to London as a literary adventurer. He first rose into reputation in 1671, by the success of his tragedy of 'Cambyses;' and the profligate Rochester, desirous to humble Dryden, eagerly adopted the new dramatist as his instrument. Settle's next tragedy, 'The Empress of Morocco,' introduced by its unscrupulous patron, enjoyed the honour (never vouchsafed to Dryden, the laureate) of being first acted at Whitehall by the lords and ladies of the court: on being transferred to the theatre it was acted to full houses for a month successively; the printed copies of it were sold for double the usual price; and the author, intoxicated by his undeserved success, prefixed to it a vaunting preface, animadverting severely upon Dryden. Dryden, alarmed and jealous, assisted Shadwell and Crowne in writing scurrilous 'Notes and Observations' on the play, which the author answered in the same strain. Political differences embittered the quarrel thus begun. But poor Settle's fame was short-lived; and Dryden had little cause to fear him when he was so ill-advised as to advocate the cause of his whig patrons, by publishing, in answer to the 'Absalom and Achitophel,' a poem entitled 'Absalom Senior, or Achitophel Transposed.' Nevertheless, the new offence was thought worthy of punishment; and, under the name of Doeg, Elkanah became the victim of some of those contemptuous verses which Dryden contributed to the second part of 'Absalom and Achitophel.' Three of these stanzas, commemorating his smoothness of versification, his bombast, and his real poverty, both of thought and fancy, may be accepted as no unfair criticism on his works in general.

> Doeg, though without knowing how or why,
> Made still a blundering kind of melody;
> Spurred boldly on, and dashed through thick and thin,
> Through sense and nonsense, never out nor in;
> Free from all meaning, whether good or bad,
> And, in one word, heroically mad.

Down to this time Settle had been a trusted servant and pamphleteer of Shaftesbury and the other whig leaders; and in November, 1680, he superintended with much approbation the burning of the pope in effigy. Soon afterwards however he suddenly changed his party, recanting his political heresies in a narrative which he published in 1683. By this change he perhaps preserved for the time his place as poet laureate for the city, and writer of verses for pageants and other civic festivities; but with the revolution his prospects were completely blighted. Although he retained his place as city-poet, he was reduced to great poverty. He had literally to suffer the fate satirically prophesied for him by Dryden, of writing plays for shows at Bartholomew fair in Smithfield; and in one of these he actually performed in person the part of the Dragon slaughtered by St. George, a fact which Pope has chronicled in the Dunciad. At length, in his desolate old age, he was received into the Charter-house, and died there in 1723. He was the author of sixteen original plays that were printed, and of a good many occasional and political pieces both in verse and in prose.

SFAX. [TUNIS, P. C., p. 360.]

SHADOWS, PROJECTION OF. [PERSPECTIVE, P. C., p. 499, &c.]

SHAGNAN is a country in Asia, situated in the Upper Valley of the river Oxus, where that river has not yet left the mountains, which enclose the upper part of its course. It lies between 37° and 38° N. lat. and between 70° and 72° E. lon., but its extent and boundaries are imperfectly known; the river Oxus which runs along its southern and western boundary, divides Shagnan from Badakshan. As the bed of this river in these parts, where it is called Panj, is several thousand feet above the sea-level, its course is extremely rapid, which renders the access to Shagnan from this side very difficult, and for the greater part of the year impossible. The country is traversed by numerous elevated ridges, which are covered with snow for the greater part of the year. These ridges are at their eastern end connected with the immense mountain masses which surround the elevated table-land of Pamir, on which the Oxus originates in the lake of Sir-i-kol. It is probable that the mountains abound in mineral wealth; but nothing is known except that there are rich ruby mines. The valleys between the mountains are said to be fertile, but on account of the cold of the climate they do not produce any grain except wheat and barley. The greater part of the population subsist on the produce of their orchards, and plantations of mulberry-trees, whose dried fruit is ground, and used as flour. Horses and the common animals of burden are not numerous, except camels. These animals are of that description which have two bunches. As the pastures on the declivities of the mountains are extensive, the inhabitants keep a considerable number of cattle and sheep. Very little is known respecting the population. It is stated that a peculiar language is spoken by them. Their number, which formerly amounted to a thousand families and more, has lately been much reduced by the incursions of the Khan of Kunduz, who has subjected Shagnan to a dependency on his authority.

(Wood's *Journey to the Source of the River Oxus.*)

SHAGREEN. [LEATHER, P. C. S.]

SHANGALLAS. [ABYSSINIA, P. C. S.]

SHEATHING. Under SHIP-BUILDING, P. C., p. 396, is given a notice of the introduction of copper sheathing in the British navy, and of Sir Humphrey Davy's experiment for protecting the copper from the destructive action of sea-water, as well as of the unexpected result by which his invention was rendered nugatory.

Owing to the great expense of copper sheathing, which has the effect of limiting its use in mercantile shipping, many attempts have been made to substitute for it either other other metals, or alloys in which it is mixed with cheaper metals, or with such as might increase its durability. In noticing several of these, Hebert, in the 'Engineer's and Mechanic's Encyclopædia,' art. 'Sheathing,' refers to a patent obtained by Mr. Robert Mushet (in what year he does not state), for 'certain means or processes for improving the quality of copper and alloyed copper, so as to render it more durable when employed as sheathing to ships' bottoms,' in which he directs that 100 lbs. of copper should be alloyed either with 2 oz. of the regulus of zinc, 4 oz. of the regulus of antimony, 8 oz. of the regulus of arsenic, or 2 oz. of grain-tin; or instead of using one of these separately, that the whole he used together in the proportion of half an ounce each of the zinc and tin, 1 oz. of the antimony, and 2 oz. of the arsenic, to 100 lbs. of copper. By these mixtures, Mr. Mushet states that the copper is rendered much more cohesive and fibrous in its texture, and the corrosive effect of the sea-water is in a great measure prevented. We may observe, in partial confirmation of the above, that Dr. Ure, in his 'Dictionary of Arts, &c.,' observes, that from a train of researches which he made for an eminent copper company, upon various specimens of sheathing which had been exposed to the action of the sea, 'it appeared that copper containing a minute but definite proportion of tin was by far the most durable.'

The metallic sheathing patented in 1824 by Mr. Christopher Pope, of Bristol, which, however, is said to have been more extensively used in covering roofs than in sheathing ships, consists either of tin and zinc, or of tin, lead, and zinc. If the former mixture be used, the zinc is first melted, an equal quantity of tin is added to it, and the alloy, after being stirred together while fluid, is cast into cakes about three-quarters of an inch thick, which are hammered or rolled out to the required degree of tenuity. In uniting tin, lead, and zinc, the lead is first melted, double its quantity of tin is then added, and the alloy is cast into small lumps. A quantity of zinc equal to the tin and lead united is then separately melted, and the alloy of tin and lead is added to it; the whole, when thoroughly incorporated, being cast into cakes as before, for subsequent rolling out into sheets. The patentee observes that no more heat should be applied than is absolutely required to effect the union of the component metals, any excess tending to harden the metal; and he states that by heating the cakes to the temperature of boiling water they will roll or hammer softer than when cold.

Iron, protected by the galvanic action of zinc, has also been used for sheathing. Hebert refers to a patent for this purpose obtained by Professor Pattison, in which it is proposed to use sheets of iron similar in size to the sheets of copper sheathing, each having at its lower extremity a sheet of zinc from one-eighth to one-fourth of an inch thick, attached in such a way that in sheathing the vessel from the upper part downwards, each succeeding sheet of iron shall be in contact with, and overlap, the zinc plate of the sheet immediately above it. For the protection of the external surface of the iron, there should be as much as 5 inches of zinc to 100 inches of iron, and smaller plates of zinc in the proportion of 3 inches to every 100, should be applied to the inner surface of the iron. Washers or perforated discs of zinc are also applied under the heads of the spikes or bolts used in fastening the sheathing; and the heads of the nails employed are made hollow, and filled with melted zinc. This method is said to have been found effectual in a vessel which had been two years at sea, the corrosion or oxidation of the metal being almost entirely prevented, and the ship returning with a bright and clean surface.

Sheathing of brown paper coated with tar, and of various other non-metallic substances, have also been used, and perhaps the most important of these is a kind of felt, into the composition of which a considerable quantity of cow-hair enters. As this material itself felts very imperfectly, the sheets are passed, in the process of manufacture, through a boiler of pitch or tar, which increases the cohesion of the fabric. This material, which is sometimes used in conjunction with copper sheathing, being laid on immediately beneath it, has, according to Barlow ('Treatise on Machinery and Manufactures' in the 'Encyclopædia Metropolitana') the important qualities of being a perfect protection against the worm, which is probably incapable of working its way against the stiff bristly hair which is incorporated in the felt, and of being at once impermeable to water, and so extensible as not to be easily broken by the working which takes place among the timbers of a crazy ship, and which would otherwise produce many leaks. A sheathing composed of a coarse fabric of fibrous material, saturated with a solution of caoutchouc, together with pitch and tar, has been recommended as a cheap and effectual substitute for felt.

Copper sheathing is usually applied in sheets about four feet long and fourteen inches wide, the thickness being such that a square foot weighs from sixteen to thirty-two ounces,—most commonly from twenty to twenty-eight ounces; and the mode of application does not vary materially whether the copper be laid upon the bare planking or upon an interposed layer of tarred paper, felt, or thin boarding. The sheets are pierced with holes, not only round the edges, but also at intervals of three or four inches over the whole surface; they are laid so as to overlap each other about an inch, and are secured to the ship with flat-headed copper nails. 'Great regularity,' observes the author of 'A Second Day at a Ship-Yard,' 'Penny Magazine,' No. 593, 'is observed in the arrangement of the sheets, so that a certain symmetry of appearance, as well as durability, is attained.' 'After two voyages to the East Indies,' according to this authority, 'the coppering requires to be renewed; and the old copper is found to have lost three or four ounces of its weight in the square foot, by the action of sea-water, friction, and other causes.' It may be mentioned as an illustration of the perfect arrangements of a first-rate ship-yard, that a vessel is frequently stripped of her old copper, the surface of the planking prepared for a new sheathing, and sent out thoroughly new-coppered within two days of the time when she entered the dry-dock in which the operation is performed.

SHEERS, or SHEARS, a contrivance used for hoisting the masts of a ship into or out of their place, and occasionally for loading and unloading heavy goods, or for performing similar operations on shore. The sheers used in masting vessels consist of two large poles, masts, or spars, the lower ends of which rest upon thick planks laid along the sides of the deck, while their upper ends are lashed together so as to cross each other exactly over the hole in the deck through which the mast is to be dropped, they being sustained in this position by ropes radiating from the top to various parts of the vessel. To this apparatus is attached the tackle necessary for lifting the masts out of the water, when they have been floated to the side of the ship, and lowering them gently into their places. This is the apparatus commonly employed in masting merchant-ships; but the like operation is sometimes performed by means of a *sheer-hulk*, and sometimes by a *masting-house*. The *sheer-hulk*, which is commonly used for masting ships of war, is an old man-of-war cut down to the lower deck, and having a mast, a hundred and twenty feet in length, fixed in the hulk, and, supported by the mast, four stout spars or sheers which project obliquely from its side. The tops of these sheers reach to such a height and project to such a distance from the side of the hulk, that the vessel to be masted can come beneath them to be fitted with her lower masts. A *masting-house* is a lofty building erected for the purpose of performing the operation yet more conveniently, by the aid of mechanism overhanging the water to a considerable distance, beneath which ships may be floated. Such a structure, of great elevation, forms a conspicuous feature of the great ship-building establishment on the Thames at Blackwall.

('A Second Day at a Ship-yard,' in the *Penny Magazine* for 1841, p. 253.)

SHEFFIELD, JOHN. [BUCKINGHAM, DUKE OF, P. C., p. 513.]

SHERARDIA (so named by Dillenius after his patron William Sherard, LL.D., consul at Smyrna), a genus of plants belonging to the natural order Rubiaceæ. It has a funnel-shaped corolla, a dry fruit, crowned with the limb of the calyx, which is 6-toothed.

S. arvensis, corn-field madder, is the only species. The stem is mostly decumbent, branched, square, and leafy. The whole plant is rough and hairy. The leaves are 6 in a whorl, acute, and obovate lanceolate; the flower is blue, in a small sessile terminal umbel. It is found on sandy soils, in Great Britain, Europe, and the Crimea.

The seeds only require to be sown in the ground in an open situation.

(Don, *Gardener's Dictionary;* Babington, *Manual of British Botany.*)

SHERIFF (SCOTLAND). In Scotland the duties of the sheriffs are not, as in England, almost entirely executive. He exercises an extensive judicial authority, and a large portion of the general litigation of the country proceeds before this class of local judges. In earlier times his authority appears to have been merely of an executive character, and, appointed by the crown, he was the person to whom the royal writs, issuing from the supreme courts, were usually directed. He was the ordinary conservator of the peace within the local limits of his authority. He was an important fiscal officer, having in the general case the duty of levying the feudal casualties, forfeitures, and other items of revenue; and by statute he was vested with the power of mustering the military force of the country to the weapon-showing. In very early times, his tenure of office appears to have been limited by the grant; at a period comparatively later, the office became, in the general case, hereditary. The precise principle on which that division into shires, by which the boundaries of each sheriff's authority were marked, is not generally known. In all Latin documents he was called the vice-comes, and it might thence be inferred that each sheriff was the deputy of a *comes* or earl. There has, however, no trace been found of the dignity of an earl in Scotland involving the right to exercise judicial or executive functions, nor did that title, like the authority of the sheriff, bear any reference to the boundaries of the shire or to any other territorial allotment. The terms of the act for abolishing heritable jurisdictions in Scotland, which will be noticed below, might encourage the supposition that they were founded on the idea of the sheriff being a depute or subordinate officer, if it were not pretty clear that the structure of that act was in some measure affected by a confusion between the office of high sheriff in England and that of sheriff in Scotland. The act, viewing the appointment of a sheriff-principal or high sheriff from among the unprofessional gentry, and of the acting judicial officer from the legal profession, provides that 'it shall not be lawful for any principal or high sheriff or stewart in Scotland personally to judge in any cause, civil or criminal, within his shire or stewartry in virtue of such his office, any law or usage in any ways to the contrary notwithstanding.' (20 Geo. II. c. 43, s. 30.) By the same statute the principal or high sheriff can only be appointed during pleasure, or for a period not exceeding a year. It is not easy to discover how such a nominal office came into existence, if it actually was in existence before the passing of the act. The commissioners who reported on the courts of justice in Scotland in 1818 stated that they could not discover any functions which it was the duty or privilege of the holder of that office to perform; and in reference to the provisions of the act, they say, 'it is to be noticed that his majesty's right of appointing an officer called a principal or high sheriff was not touched by the statute of George II., although it was no longer competent to confer such an office *heritably*. These appointments continued to be made subsequent to the statute, and it was well known that commissions of this kind have, even in very recent times, been granted by the crown, for purposes of the executive government, and connected with the office of lord-lieutenant. But whatever may have been the views of the legislature as to the proper ministerial or other functions of such an officer in time coming, it is certain that by the enactment referred to the whole judicial powers of the ordinary magistrate for the county are thus expressly reserved and excepted from any grant to be thereafter made of the office of sheriff in this part of the kingdom. And these provisions were in strict conformity with the previous and most antient state of the law. The act above referred to, generally called the Jurisdiction Act, was passed for the purpose of abolishing all those remnants of the feudal courts of Scotland which were hereditary, or in any other shape of the nature of property; of bringing all judicial offices within the appointment of the crown, and their holders under responsibility to the public. It was passed in consequence of the insurrection of 1745, and it is the point from which we have to date the equal administration of justice in Scotland. By the same statute the sheriff is authorised to appoint one or more Substitutes. This was in conformity with old practice, by which the sheriff, who might not himself be trained to the law, generally appointed a legal practitioner to act as his substitute. At the present day there is a substitute in every county, and in the larger counties there are two or more. Both the sheriff and his substitute are lawyers, but the latter is the local resident judge, the former generally frequenting the courts in Edinburgh, where he hears appeals from his substitute, and making occasional visits to his county. By the Jurisdiction Act it was provided that each sheriff should reside in his county during four months in each year. This provision fell into desuetude, and it became the usage for such sheriffs as continued to practise at the bar to remain in Edinburgh, while the greater portion, who had given up or had not obtained practice, resided at their country-seats, or wherever choice or convenience dictated. This circumstance was the object of much animadversion by the friends of law reform, and a wide difference of opinion was expressed on the matter, some maintaining that the sheriff as well as his substitute ought to be a resident judge, while, in the words of the Report above cited, the former (who is styled Sheriff Depute) in Edinburgh 'was in some degree countenanced by high legal authorities, who consider the attendance of the sheriffs-depute in the court of session, during the sittings, to be more useful than a literal adherence to the statutory rule.' It has been supposed that such an attendance tends both towards a higher degree of legal learning in the sheriffs and to uniformity of practice being promoted by their occasionally consulting each other. It was very clear, however, that it was disadvantageous to the public that there should be any of those judges who neither reside within their counties nor at the fountain of Scottish legal learning in Edinburgh, and by the 1 & 2 Vict. c. 119, it was enacted that each sheriff appointed after the 31st December, 1838, shall remain in attendance on the court of session, but shall hold eight courts in his county during the year. The sheriffs of Edinburgh and Lanark are exempted from attendance on the court of session, in the understanding that the business of their respective courts is sufficient fully to occupy their time. It may be mentioned that many law reformers maintain that these two sheriffships are a type of what the others ought to be. The incumbents receive much higher salaries than the other sheriffs, and have their time fully occupied. It has been held that, in regard to the other counties, instead of appointing persons who are endeavouring to have business at the bar, and giving them duties which only occupy part of their time, and salaries for which they would not generally agree to give up their profession, it would be wiser to unite several counties together, and employ lawyers with salaries equal to the full value of their whole time, to these enlarged districts. These various opinions were very actively discussed from ten to fifteen years ago, but it is now pretty clear that it is in the persons of the sheriffs-substitute, or permanent local judges, that the public look for the beneficial working of the system. In civil questions an appeal lies (without new pleadings) from the sheriff-substitute to the sheriff, but wherever the former is a sound lawyer and an industrious man, the privilege is seldom used. The salaries of the sheriffs-substitute have lately been raised, according to a sound policy advocated by many of the most cautious and economical politicians of the country; they average at present about 450*l.* The salaries of the principal sheriffs vary widely, but the whole amount of their aggregate incomes, as returned to parliament in 1843 (*Parliamentary Papers*, 270), when divided by their whole number, gives 551*l.* to each. From the state in which the profession of the bar of Scotland has been for the past ten years, several of its members have been induced to accept the office of sheriff-substitute as vacancies have occurred. Formerly the office fell to country practitioners, who, not quite contented with the emoluments, eked them out by private practice; a state of matters seriously detrimental to the equal administration of justice. In some instances, even retired officers in the army or unprofessional country gentlemen were the best qualified persons who would undertake the office. By the act of 1 & 2 Victoria, it was provided that no sheriff-substitute should act as a law-agent, conveyancer, or banker. By the same act it was provided that though the sheriff-substitute should continue to be appointed by the sheriff, he should not be removable, except with the consent of the lord president and lord justice clerk of the court of session. In terms of the same act, the substitute must not be absent from his county more than six weeks in one year, or more than two weeks at a time, unless he obtain the consent of the sheriff, who must then act personally or appoint another substitute. It may be observed, for the sake of preventing some confusion which the phraseology of the statute law in relation to sheriffs may occasion to the general reader, that in one or two instances, as in that of Kirkcudbright, the persons who exercise the function of Sheriff is called the Stewart. This designation owes its origin to certain peculiarities of territorial tenure which cannot be briefly explained and are subject to doubt and dispute. After the Reformation, the sheriffs were generally appointed commissaries of the local commissariat districts which most nearly conformed with their respective jurisdictions, and in 1823 (4 Geo. IV. c. 97) the commissariat functions were appointed to be merged in those of the sheriff.

The jurisdiction of the sheriff in civil matters does not extend to questions regarding heritable or real property. By the 1 & 2 Vict. c. 119, jurisdiction in all questions as to nuisance or damage arising from the undue exercise of the rights of property, and as to servitudes, was specially conferred on him. He cannot judge in actions which are declaratory of rights, or which are of a recissory nature—for the purpose of nullifying deeds or legal proceedings. In other respects his jurisdiction extends to all actions on debt or obligation, without any limit as to the importance of the interests involved. He does not act by a jury, though it appears that such an institution was formerly connected with the civil jurisdiction of the sheriff. He has authority by special statute summarily to decide small debt cases, *i. e.* cases where the pecuniary value of the matter at issue does not exceed a hundred pounds Scots, or 8*l.* 6*s.* 8*d.* When he acts in the small debts' court, he makes circuits through his county; his ordinary court is stationary. By railway statutes and other acts of local administration special functions are frequently conferred on him, and in the clauses for taking lands he is usually appointed to act as presiding judge when a jury is appointed to be empannelled. By two acts of the 1 & 2 Vict., viz. caps. 114 and 119, much was done to clear up and render efficacious the practical administration of the powers of the sheriffs. They were enabled, by indorsation, to put the writs from other sheriffdoms in force in their respective counties, and were invested with increased powers for putting their judgments and other proceedings in execution. The decisions of the sheriff, when no proceedings have been taken to enforce them, may be carried into the court of session by advocation.

The authority of the sheriff in matters criminal is practically to a great extent measured by the proceedings of the crown lawyers in leaving prosecutions to proceed before his court, or removing them to the Court of Justiciary. It is not very clearly to be traced how far, in old practice, the sheriff's jurisdiction was inferior to that of the Court of Justiciary: he had undoubtedly the power of punishing with death, though it has been long disused. The power of transporting, which is of comparatively late introduction, he never possessed, not having any criminal authority beyond his county. By degrees it came to be considered that the jurisdiction in the four pleas of the crown—murder, rape, robbery, and wilful fire-raising, was exclusively in the higher court. Important cases in the sheriff court are tried by jury. In more trifling matters the sheriff performs the functions of a police magistrate. In these cases the punishment must not exceed a fine of 10*l.* or sixty days' imprisonment (9 Geo. IV. c. 29). There is an intermediate system, by which the sheriff may try more important cases without a jury; but it is so encumbered with formalities—among others, a written authentication of the evidence—as not to hold out much inducement for its practical adoption.

SHIKARPORE is a commercial town, in the province of Sinde, in 27° 58′ N. lat., and 68° 30′ E. long. The town is built on the plain, which extends from the banks of the Indus to the Hala Mountains, and about 26 miles from the western bank of the river. Though more than 250 miles from the sea, it is only 250 feet above the sea-level. The walls enclose a space of 3831 yards in circuit. They are built of unburnt brick, but have entirely fallen to decay, for want of repairs. They have eight gates. The houses are also of unburnt brick, and have more than one floor; those belonging to the soucars or bankers are of a respectable size, and convenient. The streets are narrow, confined, and dirty in the extreme. The great bazaar, which is the centre of all trade and banking transactions, extends 800 yards, running immediately through the centre of the city. It is protected from the excessive heat by mats stretched from the houses on each side, which however produces a stagnation of the air. With the exception of one tolerable moshu on the southern side, Shikarpore possesses no building of importance. The suburbs are very extensive, and a great portion of the population who are considered to belong to the city reside outside, particularly the Mohammedans and labouring classes.

The population of Shikarpore, in 1840, consisted of about 30,000 individuals, of whom about two-thirds are Hindus, and the remainder Mohammedans, inclusive of Afghans and Pattans. The Hindus carry on all the trade, while the cultivation and mechanical arts of almost every denomination are in the hands of the Mohammedans.

The country round the city is low, and admits freely of irrigation from the inundations of the river Indus by means of small nullas, or water-courses, leading from the Sinde Canal. This canal was made by the Mogul emperor for the purposes of irrigation and navigation. It is, in its present state, only navigable from the end of April to the beginning of October, as it has been allowed to choak up at its mouth, and has generally got out of repair. But it is supposed that at no great outlay it may be rendered navigable for nine months of the year. The soil in the vicinity of the city is alluvial, and produces rich crops of rice and jowaree.

A few articles are manufactured at Shikarpore, but not to any extent, except coarse cotton-cloth, silk-cloth, and Sinde caps. There are also several dyeing-houses, in which cloth made in some of the neighbouring places is dyed and prepared for the market; and there are some paper-mills. This town is the centre of a considerable trade. The most convenient commercial road between Hindustan, Afghanistan, and Persia, runs through it, and leads to the Bolan Pass, which, in spite of its formidable aspect, is much safer than the other roads which connect the valley of the Indus with the table-land of Iran, and this safety has been greatly increased since the British have got possession of the province of Sinde, and have suppressed the predatory incursions of the Murries and Boogties, two Beloochee tribes who inhabit the mountains contiguous to the pass. The Bolan Pass is also accessible all the year round, and a good road leads from it to Kandahar, and thence to Persia. Shikarpore is as it were built at the opening of this pass.

European and India goods are brought to Shikarpore by three different routes. From Calcutta they ascend the Ganges, and are taken to Loodiana, whence they go down the Sutlej to Bhawoolpore, and thence they reach Shikarpore by passing through Kyrpore. Some of them go from Loodiana to Lahore and Mooltan. These imports consist of raw Bengal silk, ivory, cochineal, spices of all kinds, coarse cotton cloth, raw China silk, kinkanbs, silk manufactured, sugar-candy, cocoanut, metals, groceries, drugs, indigo, opium, saffron, and dyes. The British textile fabrics which reach Shikarpore by this route are red-dyed cotton cloth, white cotton cloth, partly-coloured cotton cloth, long cloth, glazed chintz, printed, bleached and unbleached cottons, red and white cottons, yellow cottons, Juggernat muslin, black velvet, sheeting cloth, and coloured coarse broad cloth.

The second commercial road connects Central Hindustan with Shikarpore. The goods are brought to Palee in Marwar, situated not far from the Aravulli range, and are taken through Jessulmere and Kyrpore to Shikarpore. Only a few articles reach that place by this road, especially sugar, opium, spices, and groceries.

The same articles with European goods are sent from Bombay to Shikarpore by way of Kurachee, a sea-port of Sinde west of the Indus. From this place they are transported by land to Sehwun and Larkhana, and thus reach Shikarpore. The returns of Shikarpore to British India consist of the produce of the country, especially rice, ghee, hides, and wool; horses brought from Afghanistan are also exported, and dried fruits.

The exports from Shikarpore to Kandahar and Persia (Herat) consist of indigo, henna, metals, coarse and fine cotton cloth, European piece goods; Mooltanee coarse cloth, silks manufactured, groceries, spices, raw cotton, coarse sugar, opium, hemp seed, shields, embroidered horse cloths, and grain. The returns consist of turquoises, raw silk, gum arabic, manufactured silk from Herat of various kinds, dried fruits (prunes, dried black grapes, walnuts, dried apricots, almonds, and dates) in great quantities, tinsel thread for embroidery, *khund seoh* (a preparation from the sugar-cane of Jellalabad), broken copper and brass vessels, madder, saffron, safflower, gum salop from Herat, *masugh*, a dye prepared from the walnut-tree, dried mint, carraway-seed, *airmah*, a very fine description of cotton from Herat, used in embroidery, cochineal, and *Chojgund* and *gooljibeel*, two dyes for silks; the last-mentioned affords a green dye.

From Cutchee, a country west of Shikarpore, are imported alum, colocynth, saltpetre, sulphur, and *kar*, a kind of potash, produced by the incineration of tamarisk and other salt shrubs. From Beloochistan are brought assafœtida, antimony, alum, and copper.

But Shikarpore is best known in the commercial world by its banking transactions. In 1841 there were in that place thirty-five soucars or bankers, who have agents in all large commercial towns in Western Asia, as far as Bokhara and Yarkand in Chinese Turkistan, and even in Astrakhan and Nishnei Novogrod in Russia. Letters of exchange may be got in all these places payable in Shikarpore, Bombay, and Calcutta.

The climate of Shikarpore is sultry, and the heat excessive from the middle of March to the end of August. There are no periodical rains, though storms are generally looked for at the end of June or the middle of July; severe falls of rain occur also at the vernal equinoxes. The air is remarkably dry and clear, and to this circumstance probably it is to be ascribed that the place is not unhealthy, in spite of the low situation of the town, its being surrounded by stagnant pools close to the walls, and a large space of the adjacent country being for a considerable period completely under water. Only for a short period from the middle to the end of September, during which the inundations are drying up, ague in a mild form is prevalent. The cold months commence in September, and last to the middle of March. Frost and ice are not unusual, and vegetation assumes all the appearance of winter in a northern climate. The mornings at Shikarpore are invariably cold.

Shikarpore is a new town. It was built by the Mogul emperor in 1617, and as, during the last century, since the invasion of Nadir Shah (1739) all the neighbouring countries almost without interruption have been in a state of disorder, the town has never had the opportunity of developing all the advantages of its situation; but as it passed three years ago under the dominion of the British, it is hoped that this change will soon improve the condition of the place.

(Burnes's *Travels into Bokhara*; Postans's *Memorandum on the trade between the towns of Shikarpore and Kandahar*; Postans's *Memorandum on the City of Shikarpore*, in the *Journal of the Asiatic Society*, 1841; and Alexander Burnes, *On the Commerce of Shikarpore and Upper Sindh*, in the *Transactions of the Bombay Geographical Society*.)

SHIPS. The different designations which are applied to sailing vessels, according to their sizes, number of masts, and disposition of sails, are mentioned under SHIP-BUILDING, P. C., p. 396.

SHOA. [ABYSSINIA, P. C. S.]

SHOOTING STARS. The phenomena presented by these meteors, with the different hypotheses which have been proposed in order to account for them, have been noticed under AEROLITES, P. C.; it is therefore intended here merely to state the circumstances which have led to an opinion that the appearances are periodical, and the efforts which have been made, by simultaneous observations on them, to determine the differences between the longitudes of places on the Earth.

On the night of the 11th of November, 1799, MM. Humboldt and Bonpland, at Cumana, in South America, observed some thousands of shooting stars in the course of a few hours; and on the same night vast numbers were observed in North America and in Europe. On the night of November 12, 1832, the like meteors were seen in great abundance over all the north of Europe; and on November 12th of the following year, as many as 240,000, according to the computations of Arago, were seen in North America. On the night of November 13, 1834, vast numbers were again observed in America; and on the same day of the same month in the years 1835, 1836, and 1838 the display of meteors in different parts of the world was remarkably numerous. Professor

Quetelet, at Brussels, observed, that during the years 1838, 1839, and 1840 the shooting stars occurred on the nights of the 9th and 10th of August more abundantly than on any other nights of the year except the 12th or 13th of November; and it has been observed that the nights about the 2nd of January, the 23d of April, the 15th of June, and the 6th of December are periods at which the phenomena are, in most years, very frequent. The attention of astonomers has, however, been particularly directed to the 10th of August and the 13th of November as the times at which the recurrence of the phenomena is most probable; but it must be admitted that during the four or five last years the shooting stars have not appeared to be more numerous on those nights than on many others of the year.

With respect to the use of shooting stars as means of finding the differences between the longitudes of terrestrial stations, the idea was first proposed by Dr. Maskelyne, the astronomer royal, in 1783; and it is obvious that, as their appearance or disappearance is instantaneous to persons stationed at two different places, if it can be ascertained that a meteor observed by persons so situated is the same, the method may become one of considerable utility. The first attempt to ascertain a difference of longitudes by such observations was made in the United States of America in 1835; seven simultaneous observations were made at Philadelphia and the College of New Jersey in Princeton, on the 25th of November in that year; and the mean of the differences between the times of observation at the two places gave a result which agreed within $1''\cdot 2$ (in time) with the distance (= 2 minutes, in time) between the meridians of the stations when determined by other methods. (Silliman's *Journal*, October, 1840.) On the 10th of August, 1838, twelve simultaneous observations were made at Altona and Breslau, and from these M. Bogulawski computed the difference ($28' 2''\cdot 07$ in time) between the longitudes of those places, which agrees within one second with the former determinations of that difference. Again, in the same year, the observed times of the first appearances and the extinctions of several meteors were employed in determining the distance between the meridians of Rome and Naples; and though, on comparing the times of appearance, some discrepancies occurred, yet the times of disappearance, which can be observed with greater precision, gave results agreeing with each other within a few tenths of a second. It is easy to perceive that much uncertainty may exist respecting the precise moment of the first appearance of a meteor, it being scarcely probable that the attention of the observers at different stations should be at the same moment directed exactly to the same point in the heavens.

The impossibility, at present, of anticipating the nights in which the phenomena of shooting stars may be observed, and the small number of observations in which the identity of a meteor is free from uncertainty, are the chief obstacles to the general employment of this method of finding the differences of longitude between places. A few observations of such meteors do not afford a result on which much dependence can be placed; and a single observation appears to be liable to a risk of error amounting to several seconds of time in a computed difference of longitude.

(See Abstracts of the papers, by Messrs. Galloway and Drach, read before the Royal Astronomical Society, in the Monthly Notices for January, 1841, and December, 1841.)

SIBBALDIA (in honour of Robert Sibbald, formerly Professor of Physic at Edinburgh), a genus of plants belonging to the natural order Rosaceæ. It has a concave 10-parted calyx, the five outer segments accessory. It has 5 yellow or white petals, 5 sepals, and a lateral style. The fruit consists of from 5 to 10 small nuts seated on a dry receptacle.

S. procumbens has trifoliate leaves, wedge-shaped leaflets, with three teeth at the apex, rather pilose, the flowers corymbose, petals yellow, small, shorter than the calyx. It is found on dry mountains in Scotland, in Europe, Siberia, and North America.

S. parviflora is a native of Cappadocia. It has trifoliate leaves, the leaflets beset with strigose pili on both surfaces, the flowers in glomerate heads, the petals obovate, one half shorter than the calyx.

Sibbaldia is a small genus of Alpine plants. They grow best in small pots containing a mixture of loam, peat, and sand, and are propagated by division.

(Don, *Gardener's Dictionary*; Babington, *Manual of British Botany*.)

SIDDONS, MRS. SARAH, was born at Brecon, in South Wales, July 5, 1755. She was the oldest child of Mr. Roger Kemble and Sarah his wife (whose maiden name was Ward), and, while a mere infant, made her first appearance on the stage on the occasion of her father's benefit. The audience expressed their disapprobation of what they considered too premature an exhibition; but Mrs. Kemble boldly led the child forward, and she disarmed their anger by reciting the well-known fable of 'The Boy and the Frogs.' From that period Miss Kemble continued to perform regularly in her father's company till she attained her fifteenth year; and, at the early age of thirteen, she sustained the principal female parts in several standard English operas. Having formed an attachment to a young actor named Siddons, which was not agreeable to the family, Miss Kemble was removed from the theatre, and placed under the protection of Mrs. Greathead, of Guy's Cliff, Warwickshire, in the capacity of reader and companion. At the age of eighteen the affection of the young couple being undiminished by separation, Mr. and Mrs. Kemble consented to their union. They were married at Trinity Church, Coventry, November 26, 1773, and the young bride returned to the provincial stage at Cheltenham in company with her husband. 'It was a happiness,' remarks Mr. Boaden, in his Life of Mrs. Siddons, 'for the subject of these memoirs to have been born in the exact position of life, and at the precise time she was. Somewhat earlier, her correct feeling might have kept her from the stage, though the true sphere of talent like hers. . . . She started as an actress when the profession did not disgrace a woman of virtue. Becoming early attached to a man of the most honourable and steady character, the incense offered to her beauty did not disturb her peace.' At Cheltenham she attracted the notice of the Hon. Miss Boyle, Lord Bruce, afterwards created Earl of Aylesbury, and some other noble personages. Upon their strong recommendation, Garrick was induced to send King down to Cheltenham, to witness her performance in the 'Fair Penitent.' The Rev. Henry Bate, afterwards Sir Henry Bate Dudley, was also much struck by her Rosalind; and her transfer to the metropolis being at length determined on, she made her first appearance in London at the Theatre Royal, Drury Lane, on Friday, December 29, 1775, being then only twenty years of age, in the character of Portia, in the 'Merchant of Venice:' Garrick performed Shylock. She was announced simply as 'a young lady;' and, though favourably received, failed to make any strong impression, being thought more of as a beautiful young woman than as a great or even promising actress. On the revival of 'Richard the Third,' Garrick not having acted Gloster for five years, he cast Mrs. Siddons the part of Lady Anne. 'She there,' says Mr. Boaden, 'met Roscius in all his terrors;' and on the first night hung a little back from timidity. 'I have mentioned,' he continues, 'in another work the glance of reproach that corrected the failure, and the extreme sensibility with which it was long retained.' The fact was, as Mr. Campbell states it, that instead of advancing to the front of the stage and turning, as Garrick had instructed her, from the audience, she by 'hanging a little back,' compelled *him* to act the scene with *his* back towards the audience, instead of *hers*, an unintentional annoyance which he never forgave her, for at the close of the season when the re-engagements for the next campaign were under consideration, his answer to the person who mentioned in her turn 'the young lady,' was simply 'Let her go.' For this latter circumstance we have the authority of a still living contemporary of Garrick and most intimate friend of Mrs. Siddons, whose memory is as clear and retentive as his means of information were numerous and peculiar. But the triumph of Mrs. Siddons, though retarded, was not to be prevented even by so great a theatrical potentate as Garrick. In the summer of 1776, she appeared at Birmingham, where her genius was acknowledged by the celebrated actor, Henderson, who pronounced her to be 'the first and best of actresses; to have in herself all that her predecessors possessed and all they wanted,' and predicted that 'she would never be surpassed.' From Birmingham she went to Manchester, York, and Bath, increasing her reputation to such a degree that offers were again made to her from the metropolis; and on the 10th of October, 1782, she re-appeared at Drury-lane, as Isabella, in the 'Fatal Marriage.' On the 30th of October, she performed Euphrasia in 'The Grecian Daughter,' and subsequently enacted Jane Shore, Calista in 'The Fair Penitent,' and Belvidera in 'Venice Preserved,' a succession of triumphs which established her fame; and at the end of the season she went to Dublin, where her brother John was engaged for three years. In 1783 the celebrated trial of skill took place between the rival

Lady Randolphs, Mrs. Crawford, at Covent Garden, and Mrs. Siddons, at Drury Lane, and added another leaf to the laurels of the latter. In 1784 a cabal was made against her, upon a most unfounded charge of illiberality towards two brother performers, and she personally addressed the audience at tho opening of Drury Lane, on the 5th of October, having been assailed by hooting and hissing on her appearance as Mrs. Beverley. On the 2nd of February, 1785, Mrs. Siddons first performed Lady Macbeth. In 1794, Mrs. Siddons opened Holland's new Drury Lane Theatre by the performance of Lady Macbeth, on which occasion her brother Charles made his first appearance in the character of Macduff; and, in 1809, she again, as Lady Macbeth, assisted at the opening of the present Covent Garden Theatre, September 18th. The famous or rather *in*famous O. P. Row ensuing, seven months elapsed before she made her second appearance that season, repeating Lady Macbeth on the 24th of April, 1810. 'Such an interval,' says Mr. Boaden, 'spoke loudly for the taste of a London audience.' Two years afterwards, on the 29th of June, 1812, Mrs. Siddons took her leave of the stage she had so long adorned hy her genius and elevated by her private conduct, in the same celebrated character of Lady Macbeth, after which she spoke a farewell address, written by her nephew, Mr. Horace Twiss. Thrice again, however, duriug the next season she was induced to revisit the scenes and revive the recollections of her former glories; she performed on the 25th of May for the Covent Garden Theatrical Fund; on the 11th of June for Mr. Charles Kemble's benefit, and on the 22nd of the same month at Drury Lane for the fund of that theatre. In November, 1815, sho acted for ten nights at Edinburgh for the benefit of the widow and family of her son Henry; again at Covent Garden, four times in 1816, for benefits and charities, and at tho request of the Princess Charlotte of Wales, who was, bowever, unfortunately prevented by illness from witnessing the performance. In 1817 sho performed once (June 5) for Mr. C. Kemble's benefit, and made positively her last appearance upon any stage at Covent Garden, June 9, 1818, for the benefit of Mr. and Mrs. Charles Kemble, in the character of Lady Randolph. For two seasons after her public farewell in 1812, Mrs. Siddons gave occasional readings alternately from Shakspere and Milton at the Argyle Rooms, having been led to do so in tho first instance by the kind desire of serving the widow of Mr. Cherry, author of 'The Soldier's Daughter.' She was also honoured by a command to read to Queen Charlotte and tho Royal family at Frogmore, and an invitation from the Universities of Oxford and Cambridge. 'Whether this great actress regretted the stated calls to exertion,' says Mr. Boaden, 'I know not.' That sho did regret them however there can be little doubt, from the following remarks, which she one day made to an old and attached friend, an eminent physician, still living, from whose lips we heard it. It was about tho period of the evening when she had been accustomed to repair to the theatre to dress for the performance. 'At this time,' she observed, 'every body in London used to be thinking of me—*now*, nobody thinks of me!' The tone in which this was spoken, and the sigh which accompanied it, sufficiently indicated the feeling with which she contrasted her public and private life, although still the queen of every circle she condescended to enter. She died on the 8th of June 1831, about nine in the morning, at her residence in Upper Baker Street, in the 76th year of her age, and the prophecy of Henderson has not yet been falsified. 'The talents of this great woman,' remarks one of her biographers, 'are said to have been slowly developed and the growing claims of her family seemed to be the only unresisted calls upon her genius. At length fully kindled, it burst forth with a brilliancy that in her own sex had never been witnessed, and rivalled in its charm the spell of the great enchanter Garrick in all but his universality.' Mrs. Siddons lost her second daughter, Maria, in 1793; her husband in 1802; her eldest daughter, Sarah, in 1803; and her son, Henry, in 1815; a third daughter, Cecilia, and her son George survived her. Amongst the most celebrated portraits of this unrivalled actress are a full-length in the character of Isabella holding her son Henry by the hand, painted by Hamilton in 1782; another, in the character of the tragic muse, by Sir Joshua Reynolds, painted in 1784, and now in the collection of the Marquis of Westminster; a third, reading 'Paradise Lost,' by Sir Thomas Lawrence; a fourth, as Lady Macbeth, by Harlowe, who also painted her as Queen Katharine in the well-known picture of the trial scene from 'Henry VIII.' executed for Mr. Thomas Welsh; and shortly before her death sho sat to the late H. P. Briggs, Esq., R.A., whose interesting portrait of her (a three-quarter lengtb) was exhibited at Somerset House, hut has not been engraved.

'Memoirs of Mrs. Siddons,' by Mr. Boaden, were published in 1827, 2 vols. 8vo.; and after her decease, Mr. Thomas Campbell became her biographer. His work, published in 1834, is also in two volumes, and partly compiled from the MS. notes of Mrs. Siddons herself. There is also a brief memoir of her in Galt's 'Lives of the Players,' which, the writer informs us, in a postscript, he had but just completed when he received the news of her having that morning expired.

SIDMOUTH, a town on the Devonshire coast, in the east division of Budleigh Hundred, 13½ miles E.S.E. from Exeter. The area of the parish is 1970 acres; the population at the successive enumerations was as follows: 1801, 1252: 1811, 1688; 1821, 2747; 1831, 3126; and 1841, 3309. The number of houses at the last enumeration was 715; namely, 634 inhabited, 77 uninhabited, and 4 building. The town was a borough and market town, governed by a portreeve, in the thirteenth century; and in the middle of tbe fourteenth century, furnished Edward III. with two small ships for the siege of Calais. [EDWARD III., P.C.] From fragments of vessels and other relics, there is reason to believe that the antient harbour has been choked up with sand and pebbles, and that it now constitutes a meadow near the town. Sidmouth was anciently one of the principal fisbing towns of Devonshire, but the fishery bas declined, and the town would have fallen into decay, had it not within the present century risen into some importance as a watering-place.

Sidmouth stands at the mouth of the Sid, in the valley through which that little stream flows. The hills on each side of the valley rise to a considerable elevation, and form, toward the sea, bold and lofty cliffs which constitute a striking feature in the picturesque scenery of the place. The narrowness of the valley does not admit of the town, which is irregularly built, displaying a considerable front to the sea; but the villas and detached houses extend a considerable distance inland, up the valley, on both sides of the stream. There is a public walk along the beach more than half a mile in length, and the baths, public rooms, and library face the sea. There are some good inns, and lodging-houses. These are two well-supplied weekly markets on Tuesday and Saturday, and two yearly fairs, one on Easter Monday, the other on September 3. The parish church, dedicated to St. Nicholas, is an ancient building, recently enlarged; among other monuments, it contains one of Dr. Currie, the biographer of Burns. A new district church, or chapel of ease, dedicated to All Saints, has been lately erected; and there are places of worship for Unitarians, Baptists, and Independents. The living is a vicarage in the rural deanery of Aylisbeare, in the archdeaconry and diocese of Exeter, of the clear yearly value of 481*l.* with a glebe-house. There were in the parish, in the year 1833, an infant-school, with 95 children; namely, 22 boys and 73 girls, supported by voluntary contributions; four day-schools, with 116 children, namely, 80 boys and 36 girls (one of these schools, with 40 scholars, being partly supported by voluntary contributions); a boarding-school, with 12 girls: and a parish-school, with 137 children, namely, 100 boys and 37 girls, giving 360 children (namely 302 boys and 158 girls) or rather more than one in nine of the population, according to the enumeration of 1831, under daily instruction. The parish school was also a Sunday-school, attended by 148 children, namely, 88 boys and 60 girls, and there were two other Sunday-schools, with 145 children, namely 45 boys and 100 girls, giving a total of 293 Sunday-scholars, namely 133 boys and 160 girls, or less than one in ten of the population.

(*Parliamentary Papers; Ordnance Maps;* Lewis's *Topographical Dictionary;* Lysons's *Magna Britannia.*)

SIDMOUTH, HENRY ADDINGTON, VISCOUNT. The father of Lord Sidmouth was Dr. Anthony Addington, a physician, who, after practising for some time with considerable distinction in London, was induced by the state of his health to retire from the metropolis, and to settle in Reading, where he died in 1790. Dr. Addington married in 1745 Mary, daughter of the Rev. Haviland John Hiley, of Reading; and Henry, who was born at Reading on the 30th of May, 1757, was their eldest son. Mrs. Addington died in 1778. In the beginning of that same year Dr. Addington obtained much notoriety by a strange attempt in which he engaged in conjunction with Sir James Wright, the medical attendant of the Earl of Bute, to bring about a political alliance between that nobleman and the Earl of Chatham, whom Addington had been in the habit of visiting in his professional capacity. The negotiation, which of course came to nothing, appears to have originated solely with the two physicians—who afterwards quarrelled upon the subject and assailed one another, through the press, with mutual contradictions and recriminations—and to have been carried on for the greater part without the knowledge of the two noble persons who were principally concerned. Lord Chatham was at the time on his deathbed.

Meanwhile Addington's son Henry, after having commenced his classical education at Winchester School, had been entered at Brazennose College, Oxford, in January, 1774. He took his degree of B.A. in February, 1778; and in 1779 obtained the Bachelor's Prize for an English essay. On leaving the university he entered himself a student of Lincoln's Inn, and was called to the bar on the 11th of May, 1784.

Events, however, had by this time taken a course which had the effect of withdrawing him from the further pursuit of the profession upon which he had thus entered. His father's connection with the family of Lord Chatham had led to an intimacy while they were yet boys between him and the younger William Pitt, who was his junior by about three years, but had been in parliament since 1780, and was already, when Addington was called to the bar, firmly seated in the post of first minister of the crown. Addington is said to have been previously fond of attending the debates in the House of Commons; his brother-in-law, James Sutton, Esq., of New Park, had much influence at Devizes; and on Mr. Pitt's suggestion he stood for and succeeded in getting himself returned for that borough at the general election which preceded the opening of the new parliament on the 18th of May, 1784.

The long political career upon which he now entered was not marked by many events in which he bore a prominent part, and its general course may be briefly traced. So long as he was only a private member of the House of Commons—in which he retained his seat for Devizes until he became a peer—he was, as might be expected, one of Mr. Pitt's steadiest supporters. Accordingly, when the office of Speaker became vacant in May, 1789, by the promotion of Mr. (afterwards Lord) Grenville to be secretary of state, Addington, although so comparatively young a member, was put forward as the ministerial candidate, and was elected by a large majority. He filled the chair, with considerable credit if not with any remarkable distinction, till on the retirement of Pitt, in March, 1801, he was induced to undertake the formation and chieftainship of a new ministry, with the offices of chancellor of the exchequer and first lord of the treasury, as they had been held by his predecessor. He differed, therefore, it now appeared, from Pitt upon the great question of Catholic Emancipation, upon which that minister had gone out; but there were probably other subjects upon which their opinions and views had by this time considerably diverged. Addington had come to be considered as the leader or head of the class of persons specially styled the King's Friends; and it was understood to have been at the express request of his majesty that he now assumed office.

The most memorable event of Mr. Addington's short administration was the Peace of Amiens, which proved still shorter than its author's tenure of power. Soon after the renewal of the war in the beginning of 1803, Pitt, who had hitherto supported his old friend, began to intimate an apprehension that he was scarcely equal to the crisis, and then openly joined Fox and the regular opposition. The result was that Addington resigned, and Pitt was restored to power in May of the following year.

The displaced minister however made no attempt to form a party against his successor. He would probably indeed have admitted as readily as any one else that Mr. Pitt was the preferable person of the two to be at the head of affairs at such a moment, now that he was willing to accept the post upon the condition—namely, the abandonment of the question of Catholic emancipation—which he had formerly rejected, but which the king, and, it must be added, the great majority of the country and of both houses of parliament, regarded as indispensable. The resumption of office by Pitt in May, 1804, was a concession on his part of a great point and a great principle, and a decided victory obtained by George III. and his friend Addington. The new government was from the first supported by Addington, who, in January, 1805, again took office as president of the council, being at the same time made a peer by the title of Viscount Sidmouth. It is said that he accepted this elevation, which removed him from the House of Commons, with much reluctance.

The writer (probably a near relative) of an extended and elaborate memoir of Lord Sidmouth, in the 'Gentleman's Magazine' for April, 1844, while full to overflowing upon every other event of any importance in his lordship's career, merely informs us, without a word of explanation, that he resigned the presidency of the council in July of the same year in which he accepted that office. The causes are thus stated in the 'Annual Register,' in the relation of the proceedings, so distressing to Pitt, which were this year taken against Lord Melville:—'During the whole of these proceedings the new president of the council and his adherents separated from the minister, and took an eager and an active part in bringing Lord Melville to the bar of public justice: conduct which must have been considered as a defection from the government of which they formed a part, and, as such, must have been deeply resented by the minister. It was also rumoured that other causes of distaste and disagreement existed between Mr. Pitt and Lord Sidmouth at this period: that the former was jealous of the influence which the latter maintained in a certain quarter, which had lately been manifested in the conferring of high ecclesiastical dignities; and that, instead of gaining an useful ally, Mr. Pitt had only exposed himself to the machinations of a dangerous rival. Whether these reports were founded in truth it is not our province to decide; but certain it is that on the 10th day of July the Viscount Sidmouth and the Earl of Buckinghamshire resigned their respective offices.'

When Mr. Fox and Lord Grenville succeeded to power in February, 1806, after the death of Pitt, Lord Sidmouth was made lord privy seal; and when the ministry was re-constructed in October, he was replaced in his former post of president of the council, which he held till the breaking up of Lord Grenville's government in March following. After this he remained out of office for about five years. Then, in April, 1812, in the last moments of Mr. Perceval's administration, he was appointed president of the council for the third time. In June of the same year, when Lord Liverpool assumed the premiership after the assassination of Mr. Perceval, Lord Sidmouth became secretary of state for the home department.

This office, which for the first time gave him much of a real share in the business of government, he continued to hold for the next ten years. His conduct on several occasions, as, for instance, on that of the great meeting for reform, held at Manchester in August, 1819, exposed him to a good deal of popular outcry and obloquy; but he was never charged with being deficient in decision and fearlessness, and he at least succeeded in very difficult times in preventing the public safety from ever being seriously endangered. He resigned his office in 1822; but at the earnest request of Lord Liverpool he retained his seat in the cabinet for two years longer. He finally retired from official life in 1824; but he continued for some years to attend frequently in the House of Lords, though he seldom spoke. He had at no time, indeed, been accustomed to come forward much in debate. He survived till the 15th of February, 1844, when he died at his residence, the White Lodge, in Richmond Park, of which he was deputy ranger. Lord Sidmouth was twice married; first in 1781, to Ursula Mary, daughter of Leonard Hammond, of Cheam, in the county of Surrey, Esq., who died in 1811, after bringing him four sons and four daughters; secondly, in 1823, to the honourable Marianne, widow of Thomas Townshend, of Honington Park, in the county of Warwick, Esq., and only daughter of Lord Stowell, who died also before him in 1842.

(*Gentleman's Magazine*, for April, 1844.)

SIEGEN, LUDWIG VON, the inventor of mezzotinto engraving, was born in Utrecht in 1609, of an ancient and noble family of Westphalia. His mother was a native of Holland, but of Spanish origin; her name was Anna Perez, and Johann von Siegen, the father of Ludwig, was her second husband. Ludwig was the third son of his parents. In 1619 Ludwig's mother died, and his father Johann entered in the following year into the service of Prince Maurice of Hesse and removed to Cassel, where he was placed at the head of the Collegium Mauritianum, founded for the education of nobles by that prince in 1617. Ludwig von Siegen was educated in this college, and was also appointed page to one of the princes. He remained in Cassel until 1626, when the inhabitants of the place were dispersed to various parts in consequence of the plague; and Maurice resigned the government in the year following, and his successor William V. suspended the college altogether. Johann von Siegen retired to Juliers and afterwards to Kampen in Holland, where he died in 1655.

Nothing is known of the life of Ludwig Von Siegen from the time that he left the college of Cassel in 1626 until 1637, except that he was in France and Holland, and it is probable that he was doing military service in this time. In 1637 after the death of the Landgrave of Hesse, he was appointed page to the young prince William VI., by his mother the regent Amelia Elizabeth of Hanau, and in two years afterwards he received the title of Kammerjunker, and served in that capacity until 1641. It was during these years, between 1637 and 1641, that Siegen discovered his new method of engraving, but he removed in 1641, or in the beginning of 1642, to Amsterdam, without imparting his secret in Germany. On the 19th of August, 1642 he sent a letter from Amsterdam to the Landgrave, enclosing some proofs of a portrait of his mother Amelia Elizabeth, and the plate of these prints is the first mezzotinto engraving. Siegen speaks of his portrait in the letter referred to as executed in a new and astonishing manner, invented by him; and he further observes, that no engraver will be able to devise the manner in which it was executed. This letter still exists among the archives in the library of Cassel, and a fac-simile of it is given in Laborde's 'Histoire de la Gravure en Manière Noire,' (History of Mezzotinto Engraving).

This earliest mezzotinto engraving, though as the above letter shows, printed in 1642, was not published until 1643, when it appeared with the date altered to that year, together with a portrait of Elizabeth of Hungary; and the prints drawn off by Siegen himself, not already disposed of, were altered with a pen to the same date; specimens of all three still exist. The inscription of the original print was as follows:—

'Amelia Elizabetha, D. G. Hassiæ Landgravia, &c. Comitissa Hanoviæ Mutzenb.
Illustrissimo ac Cel.simo Pr. ac Dño Dño Wilhelmo VI. D. G. Hassiæ Landgr. etc. hanc Serenissimæ Matris et Incomparabilis Heroinæ Effigiem ad vivum à se primum depictum novoq. jam sculpturæ modo expressam, dedicat consecratq. L. à S. Aº Dni. CIƆ IƆ C XLII.'

It is a bust portrait, 16 French inches high by 12 wide, and is rounded at the top.

After the termination of the Thirty Years War in 1648, Siegen left Holland and entered the military service of the duke of Wolfenbüttel, and he married shortly afterwards the daughter of Michael Call, the bailiff of Hildesheim, by whom he had several children. In 1654 he returned to Holland, and visited also Cologne, where he resumed the style of Siegen von Sechten, from the name of his paternal estate near Cologne, to part of the rents of which he had become entitled. From Cologne he went to Brussels, and there he became acquainted with Prince Rupert, to whom he communicated his new method of engraving. Prince Rupert, to enable him to carry out this new method, communicated it to the portrait painter Wallerant Vaillant, who assisted him in his attempts, and engraved several plates in the style at Brussels and at Frankfort, in 1656 and 1658; a few good prints were also executed by Prince Rupert himself. The secret is, however, said to have been sold by one of Siegen's sons already in the year 1656, and was known at that time at Mainz. This general publication of his discovery, forced Siegen to sign himself, on one or two of his prints of this period, as the inventor of this new method of engraving.

It was, however, in England that Mezzotinto engraving was first cultivated to any very great extent or with very great success. In 1660, Prince Rupert accompanied Charles II. to England, and explained the whole process of the new art to his friend Evelyn, who was then engaged on his history of engraving; and in this book, which was published in 1662, he describes it as Prince Rupert's, and published a specimen of the style by the prince. Through this work, entitled 'Sculptura, or the history and art of Chalcography, and engraving in copper, with an ample enumeration of the most renowned masters and their works, to which is annexed a new manner of engraving or *mezzo tinto*, communicated by his Highness Prince Rupert to the author of this treatise,' Prince Rupert was generally considered the inventor of mezzotinto. Evelyn precisely though briefly states that Prince Rupert was the inventor of the art, yet from a paper which he himself drew up on the subject, to be read before the Royal Society as a communication from the prince himself, the invention is not claimed by the prince, and this paper is noticed by Evelyn in his history, as in preparation: it was written, but was never read before the Royal Society. In his history, Evelyn heads his sixth chapter with the following words: 'Of the new way of engraving, or Mezzotinto, invented and communicated by his Highness Prince Rupert Count Palatine of Rhyne, &c.' In the paper prepared for the Royal Society, the following passage occurs:—'This invention, or new manner of chalcography, was the result of chance, and improved by a German soldier, who, espying some scrape of barrel of his musquet, and being of an ingenious spirit, refined upon it, till it produced the effects you have seen, and which indeed is for the delicacy therefore much superior to any invention extant of this art, for the imitation of those masterly drawings, and as the Italians call it that morbidezza expressed in the best of their designs. I have had the honour to be the first of the English to whom it has been yet communicated, and by a special indulgence of his Highness, who with his own hands was pleased to direct me with permission to publish into the world, but I have esteemed it a thing so curious, that I thought it would be to profane it, before I had first offered it to this illustrious society.'

Sandrart was better informed as to the origin of this art, though he was in error as to the date of the discovery and the title of Siegen: he says, 'the inventor of this art was a lieutenant-colonel in the Hessian service, of the name of Von Slegen, who discovered it after the peace in 1648.'

Siegen was not a lieutenant-colonel of Hesse, but a major in the service of the Duke of Wolfenbüttel, but he did not attain this rank until 1674. He died at Wolfenbüttel, but the date of his death is not known; he was still living in 1676, when he took possession of some property in Antwerp. He then styled himself Ludwig Siegen von Sechten. He appears to have wholly given up engraving in the latter years of his life.

Laborde gives the following list of Siegen's engravings:—the portrait already mentioned of the Landgravin of Hesse, marked L. a S. 1642; Eleanora de Gonzalgue, wife of the Emperor Ferdinand III., sometimes called the Queen of Bohemia, a bust portrait after Hondthorst, 19 inches 3 lines (French) high, by 15-6 wide, marked L. a Siegen Inventor fecit 1643; Prince William of Nassau, Guilhelmus D. G. Princeps auriacus comes Nassaviæ &c., also after Hondthorst, marked L. a Siegen Inventor fecit 1644, 1 foot 7 inches 4 lines high, by 1 foot 3 inches wide; and Augusta Maria Caroli M. B. Rex filia Guilhelmi Princ. avr. sponsa, of the same size and date; the Emperor Ferdinand III., marked Lud. Siegen in Sechten ex. novoq. a se invento modo sculpsit Anno Domini 1654, 1 foot 3 inches 7 lines high, 1 foot 1 line wide; St. Bruno,—L. a S. in S. Ao. 1654, 11 inches high by 6 inches 11 lines wide; and lastly a Holy Family after Annibal Carracci, called La Sainte Famille aux Lunettes; it is dedicated to Prince Leopold of Austria—Ludw. a Siegen humilissime offert, Annib. Caratii pinx., Ludovicq a S. novo suo modo lusit.

(Sandrart, Evelyn, Descamps, Walpole, but especially Laborde, *Histoire de la Gravure en Manière Noire*, Paris, 1839.)

SIEYES, EMMANUEL JOSEPH, Count, more generally known as l'Abbé Sieyes, was born at Fréjus on the 3rd of May, 1748. Destined from early youth to the ecclesiastical profession, he completed his studies with success at the University of Paris, where his mind became imbued with the philosophical speculations prevalent at that period, and he applied himself seriously to political economy, and to the investigation of the various schemes of social reform which were then so frequently suggested. The liberality of his sentiments does not appear to have impeded his advancement in the Church. By the patronage of De Lubersac, Bishop of Chartres, he was appointed to a canonry in that Cathedral, and afterwards became Vicar-General and Chancellor of the diocese. He took an active part in various assemblies of the clergy, and warmly espoused those opinions which were rapidly producing the Revolution of 1789. When the disordered state of the public finances compelled the government to summon the States General, the question arose, in what manner that body was to be convoked? Whether they were to be called upon, as in the last assembly of 1614, to vote by classes, or, as justice and the necessities of the time appeared to require, by individuals? To this important question Sieyes replied by publishing three pamphlets, which were so skilfully adapted to the prevailing opinions on the subject that they at once placed him on the highest pinnacle of political popularity. The first was entitled 'Essai sur les Privilèges:' the second and the most remarkable, 'Qu'est ce que le Tiers Etat?' in which he asserts that the 'Tiers Etat' is the nation itself; he then proceeds to show that it had hitherto exercised no appreciable influence on the government of France, and he demands for it a political recognition. The title of the third pamphlet was 'Moyens d'Exécution dont les Représentans de la France pourront disposer en 1789.' The bold speculations of this political thinker soon became realities through his active influence. On the convocation of the States-General Sieyes was elected deputy for Paris. An opportunity for carrying his scheme into execution was given him by the refusal of the majority of the nobles and clergy to unite with the 'tiers état,' and to verify their powers in common; by his eloquent exertions he induced the representatives of the people to constitute themselves into an independent body styled the National Assembly (June 16, 1789). He it was likewise who proposed the oath which was taken by all the members at the 'Jeu de Paume' [BAILLY, P. C.] 'never to separate themselves, but to assemble wherever circumstances required until the perfect establishment of the constitution.' This sudden and vigorous measure, which must have proved the immediate signal of civil war had not the power of the other orders of the state been already paralyzed, was vehemently opposed by Mirabeau [MIRABEAU, P. C.] at the head of the more moderate of the republican party; it was however carried by a very large majority. So great was the popularity of Sieyes that, on presenting himself before the Assembly, he was greeted by the loud and reiterated applause of the members present, who rose up to receive him. On the meeting of the 23rd of June, when the king declared the resolutions of the Assembly to be null and void, and ordered the members to disperse, Sieyes energetically reminded them that they were 'still the same body to-day that they had been the day before, and bid them proceed in their deliberations.' 'They did deliberate,' says a writer in the 'Foreign Quarterly;' 'and the revolution was the result.' Sieyes was also the framer of the decree which was passed on the 30th of October, by which the antient provinces were abolished, and France was divided into eighty departments all governed by the same law. [FRANCE, P. C.]

He continued to take a prominent part in the deliberations of the National Assembly until the publication of those decrees which he considered of too levelling a nature, and which alarmed him as to the ultimate result of the innovations which he had himself been too eager to introduce. Accustomed to command, he was unable to endure contradiction, and, when he found that the measures which he opposed were carried in spite of his influence, he betook himself to a sullen silence from which even the persuasions of his eloquent colleague, Mirabeau, were unable to rouse him. The most important of these measures was the question of the abolition of tithes. To this he was favourable; but he considered that they should be purchased by the landed proprietors, and an indemnity for their loss made to the tithe-holders. To this indemnity, however, the Assembly was unwilling to acquiesce; and the determined and impassioned manner in which he advocated it well nigh lost him the popularity which his previous conduct had acquired. The discourse he delivered on that occasion is remarkable for the earnest vehemence of the language, and the concise correctness of the arguments; he exposed the impolicy and the injustice of the proposed measure, and showed that the only members of society likely to be benefited by the change were the wealthy proprietors of land, whom they were about to enrich by the gratuitous addition of one-tenth of its value. The energetic exclamation with which he concluded his address will probably be quoted and admired long after the author has been forgotten: 'ils veulent être libres, ils ne savent pas être justes,' 'they would be free, and know not how to be just.' The apt reply of Mirabeau to Sieyes, when the latter was indulging in bitter invectives on the violence and injustice of the decrees of the Assembly which he had created, is characteristic of that remarkable man: 'You have unloosed the bull, and you complain that it gores you.'

Elected, in 1791, member for the department of Paris, in the new legislative assembly, he refused the additional honour, which was offered him by the electoral assembly, of electing him constitutional bishop of that capital. Shortly afterwards he published a letter in which he explained his opinions on monarchical government: he remarks that 'he makes it the object of his preference from no desire to accommodate himself to antient customs or from any superstitious regard for royalty, but because he considers it proved that the citizen enjoys more freedom under a monarchy than under a republic.' He was named deputy for the department of La Sarthe, in the convention of 1792, but, wisely foreseeing the danger of an active participation in the debates, he persevered in the silence he had previously imposed upon himself, and for the most part contented himself with the simple record of his vote. At the trial of the king it has been generally asserted that he accompanied the sentence of death, which he pronounced, with an ill-timed sarcasm on the lengthened arguments with which the deputy who had spoken before him attempted to justify his vote. 'Robespierre's vote,' says Carlyle, 'cannot be doubtful; his speech is long. Men see the figure of shrill Sieyes ascend; hardly pausing, passing merely, the figure says "La mort sans phrase" (Death without phrases).' (*History of the French Revolution*, vol. iii. p. 226, 8vo. ed.) It will be seen, however, by reference to the 'Gazette Nationale' or 'Moniteur Universel,' for January 20, 1793, where the different speeches are given at length, that the vote of Sieyes was simply 'la mort,' and that he gave it a considerable time after those of Robespierre and Philippe l'Egalité, to both of whom the allusion has been supposed to be made. So strongly however was the stigma of this sarcasm attached to his name, that when, at a subsequent period, he was ambassador of the French republic at the court of Berlin, one of the ministers of the king of Prussia having been solicited to show him the attentions due to the office he held, he replied: 'Non, et sans phrase.' (Morellet, *Mémoires*, vol. ii. c. 3.)

While the power of Robespierre [ROBESPIERRE, P. C.] and his colleagues was in the ascendant, Sieyes prudently retired into the country; and when subsequently asked 'What he had done during the reign of terror?' he wittily retorted, 'I have lived;' no small achievement at that time for a man of his political celebrity.

After the fall of Robespierre he returned to the Convention, and by his influence obtained the recall of the proscribed members of the Gironde party. In 1795 he again took an active part in the management of affairs, and was named a member of the new Comité du Salut Public; on the 19th August of the same year he made a proposition to the Convention to establish a constitutional jury, which was however rejected. During this time he chiefly occupied himself with the direction of the foreign affairs, and successfully carried on several important negotiations with the European states, and went to Holland to conclude a treaty of alliance.

In the same year Sieyes was named by the Council of Antients one of the five directors, but he declined the proffered honour, and Carnot was appointed in his stead.

In 1797 he had a narrow escape from the hand of an assassin, l'Abbé Poule, who, entering his room, fired a pistol at him at arm's length, and one of the balls shattered his hand. He behaved on this critical occasion with his usual coolness, and a few days after quietly told his servants, 'If Mons. Poule should return, inform him that I am not at home.'

In 1798 Sieyes was sent on a mission from the French Government to the court of Berlin, in which, though he failed in his attempt to form an alliance with that power, he succeeded in securing its neutrality. On his return to Paris the following year he was named member of the Directory, a nomination which showed the disposition of the councils, as he had openly expressed his dissatisfaction with the directorial government. Placing himself at the head of a conspiracy which had been formed against three of his colleagues, who were known for their republican sentiments, he procured their forced resignation, and a new Directory was formed in which the majority was favourable to his views. Another important measure which he effected through the instrumentality of the Minister of Police, Fouché, was the closing of the Jacobin Club, a body whose name was connected with all the excesses of the Revolution. These measures, as they destroyed the popularity of the author of the Tiers Etat, and exposed him to the vengeance of republican fury, made him anxious to secure the support of some military leader possessed of sufficient talent and energy to take upon himself the sole direction of the affairs of state. 'We must have no more dealings with declaimers,' said he, 'we want a head and a sword.' Military chiefs there were many at that period, some of them of the highest renown, but they appeared to Sieyes to fail in the necessary requisites for a civil ruler. Joubert, in whom he hoped to find them, had recently fallen at Novi. Masséna was merely a brave and skilful soldier, and Augereau and Bernadotte were too well known for their democratical sentiments. The arrival of Bonaparte from Egypt [BONAPARTE, P. C.; KLEBER, P. C. S.] determined the difficulty; the penetration of Sieyes discovered in him a fit associate for his designs. They were favoured by the enthusiastic reception which Bonaparte met with from all ranks and parties on his arrival, by the views of this military chief himself, and by the active co-operation of many of the French generals and the most influential members of the legislature. The talents and influence of Sieyes were appreciated by Bonaparte, while the speculative nature of his views precluded the possibility of his becoming an object of jealousy. Mutual esteem indeed there was none; they were in the frequent habit of expressing their dislike of each other in no measured terms; but to effect his end the soldier felt the necessity of cordially co-operating with the statesman, and the statesman perceived that a salutary change could not take place without the strong support of the soldier.

The Revolution of the 18th Brumaire (9th Nov., 1799) was the result of this co-operation, and Napoleon, Sieyes, and Roger Ducos were the first consuls named, and two commissions of twenty-five members each were appointed from each Council of State to assist the consuls in the formation of a new constitution. In the formation of this constitution, however, Sieyes and Bonaparte soon disagreed; Sieyes was allowed to form a legislature according to his political speculations, and he made it consist of a Senate without the power of debate, and a Tribunate which was to discuss with the Council of State the legislative measures proposed. But to his visionary scheme respecting the executive, which was to be vested in a Grand Elector, whose sole power was to consist in the nomination of two consuls who were to exercise all the powers of government, Bonaparte offered a vigorous and successful resistance. Discontented with the overthrow of his political theory, and discovering with characteristic penetration that he had found his master, he refused to act a subordinate part in the new constitution, which was proclaimed on the 24th December, 1799. At this period he may be said to have terminated his public career. His services however were richly rewarded with 600,000 francs and the estate of Crosne, which was afterwards exchanged for a magnificent hotel in Paris, and the valuable lands of Faisanderie in the park of Versailles. 'Thus the democratic fervour of the author of the pamphlet "What is the Tiers Etat?" sunk into the interested apathy of the proprietor of fifty thousand ponnds' (Alison). This writer quotes also from the 'Memoirs of Gohier' an incident characteristic of the extreme cupidity of Sieyes, to use no severer term (*History of Europe*, vol. iii., p. 785), but it must be remembered that Gohier was the President of the Directory on the 18th Brumaire, that he was strongly opposed to Sieyes in political opinions, and that he evinces throughout his Memoirs much personal hostility towards him.

Under the consulate and the empire, Sieyes studiously avoided all participation in power. He declined the offer of the presidency of the Senate, and contented himself with accepting the title of Count. Napoleon borrowed largely from his theories, which he had the talent to translate into acts, and many of his political ideas formed the basis of the legislative measures which he introduced. At the Restoration he was exiled, and only returned to France after the Revolution of 1830, fifteen years afterwards. He died at Paris, in tranquil obscurity, on the 20th June, 1836.

The character of Sieyes has been graphically depicted by Dumont [DUMONT, P. C.] in his valuable and interesting Memoirs. 'His manner,' he says, 'was neither frank nor engaging; he was a man with whom it was difficult to become intimate, and who was wont to express his opinion without deigning to enter into any discussion upon it. His writings had given him a well established reputation; he was looked upon as the oracle of the Tiers Etat, and the most formidable enemy of privileges. He was easily excited to a display of ill humour, and appeared to hold in extreme contempt the existing state of society (1790). I imagined that this friend of liberty had necessarily a liking for the English nation, and the subject being familiar to me, I introduced it to him, but I discovered to my surprise that the whole English constitution was in his eyes a mere piece of charlatanry to impose upon the people: he seemed to pity my ignorance as I described the various modifications that system had undergone, the cautious regard ('ménagemens réciproques') shown towards each other by the three orders of the state, the hidden checks which they opposed to each other's movements, and the disguised but real dependence which existed between them. The influence of the crown appeared to him venality, the opposition a mere court trick ('manège d'antichambre'). The only thing he approved of among the English was trial by jury, which, however, he but little understood, and, in common with most Frenchmen, he had formed wrong notions respecting it. In a word, it was manifest that he regarded the English but as children in the art of framing a constitution, and that he considered himself capable of giving a much better one to France.' (Dumont, *Souvenirs de Mirabeau*, p. 62, 63, Paris, 1833.) So great indeed was the vanity of this political philosopher that on one occasion he remarked that 'the art of government was a science which he considered he had brought to perfection.' This disposition may have been the cause of the surname of Mahomet, which Mirabeau was in the habit of applying to him. There is also an admirable sketch of his character in Mignet, 'Hist. de la Révolution,' c. ii.

The principal writings of Sieyes, not already mentioned, are, 1, 'Observations sommaires sur les Biens Ecclésiastiques.' 2, 'Préliminaires de la Constitution.' 3, 'Reconnaissance et Exposition des Droits de l'Homme.' 4, Des Opinions Politiques.' 5, Divers Rapports et Projets de Lois.' The following works have been consulted, and may be referred to for a more full detail of the life and character of Sieyes: Alison, 'Hist. of Europe,' vol. i. and iii.; 'Carlyle, 'Revolution in France;' Thiers, 'Hist. de la Révolution,' and 'Hist. du Consulat,' &c., vol. v.; Mignet, 'Notices et Mémoires Historiques,' 2 vols., Paris, 1843; Dumont, 'Souvenirs de Mirabeau,' 'Mémoires de Morellet,' 2 vols., Paris, 1821; Ælsner, 'Des Opinions Politiques de Sieyes et de sa Vie comme Homme Public,' 1800; 'Sayings and Deeds of Napoleon Bonaparte,' 2 vols., London, 1846. His speeches are printed in the 'Moniteur' of the time.

SIGILLA'RIA, a very large group of fossil plants, confined to the Carboniferous strata, in which the great stems of this genns sometimes stand upright *over* beds of coal, while *below* the coal spread the root-like branching forms to which the name of Stigmaria is applied. The genus is supposed to be related both to Ferns and to Carteaceæ. (Brongniart.)

SIGNORELLI, LUCA, a celebrated Italian painter, born at Cortona in 1439, was the son of Egidio di Ventura Signorelli, by the sister of Lazzaro Vasari: he was the pupil of Piero della Francesca, with whom he worked at Arezzo, where he lived with his uncle Lazzaro Vasari.

Vasari mentions many of Luca's works, few of which however still exist; but the altar-piece of St. Onofrio, painted in 1484, is still in the cathedral of Perugia, and there are two other pictures in the cathedral of Volterra; there are also still some pictures by him at Orvieto, Rome, Cortona, at Siena and in its neighbourhood, and in the Florentine gallery. His most celebrated work is the fresco of the Last Judgment in a chapel of the church of the Madonna or cathedral at Orvieto. The painting of this chapel of the Madonna di San Brizio was commenced in 1447 by Fra Giovanni da Fiesole, who however painted only part of the ceiling, and it was completed many years afterwards by Luca Signorelli. The contract concerning the continuation of these frescoes by Signorelli is dated April 5, 1499; he undertook the completion of the ceiling for 200 ducats, and the walls for 600 ducats, besides free lodging, and two measures of wine and two quarters of corn every month. The ceiling was finished in 1500; when the walls were finished is not known, but as the ceiling was done apparently within the first year, and this may from the amount of the remuneration be fairly estimated at about one quarter of the whole, the chapel was probably completed in 1503 at latest. The frescoes comprise the history of Antichrist, the Resurrection of the Dead, Hell, and Paradise; and such is the vigour and boldness displayed in these works, especially in the invention and the naked figure and their foreshortenings, that Vasari and many others have pointed to Signorelli as the immediate precursor of Michael Angelo. Vasari says that Michael Angelo always expressed a high admiration of the works of Signorelli, and observes that all may see that he made use of the inventions of Luca in the Last Judgment in the Sistine Chapel, especially in the forms of the angels and demons, and in the arrangement.

Luca Signorelli was one of those who competed for the prize of Sixtus IV. in the Sistine Chapel, which was won by Cosimo Roselli. [ROSELLI, P. C. S.] He retired in his old age to Cortona, where his Italian fame was rivalled by the personal respect that was shown him. He is represented by Vasari as having been a man of very high character, and he adds that he always lived more like a nobleman than an artist: he died in 1521, aged eighty-two. The frescoes of the cathedral are described and in part engraved in Della Valle's 'Storia del Duomo d' Orvieto,' Rome, 1791. The design, though full of power, is hard, and the colouring wants harmony.

(Vasari, *Vite de' Pittori*, ed. Schorn.)

SI'LAUS (a name used by Pliny (*Hist. Nat.* 26, c. 8, ed. Hard.) for an umbelliferous plant), a genus of plants belonging to the natural order Umbelliferæ, and the tribe Seselineæ. The calyx is obsolete; the petals ovate, oblong, entire, or slightly emarginate, with an inflexed lobe, sessile, truncate, or appendaged at the base.

S. pratensis, Meadow Pepper Saxifrage, has an angular stem, supra-decompound leaves, pinnate leaflets with the segments rather remote. It is a smooth dark-green herb. The umbels consist of several unequal rays. The flowers are yellowish or greenish white. The fruit is roundish and ovate. It is found in damp and moist places in England, Europe, and Siberia. The whole plant has an unpleasant smell when bruised, and is said in some parts of Norfolk to give a bad flavour to the milk of cows feeding on it, and it is generally found that cattle avoid it in pastures. The species of this genus are not numerous. They are principally found in Europe, and will grow in any common garden soil, and may be propagated by seeds or by cuttings.

(Don, *Gardener's Dic.*; Babington, *Man. Brit. Bot.*)

SILVER, GERMAN. [COPPER, P. C., p. 504.]

SILVERING. [GILDING, P. C.]

SI'LYBUM, a genus of composite plants belonging to the tribe Cynareæ and the section Silybeæ. It has an imbricated involucre with leafy scales at the base, narrowed into a long spreading spinous point. The receptacle is scaly. The fruit compressed, its terminal areola surrounded by a papillose ring.

S. marianum, is the only species. It has a stem from 3 to 4 feet high, ribbed and furrowed. The leaves are very large, oblong, lanceolate, wavy, and clasping the radical leaves, pinnatifid, and usually variegated green and white. The involucral scales closely adpressed below. The florets are purple, with a very long tube. This plant is found in waste places in Great Britain.

(Babington, *Manual of British Botany*.)

SINDE or SCINDE is that part of Hindustan which extends on both sides of the river Indus from the sea to near the place where the river is joined by the Chinab, which brings to it the united waters of the five rivers of the Panjab. It lies between 23° 30′ and 29° N. lat., and 67° and 71° E. long. It extends in length from south to north more than 360 miles, and its average width may be 200 miles. This gives an area of 72,000 square miles, or about 14,000 square miles more than England inclusive of Wales, and nearly as much less than the whole area of Great Britain.

On the south and south-west it borders on the Indian Ocean, and its eastern districts are separated from the province of Cutch by the Runn. To the east of it, and chiefly within its boundary, extends the Indian Desert or Thurr, where it borders on the Rajpoot States of Marwar and Jessulmere. On the north-east are the territories of the Khan of Bhawulpore, and north those of the Panjab or Seiks. The north-western corner of Sinde reaches the Boogtee hills, which belong to Afghanistan, but the other parts of the western borders are Beloochistan or the territories of Khelat, from which Sinde is mostly separated by the Hala Mountains.

The sea washes the shores of Sinde for about 150 miles, and is shallow, but the soundings are regular. A vessel will have from 12 to 15 feet of water a mile and a half from shore. A bank however occurs opposite the principal mouth of the Indus, called from it the Gora or Kora Bank, along the edge of which there are breakers for twelve miles. The sailors clear it by stretching out of sight of land and keeping in 12 fathoms water till they have passed the danger; for they state that a vessel would be wrecked on a course where the depth is 10 fathoms. This bank is much resorted to by fishermen. The navigation along this coast is much earlier suspended than in the neighbouring countries. Few vessels approach it after March; for the south-west monsoon, which then partially commences, raises such a sea that the waves break in three or four fathoms water, while the coast is not discernible owing to its lowness till a ship is close upon it, and there is great risk of missing the port, and there is no shelter near.

The tides rise in the mouth of the Indus about 9 feet at full moon; they ebb and flow with great violence, particularly near the sea, where they flood and abandon the banks with incredible velocity. It is dangerous to drop the anchor except at low-water, for the vessel may be left dry a short time afterwards. In the widest mouths of the Indus the tide is not perceptible more than seventy miles from the sea.

The Indus. Sinde is indebted for its fertility to the inundations of the Indus. As far as these inundations extend, the country yields abundant crops; where they cease, and no means of irrigation exist, the country is a desert. These inundations however are not derived from the same cause as those of the Ganges. The inundations in Bengal are almost entirely the effect of the periodical rains during the south-western monsoon, and the addition which the waters receive from the melting of the snow in the Himalaya mountains is comparatively small. The waters of the Indus are very little increased by rains, as the rains which fall in its basin are scanty, and so uncertain, that many parts of it frequently suffer from drought. But the upper course of the Indus traverses countries which for more than six months are covered with snow, and all its great tributaries, including the five rivers of the Panjab, are in their upper courses surrounded by mountains which rise several thousand feet above the snow-line. As in these parts the difference of the snow-line in summer and winter amounts to 3000 feet, an immense volume of snow must annually be dissolved, and the water thus produced must greatly raise the level of the river. Even in the lower course of the Indus the difference of the level between the highest and lowest points amounts to 12 feet. As the banks of the river in very few places attain such a height, the waters spread over the adjacent levels and fertilize the soil.

Artificial means are employed to increase these advantages, especially canals and dams. The canals serve two ends. The water is carried to low tracts, which are not within the reach of the inundations; and where they do not naturally disperse over the adjacent country, they are conveyed there by means of the Persian wheel. These canals are only full during the height of the inundation, and are dry in the winter months. The dams are made across the bed of the river, and are of two different descriptions. Many of them have an opening in the middle, by which all the water escapes when the river is low, but which is not wide enough to receive the whole volume which descends during the freshets. The water thus impeded accumulates above the dam so as to cover a large tract of country. In those arms of the river however which even during the freshets receive only a moderate supply of water, the dams have no opening. The whole volume is thus driven back and spreads over the district above the dam, and the bed of the river below it would remain dry if the water which is carried by canals over the country did not find by these canals a way to the bed of the river below the dam. These dams are called *bunds*.

The river begins to rise in April. Early in May the swell of the waters begins to point out the necessity of deepening and cleaning out the various canals. Towards the middle of June there is sufficient water for sowing the crops, which ripen and are cut down in October. At the end of September the waters are confined to the bed of the river.

A few miles below the point where the Indus is joined by the Chinab, the river enters Sinde. About 60 miles lower down, and only about 24 miles above Bukhur, it begins to divide into arms. At this place (about 28° N. lat.) an arm branches off on the eastern side, which is called the Eastern Narra. It appears that this arm formerly received a great, if not the greatest, part of the waters brought down, but that the river changed its course more to the west. After this event had taken place, a bund was erected across the Narra, near the antient town of Arore, which is still called the Arore Bund. Thus the Narra was deprived of the annual supply of water, except when the water in the Indus rose to an unusual height, as in 1831. Its bed would generally be dry, if it did not receive a small supply of water from a remarkable depression, which extends parallel to the Garra and Chinab rivers from the vicinity of Bhawulpore to that of Arore, and in which running water is found during four or five months of the year. This depression, being considerably lower than the flood-height of the above-named rivers, receives a good deal of water from them through canals or by direct overflows. The drainage of this natural hollow is collected in the Narra, but, except under extraordinary circumstances, is seldom in sufficient quantity to reach the Alla Bund, near 24° N. lat. The Narra extends in a south-south-eastern direction to Omercote, skirting the Thurr or Indian Desert. South of that place the river is called Pooruun, and receives a supply of water from another arm of the Indus, which, under the name of Fulailee, leaves the principal river seven or eight miles above Hyderabad, and which sends two branches to the Pooruun under the name of Goonee. After this accession of water the Pooruun has a well-defined channel from 12 to 20 feet deep and from 600 to 1200 feet wide, but it is obstructed artificially by bunds and naturally by sand-drifts. Farther down the channel of the river is occupied by a chain of pools of salt-water, and is partly separated from Sindree Lake by the Alla Bund. The Alla Bund (Embankment of God) is an immense mound, nearly four miles in width and more than fifty in length, which was thrown up by an earthquake in 1819, the same convulsion of nature having depressed a large tract of land south of it, which, being filled with salt-water through the Lucput Creek, now forms an extensive lake. This mound appeared calculated to cut off the Pooruun from its mouth, called the Koree, but in 1826 an extraordinary flood passed down the Narra and Pooruun, and, forcing a narrow passage through the Alla Bund, found its way into the Sindree Lake, and by it to the Koree month of the Indus.

About 28 miles south of Bukhur the Indus throws off another branch on the right, which is called the Western Narra. It runs about a hundred miles, expands towards the end of its course into the lake of Munchar, and re-joins the river north of the town of Sehwun. About seven or eight miles above Hyderabad, at Meanee, occurs the third bifurcation of the Indus. The eastern branch, called Fulailee, runs southward and receives a considerable supply of water, which however is greatly diminished by the numerous canals which branch off from it. In the lower part of its course it is called Goonee, and sends off two branches to the Pooruun, as observed before. It does not appear that the waters of this branch reach the sea except by the last-mentioned river.

The Indus divides again south of Jurruk, near 25° N. lat. The eastern smaller branch is called Pinjaree, and below Mugrebee it is called Goongra. It has always water enough to be navigable for flat-bottomed boats, north of the bund at Mugrebee, and even below the dam it is a running stream. It enters the sea by a wide mouth, the Seer, which is accessible for boats of 38 tons, to a place called Gunda.

The last great bifurcation of the river takes place below the town of Tatta. The larger volume of water descends nearly due southward in the eastern arm, which is called Sata. It divides towards the sea into several arms; of which four, the Mull, Khaeer, Gora, and Hijamree, enter the sea by wide embouchures. The Mull is navigable for sea-boats up to Shahbunder. The Khaeer and Gora cannot be navigated by sea-boats. The last-mentioned mouth brings the greatest volume of water to the sea, so that fresh-water is found two miles from the shore; but the dangerous bank before the opening prevents it from being navigated. The Hijamree is the most navigable of all the lower branches of the Indus. It may be ascended by sea-boats of fifty tons burden as far as Vikkur, which place is therefore considered as the harbour of the delta, and much frequented. On the bar are fifteen feet of water at high tide, and a depth of four fathoms all the way to Vikkur, even when the tide is out.

The most western arm of the Indus is the Buggaur. It leaves the Sata below Tatta, and runs in a general course duo west, but with several large bends. About twelve miles from the sea it divides into two branches, of which one runs south-south-west; it reaches the sea by the Pieteeanee mouth. The other arm runs west-north-west, and disembogues by the Pittee mouth. Both of these arms divide several times before they reach the sea, and they enter it by several mouths. The two large channels are navigable for sea-boats of fifty tons; but as they are beset at their mouths with sand-banks, which overlap ono another, the navigation is intricate and dangerous: still a few boats ascend them to Darajee.

The Indus, with the exception of the months, which, as above mentioned, are accessible for sea-boats, can only be navigated by flat-bottomed vessels which do not draw more than four feet of water when heavily laden. The largest carry about seventy-five tons. But the navigation is difficult and dangerous, because the numerous sand-banks in the bed of the river are subject to frequent changes, and large portions of the banks frequently fall down into the water, having been undermined by the current.

Surface and Soil.—The Delta, or that part of Sinde which is enclosed by the Sata and Buggaur branches, has an alluvial soil, consisting of successive layers of earth, clay, and sand. As the great branches of the river are here so numerous, and throw off so many arms, the inundation of this tract is general; and in those places which have not this advantage, artificial drains, about four feet wide and three deep, conduct the waters through the fields. Close upon the sea there is abundance of green forage, which furnishes pasture for large herds of buffaloes. At the back of it extends a belt ten miles in width, where the country is so thickly covered with furze and bushes that it is incapable of being brought under tillage. Agriculture is only carried on in those districts which are more distant from tho shores. Rice is grown in large quantities, as also bajree and all other Indian grains, and wheat and barley. There are also large plantations of sugar-cane, which yields a coarse kind of sugar. The soil in many parts is impregnated with saltpetre, which is extracted, but not exported, as formerly. The climate is sultry and disagreeable, the thermometer rising in March as high as 90°. If we except a few small towns and villages, the inhabitants reside in temporary villages, which they remove according as they are compelled by the increase of the inundation or other circumstances.

That extensive tract of country which lies west of the Indus, and extends from the sea-shore to the town of Sehwun (26° 22′ N. lat.) has a different character. It is only along the banks of the river that there is a low alluvial tract, a few miles wide, which can be cultivated, as it has the advantage of being irrigated by short cuts from the river. Beyond its limits the country rises higher, and the soil is gravelly and intermixed with pebbles, and soon passes into low hills composed of sandstone. Their height seldom exceeds two hundred fect; but in approaching the Hala Mountains they rise much higher, and form several short ranges, of which the Garra hills on the south, and the Lakki hills on the north, are laid down in our maps. The small rivers which drain this hilly tract have only water for three or four months; but during the remainder of the year abundance of water is found in pools in the bed of the rivers. The valleys have a light soil, clay and gravel mixed together, but they are not cultivated. In these parts are no fixed villages, the country being inhabited by nomadic tribes, whose wealth consists of camels, goats, sheep, and buffaloes: their number is small. The Hala Mountains, which lie between this tract and Beloochistan, are barren and almost without vegetation.

Proceeding on the same side of the Indus, north of the town of Sehwun, we enter one of the most fertile districts of Sinde, which extends some miles north of Shikarpore. The country is level, and the means of irrigating the land are abundant; for besides the main channel of the Indus, which is used for irrigating the adjacent lands, the interior of this region, for the greatest part of its extent, is traversed by the Western Narra, which partakes of the inundations of the principal river, and at some places is connected with it by transverse canals. The lake of Munchar extends about eighteen miles from north-north-west to south-south-east, and is about eight or nine miles across. But in the dry season its waters are much reduced, and those tracts which are then left dry are cultivated, and yield very rich crops. That part of the plain which lies north of the place where the Narra branches off from tho Indus, derives the same advantages from the Sinde canal, which begins some miles above Bukhur, and extends fifty miles inland, until it joins the Narra, after passing near Shikarpore. The principal articles of cultivation in this plain are cotton, sugar, and rice. Large droves of buffaloes, cows, excellent sheep, and goats, are scattered over the country. Various kinds of trees of great size are found in many places, and yield plenty of timber for the construction of water-wheels and for other agricultural purposes. The river, as well as the lake, is navigated by boats.

The plain properly extends farther northward to the boundary-line of Sinde; but north of Shikarpore it attains a higher level, and as there are no canals, irrigation is not practised. As however the soil is very good, which is shown by the excellent pastures and large trees, this tract would also yield abundant crops if it was well protected against the predatory tribes which inhabit the adjacent Murree and Boogtee Hills. But these tribes have expelled the agricultural population and taken possession of the country, in which they wander about with their herds of buffaloes, sheep, and goats.

The country on the east of the Indus, from the northern boundary-line to the parallel of Hyderabad and Omercote, presents a different aspect. The banks of the river to the distance of two or three miles inland are covered with tamarisk and acacia shrubs, and mostly uninhabited, but frequently cut by canals, which carry the water of the river to the back country. On the edge of this back country the villages are built, and generally raised somewhat above the ordinary level, to avoid the inundations. To the back country the water is carried by numerous canals. They are generally cut in those parts of the river which run east and west, that the water may be thrown south into the interior. Some of these canals are of great extent. One of them, called the Meerwah, conducts by a southerly course the waters of the Indus from the neighbourhood of Bukhur to a distance of ninety miles, where they are lost in sands or dispersed over the fields. The soil of this tract is alluvial, with the exception of a small rocky district which crosses the Indus at Bukhur, and extends on the east of the river for a few miles. The banks of all the canals are fringed with a broad agricultural band, on which numerous large villages are built, many of which contain 500 houses. Besides fertilizing the land, these canals afford the means of transporting by boats the produce of the soil. In the fair season, when dry, they become the beaten footpath of the people and are excellent cart-roads. Beyond the reach of the water of the canals, the country is very little cultivated. Though the components of the soil do not differ from those of the cultivated tracts, it is hard and sandy. Dry and cracked from the heat of the sun, the loosened sand is raised by the prevailing westerly winds into little hillocks from twenty to thirty feet high, which gradually assume the appearance of a desert running imperceptibly into the Thurr. Only at a few places grain is cultivated, as its growth depends on rain, which is very uncertain in these parts of Sinde. The lower parts of the uncultivated ground are generally overrun with tamarisk jungle.

The country south of a line drawn from Hyderabad to Omercote, and included by the Sata and Pooruun branches of the Indus, generally resembles the region just noticed. In its most northern corner, where the Indus and its Fulailee branch run nearly parallel, is a low ridge of rocks which extends for several miles, and opposite the town of Tatta are several isolated hills of limestone, of moderate elevation. Except these hills the country is flat and well cultivated in the vicinity of the numerous canals, which bring to the interior the waters of the Sata and Pinjaree branches. Between the Pinjaree and the Poorunn a considerable extent of country is covered by a salt-marsh. The country near the last-mentioned branch of the Indus is little cultivated, except in the vicinity of the Goonee river. Towards the sea this region is a complete desert, resembling the Runn. There are hardly any plants met with, except a saline plant called *darun*, which forms the principal food of the camels in this uninhabited country. The soil is of such a description as not to absorb water, which therefore remains upon the level surface until it is carried off by evaporation. Indifferent water may be obtained in many parts of this desert by digging wells to the depth of eighteen feet. This sterile tract extends twenty miles from the sea and the Koree mouth of the Indus.

A large portion of the *Thurr*, or Indian Desert, is included within the boundary of Sinde. The course of the Eastern Narra and of the Pooruun lies near the western edge of this region. The Thurr is an extensive sandy tract destitute of trees, but abounding in grass and jungle. It rises from the plains of Sinde and from the Runn in bold relief, with a demarcation as distinct as if it rose from the sea. Its features are peculiar, and throughout its whole extent preserve a uniform character, being composed of innumerable ridges of loose sand of a bright yellow colour, in height varying from 150 to 600 feet. They intersect each other almost every mile so as to form small basins, where there is no evident outlet. All rain is absorbed in the light sand of the soil, and no stream or watercourse is observable. These ranges of hills thus confusedly heaped together preserve a general direction running from south-east to north-west. Northwards they are more defined and open than to the south, where they are more crowded on one another. In a desert of this description water must be scarce, and when found it is uniformly brackish or salt. In the vicinity of the Runn water is found a few feet from the surface, but receding northward it is only procurable at a depth of two or three hundred feet. At first it is fresh, but imperceptibly it becomes brackish; yet almost always it affords a certain supply, which is increased after heavy rains. As a road this desert is impracticable to every animal except the camel. The inhabitants are few and lead nomadic lives, moving with their flocks and herds from spot to spot as water and forage fail. They are chiefly Mohammedans, with here and there a Hindu, who purchases and exports ghee, the sole product of this tract, which however is highly prized all over Hindustan.

The Runn, which extends between the Thurr and Cutch, is a tract of a very peculiar description, which has no counterpart on the globe. In length it extends from the Koree mouth of the Indus to the north-eastern part of the peninsula of Gujerat, a distance of about 200 miles; in breadth it is about 35, but there are various belts and ramifications, by the addition of which its area is increased to 7000 square miles. It is a perfectly level tract, on which no fresh water is found, and not even the most stunted vegetable. The soil is a mixture of mud, sand, and clay, and is covered with a thick incrustation of salt in the dry season, and during the south-western monsoon with water. Though somewhat higher than the common level of the sea, it is lower than the adjacent country. The southern banks are in many places very fertile, often sandy, and in some parts alluvial. On these water of excellent quality is found within a few feet of the surface, and tanks of rain-water, within 200 yards from the Runn itself, retain their sweetness for many months. There are some islands in it where fresh water occurs, but it is scarce. By some the Runn has been called a marsh, but it has none of its characteristics: it is not covered or saturated with water, but at certain periods; it has neither weeds nor grass in its bed, which, instead of being slimy, is hard, dry, and sandy, and of such a consistency as never to become clayey; nor is it otherwise fenny or swampy. That singular phenomenon called mirage nowhere produces such delusions as in this tract; the smallest shrub at a distance assumes the appearance of a forest.

Climate.—The climate of Sinde differs greatly from that of other parts of Hindustan. Though the south-west monsoons blow so hard along the shores as to prevent vessels approaching them from March to October, they do not bring any periodical rains. This probably is to be ascribed to the great distance of the large mountain masses, by which the wind is arrested. These do not occur before the wind reaches the Himalaya Mountains in the Panjab, and so far the monsoon does not extend. Rain is far from being frequent all over Sinde, nor does it occur at certain seasons, though storms may be expected at the end of June or the middle of July. There are also heavy falls at the vernal equinox. The delta frequently suffers from dearth, and sometimes for several years together; but the dews are heavy.

In Upper Sinde (Sirra), that is, north of Hyderabad, the natives of the country divide the year into three seasons, the spring, the hot season, and the cold season. The spring is of very short duration. The cold of the winter continues to the end of February, whilst the heat which commences in the middle of March is so intense, that it is but little exceeded by that of the following months. The temperate weather therefore between the extremes of the cold and hot seasons is very short. The hot season may be said to commence in the middle of March, and it continues generally without intermission till the end of August or the middle of September. The storms of thunder attended by rain which occasionally occur in June or July afford a brief cessation from the intense heat. A curious phenomenon is observed in this country on the setting in of one of these storms, it being always preceded for two or three days by a close atmosphere loaded with a fine description of sand which produces the appearance of a thick fog. But immediately previous to the bursting of a storm the air is literally darkened by immense volumes of sand driven in black masses before the wind, and obscuring the whole surface of the country. These sand-storms, which bear a great resemblance to the pamperos of Buenos Ayres, appear to be the natural effects of the desert countries surrounding Upper Sinde, over which no violent wind can pass without raising clouds of the shifting sands which cover their surface. The heat of Upper Sinde from the middle of April to the end of July is said to exceed that of any part of India, and the thermometer rises sometimes to 120° in the shade. The hot southerly winds which then prevail, continue to blow strong till midnight, but the mornings are generally cool. During the hot season the whole country, except the green forests of babool which skirt the banks of the Indus, presents a most arid appearance, which is only relieved by the annual rise of the river laying much of the country on each bank under water. In September and October, when it leaves the country, the water quickly dries up, and leaves a dry and cracked soil, except in those tracts which have been cultivated.

During the cold season, from October until the end of February, the climate of Upper Sinde is pleasant and salubrious. Frost and ice occasionally occur, and vegetation assumes the appearance of winter in the northern climates. The setting in of the cold and violent northern winds of November stops all vegetation except a few stunted tamarisk and babool bushes. Frost and blighting dews follow, and tend also to destroy a great portion of what otherwise would have been germs of vegetable life, which, if they chance to escape, rise only to be annihilated by the heats of April and May. The sun of Upper Sinde is singularly fatal in its effects, not only to the European, but the native constitution, and during certain periods of the year exposure to it is as much as possibly avoided by the people of the country.

As the country has only lately become accessible to Europeans, we have not yet received any series of meteorological observation extending over a whole year. But we have observations made at Kurachee on the sea-shore, and at Sukkur in Upper Sinde, for five months in 1844, and the result of them is very interesting.

	KURACHEE. Average Heat.			SUKKUR. Average Heat.		
	At sunrise.	At noon.	At 9 p.m.	At sunrise.	At noon.	At 9 p.m.
May . .	82°	86°	84°	88°	90°	94°
June . .	83	87	85	88	90	93
July . .	83	86	84	86	89	92
August .	80	84	81	84	86	90
Sept. . .	77	84	81	81	83	85

From this table we learn that the climate of Sinde is really hotter than in those parts of Hindustan which lie in the vicinity of the equator. The difference between the temperature of Kurachee and Sukkur ought also to be noticed. In the last-mentioned place the thermometer rises at noon from two to four degrees higher, though Kurachee lies nearly four degrees nearer the equator. This difference is to be ascribed to the desert countries by which Sukkur is surrounded. At this place the heat at 9 o'clock in the afternoon during the hottest months is three or four degrees more intense than at noon. This is solely to be ascribed to the hot southerly winds, which invariably continue to blow with considerable force till midnight.

Productions.—Sinde is rich in productions. Though its botanical wealth is not great, the agricultural products are numerous; all the grains and pulse common to India are grown. Rice is the staple in the delta and in the country between the Western Narra and the Indus, but in the other parts wheat and *joowaree* (large maize) are most extensively cultivated; next to these *Holcus spicatus* and *Phaseolus mungo.* Barley is grown in some districts; other articles are, *Phaseolus maximus*, *Ervum lens*, *Panicum italicum*, and *Cicer arietinum.* Indigo is largely grown in the north-eastern districts, but it is inferior to that of Bengal. Opium is cultivated near Shikarpore, and in some other districts. The sugar-cane is pretty generally grown throughout the whole of the province, but its produce is inferior to that of Northern Hindustan and the Panjab. Cotton is cultivated everywhere, but the best is grown in the northern districts. Tobacco of good quality is grown in the vicinity of Khyrpore. Hemp, cucumbers, water melons and musk melons, are extensively cultivated, as are also cummin and anise. There is a great variety of greens and spinach, and among the herbs eaten as vegetables, which grow spontaneously, are purslain and a species of amaranthus. The gardens produce carrots, turnips, radishes, onions, and several kinds of pumpkins, the egg-plant, three kinds of beans, peas, the *Momordica charantia*, dil, and mustard. The root of the lotus, which covers a great portion of the Lake of Munchar, is eaten. Sesamum, garlic, capsicum, and turmeric abound, and the last is used as a dye. Among the fruits are the date, mango, pomegranate, apple, grape, lime, citron, fig, apricot, pistachio, and keora nuts, several kinds of wild plum, and the tamarind, but most of these fruits are indifferent, and much inferior to those of Cabool. About Shikarpore and Bukkur the dates are so plentiful as to constitute the principal food of the lower classes, but they are inferior in size and flavour to the Arabian and Egyptian dates, though superior to those of Northern India.

The tamarisk is the most abundant production of the uncultivated parts, and almost as useful to the inhabitants as the bamboo to the native of India. The flowers form an article of export to Persia and the Panjab under the name of *sakoor.* When dried, pulverized, and infused in water, they yield a red fluid in which cottons are steeped to prepare them for dye. The wood supplies the inhabitants almost exclusively with fuel, and they employ it in the construction of houses, boats, and agricultural implements. The boughs are used for fences and cattle-sheds, to line wells and to thatch houses, and are plaited into baskets and mats for boats. The young shoots form a nutritious food for goats and cattle.

Dromedaries and asses constitute the principal means of conveyance by land. The dromedaries are reared in great numbers, but they are not equal in strength and size to those of the neighbouring countries. The horses of Sinde are small but hardy, and capable of enduring great fatigue. The best horses and asses are imported from Afghanistan and Persia. Mules are only kept at a few places. Immense herds of buffaloes graze on the banks of the Indus and its arms, and at other places common cattle. Ghee and hides constitute important articles of export. Sheep and goats are met with almost everywhere in Upper Sinde, and wool is exported from that tract which lies west of the Indus and north of Shikarpore.

Fowls are plentiful in some places; and tigers, wolves, jackals, wild hogs, porcupines, deer, and hares live in the woods. The tiger is only seen north of Bukkur. Hogs are very numerous, and very destructive to the fields. Among the amphibious animals are the alligator, otter, and badger. Badger and otter skins form an article of export to Afghanistan. Snakes, scorpions, and centipedes abound in rocky situations. Among the birds are a peculiar kind of myrops, or bee-eater, the black partridge, the grey partridge, the quail, two kinds of woodpecker, the razor-beak, several kinds of gulls, the pelican, and a species of plover. Geese, ducks, divers, and other water-fowl are plentiful on the banks of the Indus and those of Lake Munchar, as also on the swampy grounds; they form part of the food of the lower classes.

Fish abounds in the sea, the Indus, and the lakes, and the fisheries in the river and at its mouths are extensive, especially on the Gora Bank. The fins of small sharks, which abound near the Indus, form an article of export to China. Sixteen kinds of river-fish have been noticed. The most important is called *pulla*, and is a kind of carp, which is of delicious flavour, and caught in great quantities, but only in the four months that precede the swell of the river.

In the Murree and Boogtee hills, a spur of the Suliman range, sulphur and alum are found, and form articles of trade. In the delta and other places the soil is impregnated with salt, and some is collected for home consumption. Not a stone of any kind besides the limestone procurable at Sukkur and Roree is found in the level parts of the country.

Population and Inhabitants.—Sinde is a thinly peopled country; the whole population is stated not to exceed one million, but it appears to be underrated. The greatest part is a desert, on which only some nomadic tribes wander about with their herds, and the bulk of the population is settled on the banks of the Indus and on the canals which are fed by its waters. The best populated part is that which extends from Sehwun on the south to Bukkur and Shikarpore on the north.

The population is divided into three distinct classes, the Sindee, the Belooch, and the Hindu. In all the larger towns Hindus are most numerous, but in the smaller villages and agricultural districts the Sindees and Beloochees form the bulk of the people. The Hindus amount to about 200,000, the aborigines to 500,000, and the Beloochees to 300,000. The first are occupied entirely in trade; and in religion, as well as in habits, are perfectly distinct from the two latter, who are Mohammedans, agriculturists, the Beloochee as master and the Sindee as servant, yet there are many villages throughout Sinde wholly composed of natives, and others which are termed Belooch villages, from being the sole property of that nation. The Sindees are the less fixed part of the population, being scattered over the whole country, whilst many thousands lead nomadic lives, moving their villages with the rise and fall of the river Indus; they are also boatmen and fishermen. The Beloochees settled in Sinde preserved their clans, and maintained a degree of wild independence until the country was taken possession of by the British, but they are now entirely subjected. The greatest number of these clans and tribes are dispersed over the plain which lies between the Indus at Bukkur and the Bolan Pass, where till of late years they much impeded the passage of the caravans by their depredations. Some of these clans however have abandoned their wandering life, and become cultivators of the ground. The Beloochees speak a peculiar dialect, which however is considerably mixed up with Pushtoo and Persian. The language of the Sindees is quite different, and is written with peculiar characters, which apparently are a mixture of Guzuratee, Tamul, and Malayalin or a corrupted Marwari. There are no colleges, libraries, or public schools in Sinde, but the higher classes are well versed in Persian literature, and read and write that language.

Divisions and Towns.—Sinde is divided by the natives into two parts: Lar, which comprehends the southern portion as far north as Sehwun; and Sirra, which extends over the northern districts. Lar contains the three seaports of the country, Shah-Bunder, Vikkur, and Kurachee. Shah-Bunder, built on the Mull mouth of the Indus, is a small place, accessible for sea boats of 25 tons burden; it exports rice. Vikkur, situated on the Hujamree mouth, 25 miles from the sea, is larger, the river being navigable to that place for more than 35 miles for sea boats of 40 tons burden; it exports the produce of the delta. Kurachee, on the west, and about 30 miles from the most western mouth of the Indus, the Pittee, is built at the head of a creek, distant from the sea four miles. A harbour, at its entrance protected by a high headland, affords safe anchorage at all seasons to vessels of 300 tons, from whence large boats can pass close up to the town, which is built on a slightly rising ground and surrounded by a mud wall. The bazars are extensive, but the streets are narrow and filthy. The inhabitants amount to 14,000, and carry on an extensive trade by sea with India, Arabia, and Persia, and by land with Shikarpore.

Hyderabad or Haïderabad, the present capital and seat of the government, is built not far from the east bank of the Indus, between this river and the Fulailee branch, on a rocky eminence. It has no remarkable buildings, and the population, amounting to nearly 30,000 individuals, live in mud huts. Nearly halfway between Hyderabad and the Hujamree mouth of the Indus is Tatta, the ancient capital, which formerly was washed by the river, but is now five or six miles distant from it. It presents only a heap of mud ruins, and at present contains hardly 8000 inhabitants. Some good cotton fabrics are still made here. At nearly equal distances between Hyderabad and Tatta, on the western banks of the Indus, is the town of Jurruck, which is built on a hill 150 feet high, has a good bazar, and 4000 inhabitants. Meerpore is built on a canal which runs eastward from the Pinyaree branch into the interior and fertilizes a very large tract of country. This town has mud walls enclosing a circuit of three miles, and contains 10,000 inhabitants. There are more than 300 shops in the bazar. Omercote lies on the banks of the eastern Narra, and is built near the edge of the Thurr. It exports the produce of the desert, and contains 2000 inhabitants, chiefly Rajpoots.

Sirra, or Upper Sinde, contains several large places, especially on the west of the Indus. Sehwun, a large and formerly an important commercial place, is built on a rocky eminence not far from the place where the Arrul, or Western Narra, river joins the Indus. It contains between 10,000 and 12,000 inhabitants, and carries on an active trade with the fertile country to the north. The road between Kurachee and Shikarpore passes through this town. On the banks of a canal connected with the Western Narra is the town of Khyrgaon, which has seven mosques, and between 2000 and 3000 inhabitants, and is a thriving place. Farther north, on another canal of the Western Narra, is Larkhana, situated in the centre of a tract very productive in rice, which is exported in large quantities: it has 12,000 inhabitants. Shikarpore is the principal emporium of Sinde. [Shikarpore, P. C. S.]

On the eastern banks of the Indus stands the town of Roree, which is built on a rocky eminence, and contains about 8000 inhabitants. The streets are narrow and the houses built of sun-burnt bricks; many of them have three or four stories. Opposite this place, on an island of the river, is the fortress Bukkur, and on the other side the small town of Sukkur. Khyrpore, built on the canal of Meerwah, is a miserable-looking place, but it has for some time been the residence of one of the princes of the Talpoor family: it has 18,000 inhabitants; the bazar is spacious, and in the centre of it was the chief's residence. Subzulcote lies on the road leading from Roree to Bhawulpore; it has some trade in the produce of the country, especially ghee, hides, and opium.

Manufactures.—The manufactures of Sinde are not numerous; but they may be considered extensive, when the scantiness of the population is considered. Cotton-cloth of a coarse description is manufactured in the principal towns and villages, chiefly for home consumption, and a little is exported to Afghanistan and Persia. Among the silk manufactures those of Tatta have acquired a repute in India, especially the *lungis*, a rich fabric of silk, cotton, and gold, variegated in pattern and of close texture. Common lungis are fabricated in the villages of Raneepore, Gumbat, Khoora, and Duraz, situated near to one another, south of the town of Khyrpore. They are chiefly of cotton with silk borders, or a few of silk and cotton mixed, and inferior to those of Tatta and Bhawulpore. Some silk-cloths for the lower classes are woven at Roreo, Khyrpore, Shikarpore, and Sehwun. A peculiar kind of caps called Sinde caps are used by all people, and are chiefly made at Shikarpore, Roree, and Sehwun. In Lower Sinde are numerous tanneries, in which good shoe-leather is made. Shoes are exported to the neighbouring countries, but they are inferior to those of Bhawulpore. There are manufactories of paper and gunpowder in all large towns. The best paper-factories are at Shikarpore and Larkhana, but their produce is inferior to that of Cashmere and Delhi. Earthenware of a very superior description is made at Halla, a thriving town on the Indus, north of Hyderabad; in this place also a great number of Sinde caps are made.

Commerce.—Nearly the whole commerce of Sinde is concentrated in that of Shikarpore, under which head an account is given of it. Roree partakes of the commerce carried on between Shikarpore and Bhawulpore. Kurachee has some commerce with Arabia and Persia, but we have no account of its extent and the articles of export. A commercial relation between this place and Bombay has lately sprung up, which probably will become of importance.

History.—Sinde became first known to Europeans by the expedition of Alexander the Great, who followed the course of the Indus to its mouth, and constructed a fleet, which sailed along the coast and up the Persian Gulf to the mouth of the Euphrates. Tatta is considered as the Pattala, and Sehwun the city of Sambus mentioned by Arrian. [Alexander, P. C., p. 301.] It appears that at this time the country was divided among a number of independent sovereigns. Nothing is known of the political changes which took place in this part of the world before Mahmud of Ghizni conquered a part of Hindustan and subjected Sinde to his rule. Since that time up to the last century, Sinde appears always to have been an appendage to that empire, which comprehended the northern parts of Hindustan. But by the peace, which Shah Nadir concluded in 1739 with the Mogul emperor, Sinde was dismembered from it and became a part of the Persian monarchy. After the death of Shah Nadir (1747), Ahmed Khan founded the kingdom of Afghanistan, and Sinde was annexed to it, but the government of the country remained in the hands of a Beloochee family, the Kalhoras, who before that period had settled there and acquired great authority. Among the other Beloochee tribes settled in the country was that of the Talpoorees. Their chief, Byram Khan, was minister of Mirjan Surfuraz Khan, the Kalhora ruler, and was with one of his sons cruelly put to death by him in 1775. His death produced violent disturbances in Sinde, owing to the extensive influence which he had with his tribe and in the country. In 1781 Bejur, another son of Byram Khan, shared his fate by order of Mirjan Abdool Nubbee, uncle of Surfuraz Khan; this exasperated the Talpoorees, who rose in a body, and having dethroned the tyrant, raised Futtih Ulee, the grandson of Byram and chief of their tribe, to the government. Timur Shah, the sovereign of Afghanistan, to whom Sinde was tributary, endeavoured in the commencement of the struggle to restore the Kalhoras, but he had too much to do in the Panjab to assist them effectually, and he thought it prudent to invest the Talpoorees formally with the government. The Talpoorees divided the country into three unequal parts, and each of the three families of which it consisted received a portion of the country. These sovereigns were called Ameers.

When Shah Shoojah had lost the throne of Cabool, these sovereigns considered themselves as quite independent, and in 1834, when he made an attempt to recover the throne of Cabool, they refused him assistance, and opposed the march of his army through their territories. But he beat them in a battle fought seven coss from Roree, and obliged them to pay seven laks of rupees, and to farm from him the district of Shikarpore. Meanwhile Sir Alexander Burnes had visited Sinde (1831) and a treaty of commerce had been concluded between the Ameers and the British government, by which the Indus was to be open to British enterprise. No advantage to British commerce had resulted from this treaty, when the British resolved to replace the dethroned Shah Shoojah on the throne of Cabool. The Ameers, who were still to be considered as dependent on Shah Shoojah, did not oppose the march of the British army through their countries to the Bolan Pass, and surrendered by treaty the fortress of Bukkur and Kurachee to the British commander. When however the British armies in Afghanistan were nearly destroyed (in 1841), a spirit of insurrection manifested itself in Sinde among the Beloochee tribes, which however subsided when the British army had again advanced into Afghanistan. As the navigability of the Indus for flat-bottomed steam-boats was now ascertained, the British wished to retain the places in Sinde which were still in their possession, and they attempted to establish a free navigation by a new treaty. The Ameers, feeling their inability to resist, were willing to grant the proposed conditions, except one, that is, to permit a track-road to be made along the banks of the Indus, because such a road would partly destroy their shooting-ground along the river. They had here immense enclosures for the chace of wild animals; these enclosures were called *shikargurs*. It was however soon evident that this was only a pretext for breaking the treaty; the narrow track along the banks of the river, required for a track-path, would not have sensibly diminished the immense extent of their shikargurs. The negotiations were scarcely broken off, when an army of 22,000 Beloochees was ready to attack the British, and to expel them from Sinde. Sir Charles Napier, who commanded 3000 men, British and native troops, stationed at Bukkur and its vicinity, immediately put them in motion. He found the army of the Ameers near Meeanee, a place near the spot where the Fulailee branch leaves the Indus. On the 17th of February, 1843, an obstinate battle was fought at Meeanee, between the British troops and the Beloochees, and after a spirited resistance the Beloochees were completely defeated. They lost 5000 men, with all their artillery and military stores. The Ameers, six in number, came to the British camp and surrendered unconditionally. On the 20th of February their capital, Hyderabad, was taken possession of by the British. The Ameers were removed to Bombay and received liberal allowances. Thus Sinde became a portion of the British empire in India. Partial insurrections followed, especially among some of the most powerful Beloochee tribes, but the activity of the governor of Sinde, Sir Charles Napier, has put them down, and Sinde begins to enjoy that peace and prosperity which the British arms have conferred on or secured to other parts of Hindustan.

(Burnes' *Travels into Bokhara*, &c.; Wood's *Personal Narrative of a Journey to the Source of the River Oxus;* Hough's *Narrative of the March and Operations of the Army of the Indus;* Orlebar's *Visit of the Towns of Sehewan and Boobuk*, &c.; H. Knight's *Report on the Arrul River, Lake Munchar*, &c.; Macleod's *Report on the Nature and Extent of Gahra Creek;* Del' Hoste's *Route from Diesa to Sukhur;* Nicholson's *Some Account of the Koree, or Eastern Branch of the Indus;* Del' Hoste, *On the Advantages to be derived from establishing a Communication between Kurrachee and Jurruck;* Del' Hoste's *Route from the Town of Mandvee, in Cutch, to Hydrabad, the Capital of Sinde*, &c.; *Some Notes on Sinde*, by Winchester; the eight last-mentioned papers are found in the *Transactions of the Bombay Geographical Society*, 1841-1844. Baker's 'Remarks on the Alta Bund, and on the Drainage of the Eastern Part of the Scinde Basin,' in *Transactions of the Bombay Geographical Society*, 1844-1846; Hart's *Account of a Journey from Kurrachee to Kinglaj;* Del' Hoste's *Report on the Country between Kurrachee, Tatta, and Sehwan;* and Westmacott's *Short Account of Kyrpoor and the Fortress of Bukur*, in *Journal of Bengal Asiatic Society*, 1840; Postans' *Report on Upper Sindh and the Eastern Provinces of Cutchee; Various Routes in Scinde, from Official Documents;* and Nock's *Report on the Road from Sinde, from Sulzul to Shirkarpore*, in Journal of Bengal Asiatic Society, 1843.)

SINGLETON, HENRY, was born in London, 1766. His father died while he was an infant, and he was brought up by an uncle, William Singleton, a miniature-painter, who gave him instruction in drawing: the etchings of Mortimer also were favourite studies with him. At the age of eighteen he obtained the first silver medal for drawing in the Royal Academy; and in 1788 he obtained the gold medal for the best historical painting: the subject was Dryden's 'Ode on Alexander's Feast.' The medal was presented by Sir Joshua Reynolds, the last time but one that he presided at the distribution of the Academy prizes, and he is said on the occasion to have spoken in high terms of Singleton's picture.

Singleton painted portrait and history. The first remarkable picture which he produced was a large portrait piece of all the Academicians assembled in the Council Chamber; this picture was painted in 1793: the late Mr. Smirke was the last of the Academicians who survived; he died in 1845. Singleton was for more than half a century a constant exhibitor in the Royal Academy, and he exhibited many attractive pictures, both portraits and historical pieces, but it was not until 1807 that he put down his name as a candidate for the honours of the academy; he was however passed over, and he had too much pride ever to make a second attempt. He lived in the early part of his career in Norton Street, but removed in 1794 to the Haymarket, where he remained till his death in 1839.

Singleton was versatile and ready in invention, though his style of drawing was uniform; and both his pictures and his designs are very numerous; he was much employed by publishers. West has been heard to say—'Propose to Singleton a subject, and it will be on canvas in five or six hours.' The range of his works is very great, and comprises figure-pieces of almost every class; many of them have been engraved, and some on a large scale. Among his best works are Christ entering Jerusalem; Christ healing the Blind; John Baptizing; Coriolanus and his Mother; and Hannibal swearing enmity to the Romans; which have all been engraved on a large scale in Mezzotinto: further, the Storming of Seringapatam; the Death of Tippoo Saib; and the Surrender of Tippoo's Sons; of which there are large prints by Schiavonetti and Cardon. In his later years he was almost wholly employed upon a large series of illustrations from Shakspere, which are his principal works: the series includes several designs from each play, and many of them appear to be taken from the favourite dramatic representations of Shakspere which in Singleton's time were so abundant. He died on the 15th of September, 1839, and was buried in the vault of St. Martin's near his wife, who died nearly thirty years before. (*Art-Union Journal*, 1839.)

SIPHON BAROMETER. This instrument, which was invented by M. Gay Lussac, is very briefly indicated under BAROMETER (P. C.), and a representation of the tube is given in fig. 14 of that article; but, as this kind of barometer has of late been much employed (several of them, for example, were used by Col. Mudge and Mr. Featherstonehaugh in determining the levels along the ridge of heights in North America from the Penobscot and St. John's rivers to the Bay of Chaleurs), it may be advantageous to introduce here a short notice of the construction of the instrument.

The tube is hermetically sealed at both extremities, the end *a*, in the figure above referred to, being closed after the mercury is introduced, and at *g* a perforation is made, which is so small that, while it allows a communication between the air within and without, it does not, the affinity of mercury for glass being inferior to that of the particles of the fluid for one another, permit the mercury to escape. A scale of inches, each of which is divided into twenty equal parts, is placed by the side of the tube; and by means of a vernier each of these is subdivided into twenty-five equal parts. In the French Siphon Barometer the scale is divided into millimetres (each equal to about $\frac{1}{25}$ inch); and, by means of a vernier and microscope, each of them is divided into one hundred equal parts. Two indices with verniers are applied to the scale, by one of which (at *p*) is read on the scale the graduation corresponding to the top of the mercurial column in the shorter branch of the tube, and by the other (at *s*), is read the graduation corresponding to the top of the column in the longer branch. The zero of the scale is either between these indices or below the lowest of them; in the former case the sum and, in the latter, the difference of the readings is the true height of the mercurial column.

The siphon barometer has an advantage over those of a different kind in requiring no correction for capillary action, since such action equally affects both extremities *p* and *s* of the mercurial column: it is extremely light, and is easily brought to a position proper for the observation, but it requires careful management; and it is particularly necessary to avoid inverting it suddenly, since the glass is liable to be broken by the weight of the mercury when the latter strikes against the end of the tube.

SIPHON GAUGE, in Pneumatics, is a tube of glass bent so as to form two branches equal and parallel to one another, and each from 6 to 8 inches in length; the tube is hermetically closed at one end and left open at the other. One of the branches is filled with mercury; and, both of them being in vertical positions with the closed and open ends upwards, they are, by means of a brass stem terminating in a screw, affixed generally to the under surface of the table carrying the plate of an air-pump. The siphon is contained in a cylindrical glass vessel, a little exceeding it in length, which is closed at the lower and open at the upper extremity; and the open end of the cylinder is screwed to the table of the air-pump immediately about the orifice of a brass tube which passes through the pump-plate and opens into the receiver placed upon the plate, so that there is a free communication between the air in the cylinder, in the open leg of the siphon, and in the receiver. This gauge was invented by Mr. Smeaton.

The degree of rarefaction produced in the receiver of an air-pump is generally ascertained by means of a barometer-tube, open at both ends, the upper extremity being screwed directly under the orifice of a tube which, passing through the pump-plate, opens into the receiver, and the lower end being immersed in a small cistern of mercury; for the air in the receiver and that in the barometer tube having the same density, it is evident that, in proportion as the exhaustion proceeds, the pressure of the external atmosphere on the surface of the mercury in the cistern forces mercury into the tube, so that, if the exhaustion within the receiver could be carried far enough, the column of mercury would stand at the same height in the tube as it stands in the tube of an accurate barometer, and would indicate a perfect vacuum in the receiver. The degree of rarefaction in the receiver is consequently indicated by the number of inches expressing the height of the column of mercury in the tube. The siphon-gauge is also provided with a scale of inches which are decimally subdivided; but, while the pressure of the air in the receiver and in the open branch of the gauge is more than a counterbalance to the weight of the column of mercury in the closed branch, the gauge presents no indications: from the time however that, by continuing the process of exhausting the receiver, the pressure of the air in the open branch becomes less than the weight of the column of mercury in the other, that column descends in the latter branch and rises in the former; and then the degree of rarefaction in the receiver is indicated by the difference between the heights of the columns of mercury in the two branches of the siphon.

The Pear-Gauge alluded to in the article Air-Pump, P. C., and a description of which has been inadvertently omitted, was also invented by Mr. Smeaton for the purpose of determining the degree of rarefaction attained in the receiver of an air-pump. It consists of a small glass vessel nearly similar in form to a pear, or rather to a Florence flask, terminating in a cylindrical stem; the upper or smaller extremity is hermetically sealed, and the lower extremity is open. To the upper extremity of the gauge is affixed a wire which passes through an air-tight orifice at the top of the receiver on the air-pump so as to be capable of sliding up and down, carrying with it the gauge in the interior of the receiver; and under the lower extremity of the gauge is a vessel of mercury.

When the receiver has been exhausted as much as may be thought proper, the gauge is pressed down till its lower or open extremity enters into the mercury in the vessel below it; at which time, evidently, the air in the gauge will have the same degree of rarefaction as that in the receiver. Then, on admitting the air into the receiver, its pressure on the surface of the mercury in the vessel about the bottom of the gauge will force mercury into the latter, when the air which, in its rarefied state, occupied the whole interior of the gauge, will be brought to the same density as that in the receiver, and consequently as that of the atmosphere, and will occupy only a small space at the upper extremity of the gauge. A graduated scale serves to show the volume of the air in its compressed state; and this, being compared with the known volume of the whole gauge, serves to determine the degree of rarefaction which had been produced by the partial exhaustion of the receiver.

At the time when the siphon-gauge and pear-gauge were invented, it was the custom to place the receiver of the air-pump on a ring of leather soaked in oil and laid on the pump-plate, in order to prevent the atmosphere from entering the receiver during the process of exhaustion; when, on the air within being rarefied, a quantity of elastic vapour extricated from the moisture occupied the receiver; now the barometer and siphon gauges show how much the quantity of elastic fluid, air, or vapour, is diminished by the partial exhaustion; but, in employing the pear-gauge, which, during the process of exhaustion, contains a portion of the elastic vapour, on re-admitting the air into the receiver that vapour is immediately reduced to water, and the gauge shows only the quantity of pure air which is left in the receiver after the exhaustion. This discovery was made by the Honourable Mr. Cavendish on witnessing some experiments made by Mr. Nairne, a distinguished optician, in which it was observed that the pear-gauges always indicated much higher degrees of rarefaction than were given by the barometer or siphon gauges. The justness of the explanation proposed in order to account for this discrepancy was soon afterwards proved by Mr. Nairne by means of experiments made with the different kinds of gauges, in which every possible precaution was taken to exclude moisture from the interior of the receiver. The pear-guage was then found to show very nearly the same degrees of rarefaction as were exhibited by the other gauges.

It may be observed here that the pear-gauge is the instrument by which the force of elastic vapour was discovered.

SIROCCO is the name given to a hot and suffocating wind which appears to originate with the rarefied air in the sandy deserts of Arabia, about the season that the overflowing of the Nile commences; it extends eastward over Arabia, Persia, and some parts of Hindustan, and it is felt, but with less inconvenience, in Italy and Spain. This wind is probably only one of the modifications of that which, in different countries, is called *samoom*, *simoom*, *samm* or *samieli*, *khamsin*, and *harmattan*. [Samieli, P. C.]

Under Sirocco, P. C, reference is made to the article Wind; but by inadvertence the notice was, in the place referred to, omitted.

SISMONDI, JEAN CHARLES LEONARD SIMONDE DE, was the son of a Protestant minister of the canton of Geneva; he belonged to an antient family of Tuscan origin, which has become extinct by his death. His ancestors, who were attached to the Ghibelline party, were expelled from Pisa in the fourteenth century, and took refuge in France, where they remained till the revocation of the Edict of Nantes, when they settled at Geneva. Sismondi was born at Geneva on the 9th of May, 1773. He was first placed at the College of Geneva, where he acquired a sound knowledge of classical literature. From the college he was removed to the Auditoire, where he was enabled to pursue a more extended course of study. His education being completed, he was compelled by the change of fortune which befel his family, owing to the events of the French revolution, to enter as clerk in the counting-house of the firm of Eynard and Co. at Lyon. Filial obedience induced him to undertake a duty to which he was unfitted by his previous habits, and which the highly cultivated disposition of his mind rendered scarcely supportable. The moral training, however, which he underwent in mastering the difficulties of his new situation, and in the regular discharge of its duties, produced an effect which, in after life, he acknowledged to have been eminently beneficial; to it he was accustomed to ascribe his taste for the science of political economy, which predominates in his historical writings. The revolutionary troubles, which overtook the city of Lyon in 1792, compelled Sismondi to return to Geneva: this city however, having become annexed to the French republic, proved no asylum from political persecution; his father and himself, though they had carefully abstained from interference in public affairs, were imprisoned; but, as no charge could be brought against them, they were soon after liberated. In February, 1793, he accompanied his family to England, where they intended to settle; but the dilapidated state of his father's fortune rendered their residence in London one of privations to which they had not been accustomed, and, after a year's residence in different parts of England, they returned to their native city. This sojourn in England Sismondi turned to profitable account; besides acquiring a sound knowledge of the language, and, studying the English constitution, he examined our commercial and agricultural system, and was thus enabled, when in after-life he published his peculiar views on political economy, to speak from actual knowledge of the merits and defects of the internal policy of England. His return to Geneva afforded him the painful opportunity of studying the science of politics in a far ruder school; it was his lot to behold the peaceful commonwealth where his fathers had enjoyed liberty of conscience and freedom of speech, suffering under the despotism of what was, by courtesy, termed a popular rule. The frenzy of revolutionary feeling had spread over the city of Geneva, and had converted its quiet money-making citizens into turbulent and suspicious demagogues. In the hope of finding a more quiet abode, and in order to afford a shelter to a friend, M. Caila, who had been proscribed by the revolutionists, the family of Sismondi removed to Châtelaine. The capture of their unfortunate friend, and his immediate execution in their presence, rendered their residence at Châtelaine as distasteful as it was dangerous. Having sold the estate they possessed there, they determined upon emigrating to the country of their ancestors, and arrived at Florence in October, 1795. They invested the produce of the estate which they had sold in purchasing a small farm at Valchiusa, near Pescia, a spot selected by the young Sismondi. Here he divided his time between the active superintendence of his farm and the preparation of a work which he had projected during his travels, 'Recherches sur les Constitutions des Peuples Libres.' These researches, though they have not been published, are generally regarded as the groundwork of his subsequent historical writings; the ideas which he adopted in them have been amplified and illustrated in the work of M. de Tocqueville on the democratical governments of America.

In 1801 appeared at Geneva the first published work of Sismondi, which he had written during the latter part of his stay of Italy; it was entitled 'Tableau de l'Agriculture Toscane.' To his study of this subject may perhaps be attributed the prominence which, in his writings on political economy, he gives to agriculture. Eminently practical in its details, this interesting treatise discards even the appearance of theory, and contents itself with portraying in true but lively colours the actual state of the country and the manner of life of its inhabitants. The year previous to the publication of this work Sismondi and his parents had again returned to Geneva, where they lived on the remnant of a once large property, which his father had sacrificed to his confidence in the financial measures of Necker. [Necker, P. C.] He published, in 1803, his essay on political economy, with the title 'De la Richesse Commerciale, ou Principes d'Economie Politique appliquée à la Législation du Commerce.' This work he afterwards entirely remodelled, and, in 1819, published it under the title 'Nouveaux Principes d'Economie Politique.' The views of Adam Smith [Smith, Adam, P. C.] are almost implicitly followed in this treatise, and, as they happened to coincide with the popular notions on the subject, they brought the writer into repute. The vacant chair of political economy in the university of Wilna was soon after offered to him by Count Plattner, who came purposely to Geneva to urge in person his proposal. Though the offer was advantageous in a pecuniary point of view, and the acceptance of it on that account urged upon him by his parents, it was declined by him from his dislike to teaching. It was at this period that Sismondi began to apply himself in earnest to historical investigations, and, by the advice of his mother, a woman of cultivated mind and sound understanding, to devote himself chiefly to the study of history.

His residence at Geneva, though it was enlivened by his enjoying the intimacy of several literary persons, such as Benjamin Constant and Madame De Stael, could not deliver him from the desponding feelings which are so common to the young author, and, at the suggestion of his excellent mother, he was induced, in 1805, to accompany Madame De Stael in a tour through Italy. Sympathy of literary tastes had produced the sincerest friendship between these two distinguished writers; the influence of the scenes they visited together in that classical country, and the poetic charm cast upon them by the conversation of the authoress of 'Corinne,' [Stael, Anne Germaine de, P. C.], fixed the determination of Sismondi to consecrate the past glories of the land of his ancestors in the page of history. The first-fruits of his historical studies appeared in the first two volumes of his 'Républiques Italiennes,' which were published at Zürich, in 1807. His publisher, Gesner, is stated to have dealt hardly with him, and the publication of the subsequent volumes, the last of which appeared in 1818, was transferred to Treuttel and Würtz. A new and more complete edition, in sixteen volumes, appeared during the years 1825 and 1826, both at Paris and Brussels. In the composition of this his first and most important historical work, Sismondi has been blamed for not having made a sufficient use of public archives and private collections; he is, however, acknowledged to have carefully consulted every printed book from which he could derive information It is to this conscientious examination of authorities, and the absence of political prejudices, that the value of the 'Républiques Italiennes,' as a faithful historical record, is chiefly due. The style is pleasing and attractive, but, though a good French scholar, he never hesitates to use an unauthorised or even ungrammatical phrase in order to convey his meaning with greater precision. The part of the work, which is generally considered to be most defective, is that which treats of the development of the republican constitutions and the modifications which they afterwards experienced; for the full accomplishment of this portion of his task, Sismondi is said not to have possessed sufficient legal knowledge. While engaged in writing this history he was likewise employed as a contributor to the 'Biographie Universelle,' which was publishing in Paris under the editorship of Michaud. The biographies which he contributed to this valuable work were those of the principal historical personages of Italy, for the composition of which the researches he was then making in Italian history eminently fitted him. Sismondi was accustomed regularly to read the manuscript pages of his history to his mother, and, with the humility of filial obedience, to lend an attentive ear to the corrections she suggested. To her pious care he has gratefully acknowledged himself not a little indebted for the eminence he attained as an author; in his desponding moments she was ever a present comforter, and the rough path to literary fame was smoothed by her counsels and cheered by her example. In 1811 he delivered at Geneva a course of lectures upon the Literature of the South of Europe, which were printed at Paris in 1813, and a third edition, in four volumes, was published in 1829. It comprises an introductory history of the decline of the Latin language and the formation of the languages of Southern Europe, and presents us with a history of Italian, Spanish, and Portuguese literature to the end of the eighteenth century. The portion of this work which treats of the literature of Spain and Portugal is the most imperfect, as the information which it contains is derived from secondary sources.

In 1813, Sismondi visited Paris, which at that time presented an interesting study for a political observer; he there formed an acquaintance with an illustrious brother historian, M. Guizot, who, when, in 1819, he became Minister of Public Instruction, made him the offer of a valuable professorship at Paris, which, however, he declined. During the Hundred Days a series of letters, which he published in the Moniteur, on the French Constitution, attracted the attention of Napoleon, who requested an interview with the author. The interesting details of this interview were immediately after reported by Sismondi to his mother, and an abridgment of them may be seen in the article of the 'Quarterly Review' referred to at the end of this article (p. 318-321).

In the year 1819 Sismondi began his longest, and, as it is by some considered, his best work, 'L'Histoire des Français,' which occupied him till the close of his life. It was not at first the intention of the author to bring down this history to a later period than the Edict of Nantes, which terminates the twenty-first volume; he was induced to continue it, on a more abridged scale, to the period of the Revolution, but he carried it no further than the year 1750. His principal motives for undertaking this important work were, the connection of French history with Italian, and the fact that French literature possesses no history of the kind which can be looked upon as a work of authority. To these motives may be added the great interest which Sismondi evinced in the affairs of a country which he had adopted as his own. He has not, however, allowed his bias in favour of France and the French to interfere with the investigation of truth and the declaration of it. So little indeed did he seek to gratify in it the national vanity, that he has not hesitated to expose the weak foundation on which had rested undisturbed for centuries many traditional incidents in the history of France, which, as they responded to the popular feeling, had been fondly cherished in the memory of the people.

The history is divided into eleven periods: the first three treat of the early races of French kings, the Merovingian, Carlovingian, and early Capetian races, to the accession of Louis IX.; the fourth brings it down to the death of Charles IV., 1328; the fifth, from the accession of Philip le Valois to Charles V., 1422; the sixth, from 1422 to 1515; the seventh, and most interesting, presents us with the reign of Francis I., and is a beautiful specimen of historical portraiture, in which the colours, though lively and pleasing, are never exaggerated; the eighth embraces the period of the religious wars of France, which are treated of with an impartiality scarcely to be looked for in a Genevan Protestant; the ninth is the reign of that favourite of French kings, the first of the Bourbons, and here, more perhaps than in any other part of his writings, may be seen the honest spirit by which he was actuated; indeed in his endeavour to be impartial, he has perhaps sometimes been unnecessarily severe on the character of Henry IV. The last three periods embrace the history of France under the Bourbons to the latter period of the reign of Louis XV. [France, P. C.]

In the year 1830 Sismondi published, in 'Lardner's Cabinet Cyclopædia,' an abridgment, in English, of his 'Républiques

Italiennes;' a French edition of this work appeared in Paris in 1832, under the title 'Histoire de la Renaissance de la Liberté en Italie.'

The last and least known of his historical works is entitled 'Histoire de la Chute de l'Empire Romain et du Déclin de la Civilisation.' This work, which was published at Paris in 1835, embraces the history of 750 years, from A.D. 250 to 1000.

The other writings of Sismondi are, 1, 'Julie Sevère,' an historical novel in imitation of Sir Walter Scott, in which he describes the condition of Gaul at the time that Rome was a prey to the barbarians; it was published at Paris in 1822: 2, 'Études sur les Sciences Sociales,' published at Paris in 1836; this work contains a collection of articles which he had previously contributed to various periodicals: 3, 'De la Vie et des Ecrits de Th. Mallet,' 1807, in 8vo.

The above is a brief account of the writings of Sismondi; but it would be doing injustice to his memory to omit some of the details of his private life and character which have been recorded by his biographers. Surrounded by a circle of all that was most distinguished in literature, he was conspicuous among them for the amiability of his disposition and the devotedness of his friendship. Though he never reached a state of affluence, he was liberal in contributing to the necessities of the poor, and he is said to have spent considerable sums in the furtherance of causes which had political freedom for their object. Fond of society, he never allowed his inclination to enjoy it to trespass upon the time he had marked out for study, usually nine or ten hours a day. The time he allotted to this object was never broken in upon, except to assist a friend or to alleviate misfortune. As a public character he displayed considerable firmness in the maintenance of his political opinions, and he was careless of the unpopularity which this conduct often entailed upon him.

About the year 1840 he felt the first symptoms of the cruel malady to which he fell a victim, which was a cancer in the stomach. A short journey which he made to England appears to have aggravated his disease; but his sufferings, though intense, scarcely interrupted his application to study, and he may almost be said to have died with the pen in hand. Indeed three days before his death, which occurred on the 25th of June, 1842, he was occupied in correcting the last proof sheets of his 'Histoire des Français.'

Sismondi married, in 1819, Miss Allen, sister to the late Mr. Allen of Cressilly, member of parliament for Pembrokeshire, and to the second wife of Sir James Mackintosh. [MACKINTOSH, SIR JAMES, P. C.]

The following extract, which we translate from the conclusion of 'L'Histoire des Français,' will be found an interesting supplement to this biographical sketch of Sismondi:—'My life has been divided between the study of political economy and that of history; thus, in this long narration of events, the political economist will ever be discovered conjointly with the historian. I have endeavoured to prevent those lessons being lost which experience has given us on the causes which contribute to create and maintain the prosperity of nations; but, above all, I have always looked upon wealth as a means, not as an end; I have always inquired respecting it, whether it really advanced the well-being of all classes, and I trust my readers will discover, in the constant interest I have taken in the welfare of the cultivator of the land, in the artisan, and in the poor, who has to earn his bread by the sweat of his brow, that all my sympathies belong to the needy and suffering classes of the community.'

An interesting account of the private life of Sismondi may be seen in the 'Magasin Pittoresque,' for 1843, pp. 314-319. For a critical detail of his writings we refer our readers to the 'Quarterly Review,' vol. 72, pp. 300-356, and the 'Foreign Quarterly Review,' vol. 30, pp. 258-261.

SKIN, DISEASES OF. The healthy functions of the skin and its structure have been described under SKIN, P. C. Most of the diseases of the skin have been described in this work under the head of their particular names. In this article we shall supply an arrangement of them, and a description of those which have been omitted. The following arrangement is that adopted by Rayer in his work on diseases of the skin.

Class I. INFLAMMATION OF THE SKIN.

Order 1. *Exanthematous.*—Rubeola, Roseola, Scarlatina, Urticaria, Erythema, Erysipelas.

Order 2. *Bullous.* — Vesication, Ampullæ, Pemphigus, Rupia, Zona.

Order 3. *Vesiculous.*—Herpes, Psora, Eczema, Miliaria.

Order 4. *Pustulous.*—Varicella, Variola, Vaccinia, Vaccinella, Ecthyma, Cuperosa or Acne, Mentagra, Impetigo, Tinea, Artificial pustules.

Order 5. *Furunculous.*—Hordeolum, Furuncle, Anthrax.

Order 6. *Papulous.*—Strophulus, Lichen, Prurigo.

Order 7. *Tuberculous.* — Lupus, Cancer, Elephantiasis of the Greeks.

Order 8 *Squamous.*—Lepra, Psoriasis, Pityriasis.

Order 9. *Linear.*—Fissures.

Order 10. *Gangrenous.*—Malign pustules, Carbuncle of plague.

Order 11. *Multiform.*—Burns, Frost-bite, Syphilitic eruptions.

Class II. CUTANEOUS AND SUBCUTANEOUS CONGESTIONS, AND HÆMORRHAGES.

Cyanosis, Vibices, Petechiæ, Purpura Hæmorrhagica, Ecchymosis, Dermatorrhagia.

Class III. NERVOUS DISEASES OF THE SKIN.

Exaltation, Diminution, Abolition of the sensibility of the skin, without appreciable alteration in the texture of this membrane.

Class IV. ALTERATIONS IN THE COLOUR OF THE SKIN.

Order 1. *Decoloration.* — Leucopathia, partial, general; Chlorosis.

Order 2. *Accidental Colorations.*—Ephelis, Lentigo, Chloasma, Melasdermis, Icterus, Nævus maculosus, Argentism.

Class V. MORBID SECRETIONS.

Ephidrosis, Acne, Folliculous Tumours.

Class VI. DEFECTS OF CONFORMATION AND TEXTURE.

Distention of the Skin, Cicatrices, Vegetations, Nævus hæmatodes, Subcutaneous vascular tumours, warts, pearly granulations; Corns, Ichthyosis, Horny appendages.

The following are the diseases which appear to demand further notice:—

Urticaria (Nettle-rash, Purpura urticata, and Febris urticata). This disease has acquired its name from being attended by prominent elevations of the skin, called wheals, resembling those produced by the sting of the common nettle. The wheals are either paler or redder than the surrounding skin, and seldom permanent, they return in paroxysms, and are attended with a painful sense of itching.

This disease is produced directly by the application of the glandular hairs of species of Urtica and Loasa, the hairs of some caterpillars, and the secretion from the surface of the Acalephæ. Under these circumstances it seldom continues for more than a few hours, and seldom requires anything more than the application of a cooling lotion, although instances are related of very severe inflammation coming on from the stings of some of the tropical species of nettle.

Urticaria is more frequently symptomatic or attendant upon some other derangement of the system. It not unfrequently appears after partaking of indigestible food of any kind, and some persons are liable to it after particular kinds of food. The kinds of food which seem to favour the development of this disease are shell-fish, lobsters and crabs, mushrooms, the spawn of some fishes, &c. Attacks brought on in this way are also generally temporary, and disappear with the cause of the disease. If taken sufficiently early, an emetic of ipecacuanha and tartarised antimony will sometimes afford immediate relief. In other cases a purgative will relieve.

The nettle-rash is frequently an attendant upon prolonged gastro-intestinal irritation, and although disappearing from time to time, cannot be got rid of independently of the primary disease. In these cases the causes of the gastro-intestinal disturbance, such as indulgence in eating and drinking, should be sought out, removed, and medical treatment applied to the organs disordered. Sometimes the gastro-intestinal irritation proceeds to gastro-enteritis, which can only be subdued by active treatment, and in this way alone can the Urticaria be got rid of. This disease has also been observed to accompany ague or intermittent fever, and to yield only by treatment adapted for that disease.

Eczema, Heat-eruption, is an inflammation of the skin, characterised at the outset by small non-contagious vesicles, the fluid of which is finally reabsorbed; by superficial excoriations, attended by a serous discharge, or by a squamous condition of the skin. This disease may be confined to one particular part of the body, or it may attack the whole surface. It may arise from a local cause, as from the direct rays of the sun, or from some general disturbance of the system. The vesicles may be only few and the surrounding skin only slightly inflamed and confined to a very limited surface, or the vesicles may be numerous, the excoriations painful, the surface attacked extensive, and the tendency to inflammatory action in the skin so strong as to produce pustules instead of vesicles. Such are the characters of the three forms of Eczema usually described by writers on diseases of the skin,—*E. solaris*, *E. rubrum*, *E. impetiginoides*. Eczema is more likely to be confounded with itch than any other disease, from which it may be distinguished by its non-contagiousness and the very different parts of the tegumentary system which it occupies.

There is a form of Eczema which comes on from the exhibition of mercury and the external application of other medicines, and which frequently arises from the carelessness of the person attacked, which is called *E. mercuriale*.

The treatment of Eczema must be adapted to the causes which have produced it. According to the general state of health of the person attacked, the disease will be either acute or chronic. Slight cases of acute eczema require only a simple treatment, a light diet, saline purgatives, and cooling or emollient applications to the part being all that is required. In some cases the inflammation is great and the pain intense, and where this occurs bleeding and a more active general treatment should be had recourse to. Chronic eczema is much more difficult to treat. The general health demands attention, and alteratives and tonics, according to circumstances, are demanded. Astringent lotions and ointments, such as the preparations of silver, zinc, alum, &c., may be used; sulphurous baths, and various mineral waters have also been recommended in old chronic cases of this disease. The tincture of cantharides and the preparations of arsenic have also been employed in the chronic forms of eczema.

Miliaria (Febris miliaris, Miliary Eruption) is also a vesiculous disease of the skin, and is described as contagious. It is accompanied with inflammation of the gastro-intestinal mucous membrane, and is accompanied by profuse sweating. Miliaria as an epidemic and independent disease is only seen between the 43rd and 49th degrees of latitude, and its existence has been doubted by some nosologists. It frequently accompanies other diseases, and retires with the cessation of the disease which it attends. When the fever accompanying it is slight it requires little treatment. Gentle purgatives and demulcents will be found sufficient. In the epidemic form however it is often a formidable disease, and requires the same treatment as other epidemic contagious fevers.

Rupia is a bullous disease accompanied with small bullæ, the bases of which are inflamed. The bullæ are not numerous but flat and full of a serous fluid, which becomes thick, puriform, or sanguinolent, and drying up forms blackish thin or prominent crusts. It is commonly developed on the legs, sometimes on the loins or thighs. It attacks children that are of a delicate constitution, and persons weakened by other diseases. The scrofulous are peculiarly liable to it, and it comes on after hard living, insufficient food, exposure to cold, and vicious courses of life. It is generally indicative of an imperfect state of nutrition, and the treatment consists not so much in applications to the diseased skin, as in giving tone to the system by nutritious food, and tonic and alterative medicines.

Ecthyma (Pustulous Scale) is a non-contagious inflammation characterised by large pustules raised upon a hard circular base of a bright red colour. The pustules are of the largest size, the *phlyzaciæ* of Willan, so that ecthyma bears the same relation to pustular diseases that rupia does to vesicular ones. In some stages in fact it is difficult to distinguish one of these diseases from another. Willan describes four varieties of ecthyma, but Rayer recognises but two, acute ecthyma and chronic ecthyma. Acute ecthyma is a comparatively rare disease; it generally appears on the neck and shoulders, and runs its course in a few days. This form requires little treatment; light diet, diluent drinks, mild purgatives, and warm or cold applications to the part will suffice.

In chronic ecthyma the same kind of pustules appear, which discharge their contents in the course of two or three days, leaving behind them thick brown adherent crusts, which sometimes fall off, leaving an ulcer behind, but more frequently leaving a cicatrix. This form of the disease comes on in scrofulous and debilitated subjects, and is frequently modified by a syphilitic taint. Just in proportion to the intensity of the constitutional derangement will be the duration and extent of the disease. In its treatment the general health must be especially attended to; it is more a disease indicating a want of action than of increased action, and alteratives, tonics, nutritious diet, change of air, and sea-bathing are more beneficial than the opposite kind of treatment.

Acne (Gutta rosacea, Rose-Drop) is a chronic inflammation of the skin characterised by an eruption of small pustules surrounded by a hard and inflamed base. They are generally observed on the cheeks, nose, and forehead, and sometimes on the ears and neck. The pustules are sometimes single, constituting the simple form of the disease; at other times they become hardened and the whole skin becomes red, when the disease has different designations. This disease has its origin in the oil-tubes, and arises from an obstruction to the performance of their functions, which produces inflammation. The oil-tubes of the face are very liable to obstruction from exposure to the air and other causes, and may be frequently observed tipped with a little black spot, and when pressed they give out a quantity of their oily secretion in the form of a little maggot. They were at one time supposed really to possess an independent animal life. Although this is not the case with the masses of oil in question, it is now known that a little acarus takes up its abode in these oil-tubes, and is well known to zoologists under the name of Demodex Folliculorum. This little insect may then in some instances be the exciting cause of acne.

In the treatment of acne, regard must be had to the general health. It is frequently connected with a diseased state of the gastro-intestinal mucous system, which requires attention. Where it is connected with general debility from a rapid growth, or with a scrofulous constitution, tonics and alteratives with sea-bathing and regular exercise will be found of service. As external applications, the preparations of copper, zinc, and mercury, have been found most efficient. Where the face is much swelled and inflamed, fomentations will be of service previous to the use of the astringents.

Lichen is a papulous disease, characterised by the simultaneous or successive eruptions of red itching pimples, scattered or disposed in groups over the whole body. It is in the adult what Strophulus is in the child. [STROPHULUS, P. C.]

Diseases of the skin are very numerous and prevalent, but in the case of the majority which occur they arise from the neglect of some of the conditions necessary for the health of the skin. These conditions in general are, good nutritious food, which should be properly digested; a due amount of warm clothing, especially during changeable and cold weather; constant and regular exercise, so as to keep the skin as an excretory organ in perfect order; and daily ablution of every part of the body, without which and the occasional use of soap it is vain to expect to be free from many forms of skin disease.

SKY is the name commonly applied to the infinite space which surrounds the earth, and of which the visible portion, above the horizon of a spectator on any part of the earth's surface, appears to have the form of a concave segment less than a hemisphere. [ENLARGEMENT OF OBJECTS, P. C. S.]

The earth is surrounded by the atmosphere, which is charged with vapours and terrestrial particles; and by the reflections which, in consequence, the rays of light experience in passing to the spectator, the sky assumes the variously-coloured tints under which it is seen.

It is known from many experiments that pure air is devoid of colour; and the observations of M. de Saussure (*Voyages dans les Alpes*) have established the fact that, in an atmosphere free from vapours, such objects as mountains covered with snow, when seen by a spectator at a distance of 20 or 30 leagues from them, by light which is merely transmitted through the air, appear to be white: the same philosopher has observed, however, that at times when the sun is seen to set behind a mountain so covered, the blue rays reflected to the spectator from the parts of the atmosphere on each side of the mountain, cause the latter to assume a blue colour, the direct light from the mountain not being strong enough to interfere sensibly with the reflected rays.

When the sun has considerable elevation, the rays of light which pass through the earth's atmosphere almost perpendicularly to its surface, undergo scarcely any change of direction; but, with respect to the light from the sun which enters obliquely into the atmosphere, the violet and blue rays, or those which are conceived to have less momentum than the red rays, are partially arrested in their course, and are reflected in abundance to the earth; they thus, when the atmosphere is nearly free from clouds, give to the parts of the sky which are remote from the apparent place of the sun an azure tint.

The blue colour of the sky about the zenith increases in proportion as the sun is nearer the horizon; the rays then fall with greater obliquity upon the parts about the zenith, and, at the same time, the blue rays in the beams of light which traverse the atmosphere in directions nearly parallel to the horizon are absorbed, so that those only, as the yellow and red, which have greater momentum, arrive at the eye of the spectator: in consequence of this the sky near the horizon, on the side which is towards the sun, appears to be highly tinted with those colours.

Many of the blue rays, after reflection from the upper parts of the atmosphere, are however absorbed in passing down to the earth; and hence it is that the blue tint of the sky is found to increase in intensity as the spectator ascends above the general surface of the earth. On the top of high mountains, or in balloons at great elevations, the quantity of blue rays which, after reflection in the atmosphere, enter the eye is very great; and the blueness at length becomes a deep black-ground on which the stars appear to shine at all times with as much lustre as at midnight on the earth, during the absence of the moon. It is hence evident that if it were not for the innumerable reflections of the light from the sun or moon, which take place in the atmosphere, total darkness would prevail from the instant of sun-set to that of sun-rise; and even during the day, darkness would ensue, so that the stars would become visible, every time that the sun is obscured by a cloud.

That the blue tint of the sky is caused by light reflected in the atmosphere is abundantly evident from the fact that the light of the sky is found to be polarized: this quality in light, being a result of its reflection. Dr. (Sir David) Brewster, who first made the observation, has moreover ascertained that the light of the sky consists of two parts, one blue and the other nearly without colour; and he discovered that these lights are polarized in different directions. (*Treatise on New Philosophical Instruments, p.* 349.)

The hypothesis that the azure colour of the sky is caused by reflections of blue rays, was at one time objected to on the ground that the shadows of opaque objects, placed on white paper and exposed to the sun's light, should always appear to be blue, since the part of the paper which is in shadow can only be visible by the light of the sky reflected from thence. This phenomenon is, in fact, frequently observed; but M. de Saussure, while admitting that he has often perceived the shadows of objects to be bluish in the mornings and evenings on the general surface of the earth, states that in alpine regions, where the sky is intensely blue, the shadows of objects never appear to be so: he adds that, of fifty-nine observations made for the purpose of ascertaining the colours of shadows on the mountains, thirty-four showed them to be a pale violet, eighteen showed them to be black, six a pale blue, and once they appeared to be yellowish. It may be inferred, therefore, that shadows cast by opaque objects are so much affected by the colours of the neighbouring objects that a right judgment can scarcely be formed of the colour which they receive from the light of the sky. [ACCIDENTAL COLOURS, P. C. S.] To the like interference must be ascribed the variously-coloured shadows which were observed by M. Bouguer. (*Essai d'Optique;* and M. Buffon, *Mémoires de l'Académie des Sciences*, 1748.)

Between the tropics the transparency of the atmosphere is far greater than it is, in general, in regions beyond them towards the north or south; hence the sky there is almost always serene and intensely blue, while the clouds near the setting sun are brightly tinted with the prismatic colours. The skies of the south of Europe and some parts of North America are distinguished for their serenity and beauty; but, in these respects, they are said to be inferior to the skies over the islands in the Pacific Ocean.

For the description of an instrument invented in order to measure the intensity of the blue colour in the sky, see CYANOMETER, P. C. S.

SMEDLEY, EDWARD, Reverend, was born about the year 1789, and was the son of the Rev. Edward Smedley, who died in 1825, after having been one of the ushers of Westminster school for nearly half a century. The elder Smedley was the author of 'Erin, a Geographical and Descriptive Poem,' published by subscription in 1810. His son was admitted a king's scholar at Westminster in 1800; and thence he removed in due course to Trinity College, Cambridge. He took his degree of B.A. in 1809, as tenth Junior Optime, and, having obtained one of the Member's Classical Prizes in 1810, and again in 1811, was then elected a fellow of Sidney College. He obtained no fewer than four of the Seatonian Prizes for English poems; the first on the Death of Saul and Jonathan, 1814; the second, on Jephtha, 1815; the third, on the Marriage at Cana, 1827; the fourth, on Saul at Endor, 1828. In 1829, he was collated by Bishop Tomline to a prebend in the cathedral church of Lincoln, the value of which, however, was only 14*l.* a-year; and this was the only ecclesiastical preferment he ever obtained. Besides his Seatonian Prize poems, he was the author of a poem entitled 'Prescience,' and of some others; and also of a 'History of the Reformed Religion in France,' in five vols. 12mo., and of one volume of a History of France, published under the superintendence of the Society for the Diffusion of Useful Knowledge. At the time of his death he was editor of the 'Encyclopædia Metropolitana;' and he contributed several articles on French biography and English and Roman literature to the earlier volumes of the present work. His death took place at Dulwich on the 29th of June, 1836.

(Memoir in *Gentleman's Magazine* for September, 1836.)

SMIRKE, ROBERT, R.A., of late years the Nestor of the Royal Academy, of which he was a member for fifty-three years, died at his house in Osnaburgh Street, Regent's Park, January 5, 1845, in his ninety-fourth year: he was born in 1751.

Smirke, originally a painter of coach-panels, was one of the most distinguished of the English *genre* painters, and had indeed no great rival before the time of Wilkie. His subjects are various, but his favourite author was Cervantes; a great proportion of his pictures are from Don Quixote. Though so long a member of the Academy, he sent few pictures to its exhibitions, and only three before his election as a member, which were Narcissus, and the Lady and Sabina, from Comus, in 1786; and the Widow in 1791. He was elected an Academican in 1792, the year that Reynolds died, and he gave as his presentation picture Don Quixote and Sancho. He contributed two pictures also in this year to the Academy exhibition: The Lover's Dream, and Musidora, from Thomson's Spring and Summer. In 1793 he exhibited Lavinia, from the Autumn of the same poet. Smirke designed much for booksellers, and for annuals and such works, and he was one of the contributors to Boydell's Shakspere. He painted several pictures from Shakspere, as Catherine and Petruchio, Juliet and her Nurse, Prince Henry and Falstaff—'This chair shall be my state, this dagger my sceptre, and this cushion my crown:'—The Seven Ages; and others. From Don Quixote he painted Sancho's audience of the Duchess; The Countess Dolorado discovering the cause of her grief to Don Quixote; The ceremony of beard-washing performed by Don Quixote at the table of the Duke; Don Quixote addressing the Princess Dulcinea; and The Combat between Don Quixote and the Giants interrupted by the Innkeeper. The last time he exhibited was in 1813: the picture was styled 'Infancy.' In other classes, the following pictures are among his best works. Infant Bacchus; Psyche; the Plague of Serpents; the Angel justifying Providence, from Parnell's Hermit; the Gipsy; the Fortune-tellers, &c. &c. Smirke was the contemporary of Sir Joshua Reynolds—he was the father of the present Sir Robert Smirke.

SMITH, SYDNEY, Reverend, was born in 1768, at the village of Woodford, in Essex. His father was a gentleman, whose residence was at Lydiard, near Taunton, in Somersetshire. Sydney Smith was educated at the collegiate school of Winchester, on William of Wykeham's foundation, and was elected in 1780 a scholar of New College, Oxford, of which college he was elected a fellow in 1790. In 1796 he took the degree of M.A., and soon afterwards obtained the curacy of Nether-Avon, near Amesbury, in Wiltshire, where he remained about two years, and then accepted the office of tutor to the son of Mr. Hicks Beach, a gentleman who resided in the neighbourhood, and who was member of parliament for Cirencester. Sydney Smith was to have gone with his pupil to reside at the University of Weimar, but Germany having just then become the seat of war, he proceeded to Edinburgh, where he remained about five years. Among the first persons with whom he formed an acquaintance in that city were Henry Brougham, now Lord Brougham, Francis Jeffrey, now Lord Jeffrey, and others of similar opinions in politics. This acquaintance led to the establishment of the 'Edinburgh Review,' the origin of which is thus related by Sydney Smith himself:—'One day we happened to meet in the eighth or ninth story or flat in Buccleuch Place, the elevated residence of the then Mr. Jeffrey. I proposed that we should set up a Review; this was acceded to with acclamation. I was appointed editor, and remained long enough in Edinburgh to edit the first number of the Edinburgh Review.' The first number was published in October, 1802. Sydney

Smith while in Edinburgh officiated at the Episcopal chapel there. In 1803 he removed to London, where he married the daughter of Mr. Pybus, the banker, and where he fixed his residence. He became popular as a preacher at the chapel of the Foundling Hospital, and at other places. He also delivered lectures on polite literature with much applause at the Royal Institution in Albemarle Street, and was a regular contributor to the 'Edinburgh Review.'

Lord Erskine, when Lord Chancellor, gave him, in 1806, the rectory of Foston, in Yorkshire. In 1829 he was presented to the rectory of Combe-Florey, in Somersetshire, by Lord Lyndhurst, and in 1831 he was appointed by Earl Grey one of the canons residentiary of St. Paul's Cathedral. Except a few years when he resided at his rectory of Foston, and during which he published anonymously, in 1808, 'Letters on the Subject of the Catholics to my Brother Abraham who lives in the Country, by Peter Plymley,' his place of residence was London, where he associated with literary men and politicians of Whig principles, distinguished for his conversational powers, and consequently a frequent 'diner out.' It is probable however that he kept within reasonable bounds of temperance, for he lived till the age of 77. He died at his house in Green Street, Mayfair, London, Feb. 21, 1845, and was buried in the Kensall Green Cemetery. He left the bulk of his property, which was large, to his widow and his son Wyndham Smith.

The Rev. Sydney Smith published 'Six Sermons,' Edinb., 12mo., 1800; 'Sermons,' 2 vols. 8vo., Lond., 1809; several occasional sermons and political pamphlets; and contributions to the 'Edinburgh Review.' In 1839 he published what he himself probably regarded as the best of his literary compositions, 'The Works of the Rev. Sydney Smith,' 3 vols. 8vo., with a preface by the author and a portrait. The collection consists of his contributions to the 'Edinburgh Review,' Peter Plymley's Letters, and various occasional tracts. With respect to his contributions, he observes, 'I see very little in my reviews to alter or repent of. I always endeavoured to fight against evil, and what I thought evil then I think evil now. I am heartily glad that all our disqualifying laws for religious opinions are abolished, and I see nothing in such measures but unmixed good and real increase of strength to our establishment.' When he wrote this however, '*all* our disqualifying laws' had not been abolished, as may be seen by looking over the act of parliament which is reprinted under the head ROMAN CATHOLICS AND JEWS, P. C. S.

Sydney Smith is a very effective writer; he has considerable argumentative power, united with wit, humour, and poignant satire. His style is clear and forcible, without any apparent aim at elaboration or polish. Two or three letters which he published in the newspapers shortly before his death against the repudiation of their debts by certain States of North America are as strong in argument, as pungent in satire, and as effective in style as anything which he wrote in less advanced age.

(*Athenæum; Gentleman's Magazine; Preface to the Rev. Sydney Smith's Works.*)

SMOKE BALLS. [LIGHT BALLS, P. C. S.]

SNAPDRAGON. [ANTIRRHINUM, P. C. S.]

SOCRATES, the ecclesiastical historian, was born at Constantinople towards the end of the fourth century. He was instructed in grammar and rhetoric by Ammonius and Helladius, of Alexandria, and afterwards followed the profession of scholastic or advocate, on which account he is generally designated as Socrates the Scholastic. He appears, however, to have abandoned this profession in order to devote himself to the study of ecclesiastical history. He is generally considered the most exact and judicious of the three continuators of the history of Eusebius [EUSEBIUS, P.C.]; he is less florid in his style and more careful in his statements than Sozomen [SOZOMEN, P. C.] and less credulous than Theodoret. [THEODORET, P. C.] He is likewise the earliest writer of the three, and Sozomen is supposed to have borrowed some what largely from him. His history extends from the year 306 to 439; it has been abridged by Epiphanius the Scholastic in his 'Historia Tripartita,' and was published for the first time as a continuation of Eusebius, by Robert Stephens, Paris, 1544, in fol. There is a good French translation of it by the President Cousin. The history is divided into seven books; the five last are chiefly composed on the authority of Rufinus [RUFINUS, P. C.], and on the relations he gathered from eye-witnesses of many of the events he records. The two first had also been composed on the same authority; but on reading the writings of St. Athanasius he found that Rufinus had omitted several of the principal circumstances in the life of this celebrated father of the church. [ATHANASIUS, P. C.] He therefore undertook the task of writing them anew, and took occasion of inserting several valuable documents and formularies of faith which throw much light on the Arian heresy.

Though the most exact of the continuators of Eusebius, he has nevertheless allowed himself to fall into error on several important points. For instance, he confounds the Emperor Maximianus with Maximinus (b. 1, c. 1.), a mistake the more surprising as he was a native of Constantinople, and professes to relate the principal events which took place in that city. 'The carelessness of writers of that age,' says Gibbon, 'leaves us in a singular perplexity' ('Hist. of the Dec. and Fall of the Rom. Emp.,' c. vii., note). He is mistaken also respecting the number of bishops who refused to sign the creed drawn up at the Council of Nice (b. 1, c. 8), as it appears clearly from the acts of the council and the authority of St. Jerome, Theodoret, and others, that there were only two, not five, dissentients, as Socrates asserts. His statements respecting a law passed by the Emperor Valentinian authorizing bigamy (b. iv. c. 31), on the occasion of his marriage with Justina, rests on no other known authority, and bears the semblance of a fiction rather than a fact. His account of church discipline has been severely criticized by Baronius, Fleury, and other Roman catholic writers; but he has on this point been very ably defended by Cousin in the preface of the translation to his history. 'His impartiality is so strikingly displayed,' says Waddington, 'as to make his orthodoxy questionable to Baronius, the celebrated Roman catholic historian; but Valesius in his life has clearly shown that there is no reason for such suspicion. We may mention another principle which he has followed, which in the mind of Baronius may have tended to confirm the notion of his heterodoxy—that he is invariably adverse to every form of persecution on account of religious opinions—διωγμὸν δὲ λέγω τὸ ὁπωσοῦν ταράττειν τοὺς ἡσυχάζοντας: and I call it persecution to offer any description of molestation to those who are quiet.' ('Hist. of the Church,' p. 104.) He is, however, very generally suspected of a leaning in favour of the schism of the Novatians, though he shows but little knowledge on the subject, and confounds Novatian, who was a priest of Rome, with Novatian of Africa. [NOVATIANS, P. C.] The date of his death is not ascertained.

(*Hist. de l'Eglise*, traduite par Cousin, vol. ii., Paris, 1775; Fleury, *Hist. Eccles.*, l. xxvi. c. 49; Waddington, *Hist. of the Church*, London, 1833; Moreri, *Dict. Historique*, art. Socrates.)

SOEUR, LE, HUBERT. This excellent sculptor, a Frenchman by birth, according to Walpole, was the pupil of the celebrated John of Bologna. He came to England probably shortly before 1630, in which year he was then living in Bartholomew Close, and a son of his was buried on the 29th of November of that year in Great St. Bartholomew's.

Le Soeur must have been a man of about fifty years of age in 1630, for John of Bologna died in 1608 in Florence at an advanced age, and Le Soeur must have visited Florence therefore about the beginning of the seventeenth century if he were his pupil. The connection with John of Bologna, who was a native of Douay in Flanders, and his subsequent connection with Rubens in England, seem to indicate Flanders as the country of Le Soeur rather than France. Rubens is said to have designed the much-admired bronze or brass statue of William Earl of Pembroke in the picture gallery of Oxford, which was executed and cast by Le Soeur. William Earl of Pembroke was Chancellor of the University of Oxford from 1616 to 1630.

In 1633 Le Soeur cast the well-known equestrian statue of Charles I. at Charing Cross; it was cast in a spot of ground near the church of St. Paul, Covent Garden, but not being put up before the commencement of the great civil war, it was sold by the Parliament to a brazier of the name of John Rivet, living at the 'dial near Holborn Conduit,' who had orders to break it into pieces. Rivet, instead of breaking it up, buried it, and it remained concealed until the restoration. It was placed in its present situation at the expense of the crown, about the year 1678, by an order from the Earl of Danby, afterwards Duke of Leeds. The statue was made for and at the expense of the family of Howard-Arundel, who have still the receipts to show by whom and for whom it was cast. There is a story about Le Soeur's destroying himself when, after the statue was set up, he found that he had omitted the saddle-girth; unfortunately for the truth of this story, however, the saddle-girth is there, and further, Le Soeur can never have seen the statue set up, as he must have died several years before 1678. The figure is dignified and expressive, but the horse is heavy and is generally deficient in modelling; the hinder quarters are especially void of character and motion. The pedestal was made by Grinling Gibbons. Walpole speaks of a bust at Stourhead by Le Soeur of Charles I. in bronze, with a helmet surmounted by a dragon à la Romaine, three feet high on a black pedestal. It is mentioned in Vanderdoort's Catalogue of Charles the First's Collection. Le Soeur executed many other bronze or brass works in England, but they are now all lost or destroyed.

(Walpole, *Anecdotes of Painting, &c.; English Connoisseur.*)

SOFTNESS is a condition of solid bodies in which the particles are held together by a cohesive power of small intensity: in consequence of this, such bodies change their figures upon the application of a small degree of force; and they do not recover their previous forms upon its removal.

This condition is the opposite of hardness, in which the particles are held together by a power of cohesion so great that they cannot be separated by any force which it may be convenient to apply to them. No body in nature is known to possess either of these qualities absolutely; but in contemplating the mechanical actions of soft bodies, balls of wet clay are generally used, while blocks of wood acting against one another in the directions of their fibres are frequently used to illustrate the effects of hardness. Balls of glass or ivory, or steel springs, serve to show the mechanical actions of elastic bodies. [COLLISION OR PERCUSSION OF BODIES, P. C. S.]

SOLENI'TES, a finely leaved fossil plant from the Yorkshire coast, whose affinities are somewhat uncertain. Supposed to be Marsiliaceous. (Lindley.)

SOLIDA'GO (from *solido*, to make firm, on account of its supposed virtues), a genus of plants belonging to the natural order Compositae, the suborder Corymbiferae, and the tribe Asteroideæ. It has radiant heads of flowers, the florets of the ray pistilliferous ligulate in one row; those of the disk tubular, with stamens and pistils, the receptacle rather alveolate, the involucre imbricated, with a few scales on the peduncle; the pappus pilose in one row; the fruit terete. This genus closely resembles Aster, from which it is distinguished by its pappus in a single row, and its terete fruit.

S. Virgaurea, Golden Rod, has an erect, slightly angular stem, the leaves lanceolate, narrowed at both ends; the lower leaves elliptical, stalked, serrated; the raceme erect, simple, or compound; involucral scales, lanceolate, acute; the fruit downy. This plant is a native of the woods and thickets of Great Britain, and was formerly much used in medicine. Its leaves and flowers are said to be aperient, and it has been employed for internal hæmorrhages. It is astringent and tonic.

SOLIDITY. For the signification of this word in its strictest sense the reader is referred to IMPENETRABILITY, P. C.; but, as the word is frequently employed to designate a condition of material substance in contradistinction from liquidity, or a gaseous form, it may in this sense be defined to be a state of a body in which the force of cohesion between the molecules is such that these require a certain amount of force to separate them from one another; and, at the same time, they are subject to small variations only of their mutual distances by the application of any quantity of heat less than that which would reduce them to ashes or convert them into fluids. The expansion of solids by heat is noticed under HEAT, P. C.; see also SPECIFIC HEAT, P. C. S.

SOLIME'NA, FRANCESCO, Cavaliere, called l'Abate Ciccio, a celebrated Neapolitan painter, was born at Nocera de' Pagani in 1657. He was originally intended for the law, but having a decided taste for art, he was first taught by his father Angelo, who was the pupil of the Cav. Massimo, and studied afterwards at Naples under Francesco di Maria, and in the academy of Pietro del Po. Solimena was one of the best and most correct painters of his time; he had great versatility of talent and executed works in every style, and had also very great facility of execution. But his style in all its varieties belonged to the elegant and ornamental; his drawing is uniform, and in a great degree merely academical; his heads are only graceful, but his light and shade is effective; his works however want expression, sentiment, and dramatic vigour. He was a great admirer of Pietro da Cortona and the Bolognese painters, one or other of whom he generally made his model. He died at Naples extremely wealthy and in the enjoyment of a great reputation in 1747, at the very advanced age of ninety.

Solimena was the rival and at the same time the friend of Luca Giordano, by whose death in 1705 he was left without a rival, and he raised accordingly the price of his pictures, which however in no way diminished the number of his commissions. His works, both in oil and fresco, are very numerous; the principal of them are the frescoes of the sacristy of the Theatines of San Paolo Maggiore; others, in oil, in the Church of the Apostles, and those of the Chapel of San Filippo Neri in the church dell' Oratorio: there are likewise by him many great altar-pieces and other pictures in oil in the churches of Naples and in other cities of Italy. His portraits also are very numerous, including those of some of the principal kings and princes of his time. Solimena was also a poet; his sonnets have been several times published. He was never married; his large property, which besides estates amounted to 300,000 scudi, went to his nephews, the sons of his brother Tommaso Solimena, who was a distinguished lawyer. During his long life Solimena appears to have made only two short visits to Rome. Of his numerous scholars the principal were Sebastiano Conca, Giaquinto Corrado, Ferdinando Sanfelice, and Francesco de Mura.

(Dominici, *Vite de' Pittori, &c. Napolitani*; Lanzi, *Storia Pittorica, &c.*)

SOTHEBY, WILLIAM, was born in London, November 9, 1757. He was the eldest son of Colonel Sotheby, of the Guards, and Elizabeth, daughter of William Sloane, Esq., of Stoneham, in Hampshire. His father died when he was only seven years old, and he was placed under the guardianship of the Hon. Charles Yorke (afterwards lord chancellor) and of his maternal uncle Hans Sloane, Esq., and by them he was sent to Harrow School, where he remained till he was seventeen years of age. Instead of completing his studies at either of the universities, he entered the army, and purchased a commission in the Tenth Dragoons, from which he immediately obtained leave of absence, and passed several months at the military academy at Angers for the purpose of studying the principles of his profession, England at that time having no similar institution for military instruction. On leaving Angers he passed a winter and spring in Vienna and Berlin, and rejoined his regiment at the end of 1777, at Knaresborough, in Yorkshire, where, besides attending to his military duties, he studied, critically and assiduously, Shakspere and the other masters of English poetry. In 1780 he married Mary, youngest daughter of Ambrose Isted, Esq., of Ecton, in Northamptonshire; he immediately afterwards quitted the army and purchased Bevis Mount, near Southampton, where he continued to reside for the next ten years, amusing himself with poetical studies and writing. In 1788 he made a pedestrian tour through Wales with his only brother Admiral Sotheby, of which he published a poetical narrative under the title of 'A Tour through North and South Wales.' His mother died in 1790, and in 1791 he removed from Bevis Mount to London, where he afterwards chiefly resided, passing however a considerable part of every year at Fair-Mead Lodge, in Epping Forest, of which he was one of the master keepers. Soon after he settled in London he became a Fellow of the Royal Society, of the Antiquarian Society, and of the Dilettanti Society; and was in the habit of receiving at his house persons distinguished in literature and politics without any regard to party distinctions.

The language and literature of Germany had been for some time advancing in favour in England. Taylor, of Norwich, had chiefly contributed to this result; and Sotheby's friend Spencer had translated Bürger's 'Lenore' with more success than Taylor had done previously. Sotheby studied the language, and in 1798 published a translation of Wieland's 'Oberon,' which immediately became popular. In 1799 he published a short poem on the battle of the Nile, and in 1800 a translation of the 'Georgics' of Virgil. In 1801 he addressed Sir George Beaumont in 'A Poetical Epistle on the Encouragement of the British School of Painting.' In 1802 he published 'Orestes,' a tragedy, on the model of the Greek drama, accompanied by a mask, entitled 'Huon de Bourdeaux,' founded on the story of 'Oberon.' His next work, on which he was occupied the greater part of two years, and which appeared in 1807, was an epic poem, in blank verse, under the title of 'Saul.' In 1810 he produced 'Constance de Castille, a metrical Poem, in Ten Cantos,' in the style of the 'Lady of the Lake' and 'Marmion.' In 1814 he republished 'Orestes,' together with four other tragedies. Sotheby travelled through France, Switzerland, and Italy in 1816, in company with Mr. Elmsley and Professor Playfair. He returned through Germany to England at the close of 1817. In 1827 he published a corrected edition of his translation of the 'Georgics,' together with the original text, and the translations of De Lille, Soave, Guzman, and Voss, in folio; of which he presented copies to several of the sovereigns of Europe, and received medals from them in acknowledgment.

When he was in his seventieth year he commenced a poetical translation of the 'Iliad,' of which he completed a portion every day, even during a tour which he made to Scotland in the summer and autumn of 1829. On his return to London he pursued his task with unabated diligence, and completed the 'Iliad' in September, 1830. He immediately commenced the 'Odyssey,' which he finished in July, 1832.

He died December 30, 1833, in the seventy-seventh year of his age. His eldest son William, who was a colonel in the First Regiment of Guards, died in 1815, in consequence of injuries which his constitution had suffered in the Walcheren expedition and the war in Spain. His third son George, who was assistant-resident at Nagpoor, in Hindustan, was killed in repelling an attack of the Pindarees, November 27, 1817. Another son, Hans, who had been in the civil service in India, died in London, April 27, 1827.

Besides the works already mentioned, Sotheby published, in 1828, 'Italy, and other Poems,' fcap. 8vo., consisting chiefly of descriptions of Italian scenery, most of which were probably written while he was travelling in 1816-17, and a few other small compositions.

Sotheby's original poems made little impression on the public, and are now nearly forgotten. His thoughts are pleasing, but faint, and frequently indistinct, from the polished diffuseness of his style. He has little originality or strength of imagination, but he has great facility and elegance of diction and versification, and hence his poetical translations are among the best which have been made in English. His 'Oberon' is an excellent version of Wieland's romantic poem, tolerably close, and no bad substitute for the original to those who cannot read German. His version of the 'Georgics' seems to have been a favourite work, and to have occupied much time in correction and improvement, and is perhaps superior to any other which has been made in our language. The folio edition was published at five guineas, and is a splendid specimen of typography. His versions of the 'Iliad' and 'Odyssey' are closer than those of Pope, but have less animation and energy, and have certainly no chance of superseding Pope's. Of the English poetical versions of the 'Iliad' and 'Odyssey,' Cowper's blank-verse translation is the closest which has yet been made. Sotheby's is in rhyme. In 'Blackwood's Magazine,' April, May, July, and December, 1831, are four critical articles on Sotheby's 'Iliad,' written by Professor Wilson in his usual popular style, but with great skill, truth, and nicety of discrimination, in which the versions of Chapman, Pope, Cowper, and Sotheby are examined and compared, as well as the translation of the first book of the 'Iliad' by Dryden, and that (also of the first book) which was made by Tickell in rivalry with Pope. Sotheby receives a fair share of the praise as well as the blame which the critic deals out to the different translators; but Wilson's own specimens of literal prose versions exhibit Homer more truly than any of the others, and are probably to most readers more interesting, and even more delightful to read.

(*Annual Biography and Obituary for* 1835.)

SOULAMIA (Soulamion is the name of the tree in the Moluccas), a genus of plants belonging to the natural order Polyaleae. It has 5 sepals, the 3 outer ones very small, the 2 inner large and concave. The petal is concave. The capsule samaroid, indehiscent, compressed, corky, emarginate, and 2-celled.

S. amara, bitter Soulamia, is a shrub with crowded ovate leaves tapering to the base, quite entire, and veiny. It is native of the Moluccas, and has white racemose flowers, the size of those of the vine. The fruit is compressed, thin at the edges, dry, with 2 seeds in each cell resembling cucumber seeds, but smaller, each lying in a small cavity of the cell. The plant has not yet been introduced into gardens, and the mode of cultivating it is at present unknown.

(Don, *Gardener's Dictionary*; Lindley, *Flora Medica*.)

SOULS, CURE OF. [BENEFICE, P. C.]

SOUTH AUSTRALIA is a British colony, established on the southern shores of Australia. It extends, as fixed by the British government, from 132° to 141° E. long. From the coast, which at its western border occurs near 32° 30′, and at its eastern near 38° S. lat., its boundary line runs due north to 24° S. lat., which parallel constitutes its northern boundary. On all three sides it is encompassed by Eastern Australia, or New South Wales. Within its boundary are contained two large bays: Spencer's Gulf, and the Gulf of St. Vincent, and the lower part of the course and basin of the River Murray. Kangaroo Island, which lies before the entrance of the Gulf of St. Vincent, is also annexed to it. The area of the colony, according to a rough estimate, is about 320,000 square miles, and it is about 100,000 square miles larger than France.

The western portion of the territories is a mere waste. Near the western boundary-line the country along the sea-coast is low and barren, without trees or high bushes, but covered with scrub. It is almost entirely destitute of grass, and also of water, except during the rains and a few days after they have ceased, when small quantities of water remain in the flat depressions for a short time. This country continues as far east as Streaky Bay, south of which there is some improvement. The shore is skirted by low sand hummocks; and at the back of them is a belt a few miles wide, whose surface presents a succession of low hills, wooded and grassy, but very stony and destitute of water, except what is left by the rains in the depressions between the sandy hummocks and the stony hills. Behind the stony tract the country is a perfect level, and overgrown with scrub, consisting of the *Eucalyptus dumosa* and the Tea-Tree. Towards the southern extremity of the peninsula lying west of Spencer's Gulf, especially east of Coffin's Bay, the hills rise higher, and attain an elevation of between 600 and 800 feet; they consist of sandstone, and are covered with wood. The interior of the peninsula is low and barren, but interspersed with salt-lakes. Where the peninsula is connected with the main body of Australia, between Streaky Bay and the head of Spencer's Gulf, lies a mountainous tract, exhibiting a succession of lofty rugged ranges, one behind the other, running from east to west, but turning north-west at their western extremity. They are called Gawler's Range, and attain an elevation of about 2000 feet above the sea-level, but decrease as they advance farther east. These ranges are devoid of timber, and have a barren appearance, but are overgrown with prickly grass. There are no rivulets nor springs, but between the hills are small salt-water lakes, with salsolaceous plants growing round their margins; fresh water is only found after the rains in the clefts of the rocks. The country north of Gawler's Range has not been explored.

The country situated on the western shores of Spencer's Bay is of a much better description. It contains Port Lincoln, the most extensive and the best harbour in the colony. It consists of three basins: Spalding Cove, Port Lincoln, and Boston Bay, in each of which there is not less than ten or twelve fathoms water, with a bottom of muddy sand; they are capable of holding the navies of all Europe. Round these extensive sheets of water are many large tracts well wooded, and others grassy with single trees dispersed over them. It is calculated, that in the vicinity of Port Lincoln there are three millions of acres of land available for cultivation or pasture. The peninsula south of Port Lincoln is hilly, but well wooded, and has much good pasture ground, and also the country north of it to the distance of ten or twelve miles; but farther north the hills disappear and are followed by a low tract which extends along the shore, and is densely wooded with brush, among which are scattered a few small patches of grass. Water is only found near a few rocky elevations. At the back of this low and rather narrow tract is a moderately elevated table-land, whose edge is broken by deep gorges into portions resembling hills. The soil is a sandy red loam, greatly mixed with stones, and presents only here and there a little old withered grass. There are no high trees, but patches of scrubby bushes, and a few small pines. No water has been discovered.

The table-land just mentioned terminates at the head of Spencer's Gulf, where a rather narrow low tract separates it from Flinders' Range. This tract is quite level, and has a sandy soil almost without vegetation. Flinders' Range constitutes the western borders of a mountainous tract of considerable extent. It occupies in width a space more than sixty miles from west to east, lying east of Spencer's Gulf. It may be said that this mountain tract terminates on the south of the banks of Broughton River (33° 30′ S. lat.), where a higher summit occurs, Mount Bryan, 3000 feet high. From these parts it extends nearly due north, with a small declination to the east to Mount Hopeless (29° 20′ S. lat.). This region is traversed by a great number of ridges, which in general run south and north, but grow gradually narrower towards the north; for in 31° S. lat. the region is only thirty miles across, and still less towards its northern termination. In the southern portion of this mountain-region several summits attain an elevation of between 2000 and 3000 feet. The highest appears to be Mount Brown, not far from the head of Spencer's Gulf. Farther north, the mountains decrease in elevation. Between these ridges there are plains of considerable extent. The higher portion of the hills consists invariably of naked rock, generally sandstone, and without the least vegetation. The lower slopes are covered with dense brush, and the valleys with low shrubs, and occasional small patches of thin wiry grass. The plains are in general barren. Some of them have an undulating surface, and then it is found that the higher parts are quite destitute of vegetation, whilst the slopes and valleys are overgrown with scrub. In other parts the plains are level, and some of them are covered with salsolaceous plants. In a few places, patches of grass are found, but others are quite sterile. During the rains, and a short time afterwards, running water is found at a few places among the hills, but it does not appear that it reaches the plains at the foot of the hills.

This mountain-region, as already observed, terminates on the north near 29° 20′ S. lat. Its extremity is surrounded by a level desert, which when first seen appears to be covered with water and studded with islands. The first explorers of this region considered it to be a lake, and called it Lake Torrens. But it was found that these appearances were deceptive, being caused solely by an extraordinary mirage. Not a drop of water was found, and the islands turned out to be mere low sandy ridges, scantily clothed with stunted scrub on their summits. A salt crust is found at intervals on the surface of the sand, and a few pieces of what appear to be drift timber are lying about. Not a blade of grass or any species of vegetation is visible, and the sand is loose and drifting. This desert is about 300 feet above the level of the sea.

The river Broughton may be considered the southern boundary of the barren mountain-region just described. This river rises on the declivities of Mount Bryan, and appears to be a considerable river during the rains. In the dry season its upper course consists of extensive reaches of water connected by a strongly running stream, into which several chains of ponds discharge their water during the rains. Lower down, the Broughton winds through some broken hills of an open but barren description, and here the water is lost in the sands; only water-holes are found at intervals. Still further down, the channel, though very wide and deep, is quite dry. After the rains, however, the waters come down to Spencer's Gulf.

South of the Broughton a few high hills are found, as the Razorback (2900 feet above the sea), and the Lagoon Hill (2260 feet), but they soon sink much lower. The country between these hills and the shores of Spencer's Gulf presents open grassy downs, which are well adapted for sheep, and abundantly watered by ponds. With this part is connected Yorke's Peninsula, which separates Spencer's Gulf from the Gulf of St. Vincent. This peninsula is about a hundred miles long, with an average width of fifteen miles. It is a level country, rising gently towards the interior; the soil is a light sandy loam, and generally wooded in a park-like manner, except towards the eastern shores, where the woods are thick and have underwood. The surface is almost everywhere covered with grass. The most southern part of the peninsula is rather hilly, and very well wooded; there are numerous good timber-trees. On this part it appears that there is land fit for cultivation, but the remainder of the peninsula is better adapted to pasture.

The best portion of the colony is the country lying on the east of the Gulf of St. Vincent. The interior of this tract is hilly, but the hills do not attain a great elevation; the highest, called Mount Lofty, is about 1200 feet above the sea-level. This hilly tract lies nearer to the Gulf of St. Vincent than to the Murray River. The hills come down to the sea on the Gulf of St. Vincent, about three miles south of Holdfast Bay, and occupy the whole of the peninsula between the Gulf and Encounter Bay. They are mostly well wooded, with large timber trees, and between them are tracts of good land. Along the shores of the gulf are low sand-downs, on which only bushes grow. Between these downs and the hills, which are about ten miles distant, is an undulating country, which contains a great portion of land capable of cultivation. In its natural state it resembles a park, the single trees standing at considerable distances from each other.

In this part, the capital of the colony, the town of Adelaide is situated. It is built on the southern border of the Torrens, a river which rises in the hills about six miles east of the town. It can be called a river only in the rainy season, when the banks are full, and it runs with great velocity. In the dry season it consists of a number of expansions like small lakes, which are very deep and of considerable length, but rarely more than thirty or forty feet wide. These pools are connected with one another by shallow places, in which the water is hardly a foot wide and an inch deep. At these places hardly a current is perceptible in the dry season. The Torrens in that season does not reach the sea, but is lost in what is called the Reed-Bed, a swampy flat depression, overgrown with reeds, which is separated from the shores by the sandy downs. When the river is full, the surplus water finds its way to the sea by running from the Reed-Bed to the Creek. The Creek is an inlet, branching off from the Gulf of St. Vincent about twelve miles to the north-west of Adelaide. It runs about four miles eastward and then twelve miles southward, terminating not far from the Reed-Bed. Though there is a bank at the entrance of the creek, with only fourteen or fifteen feet of water over it, vessels of five hundred tons burden can sail up to Port Adelaide, which is only four miles from the town, and has a good landing-place and wharfs. As the water in the wells of Adelaide is brackish, that of the Torrens river is used for all purposes, and is even transported to Port Adelaide for the consumption of the people there, and for the vessels.

The Murray is the largest river in Australia, and its remotest tributaries rise in the mountains which are not far from the eastern shores of that continent. [AUSTRALIA, P. C., p. 121; WALES, NEW SOUTH, P. C., p. 13 and 14.] It enters South Australia near 34° S. lat., and flows for about eighty miles west, when it suddenly turns to the south, and runs in that direction to the sea; before entering into the sea it expands into a large lake called Lake Victoria. This navigable river runs in a bottom inclosed by higher ground, from twenty to forty feet above the bottom. The bottom is about four miles wide. As the river does not occupy the centre of the bottom, but inclines to either side according to its windings, the flats on its sides are of greater or less extent, according to the distance of the river from the base of the higher grounds. The bottom is level, and almost everywhere overgrown with high reeds. The soil is of the richest kind, being formed by an accumulation of vegetable matter, and as black as ebony; but as the destruction of the reeds would require much labour, no trial has hitherto been made to bring it under cultivation. Lake Victoria is about thirty miles long and fifteen miles across in the widest part. It has no great depth, and is united to Encounter Bay by three channels of little depth; the shortest of these channels is four miles long. From the southern side of Lake Victoria branches off a narrow channel, which after two miles gradually expands into another lake of smaller dimensions, called Lake Albert. This lake is not connected with the sea, but separated from it by a sandy neck of land and the Coorong.

The higher country between the Murray River and the hilly tract which forms the watershed between it and the Gulf of St. Vincent is rather hilly near the bend of the river, and overgrown with light woods; it appears to be adapted for sheep-walks. Nearer the sea the soil is sandy, and appears to possess only a small degree of fertility; but in the vicinity of Lake Victoria it is beautifully studded with cypress. The country east of the Murray is of a more barren description. The soil contains a much greater portion of sand, and it is covered in its natural state with low brush; large trees occur only at some spots. In some places it is covered with scrub, and in others the sandy surface does not present any indication of vegetation or water. The last-mentioned observation applies especially to the country which begins on the banks of the river, and extends to the eastern boundary of the colony.

The interior of the country, which, south of the parallel of Lake Victoria, extends from the sea to 141° E. long., is a desert; its surface being formed by a succession of low ridges destitute of vegetation, with wide valleys between them, in which only shrubby bushes grow. At the sea-mouth of the Murray begins a narrow arm of the sea, which extends along the shores and parallel to them over an extent of more than a hundred miles. It is called Coorong, and is separated from the open sea by a narrow strip of land covered with sand-downs of moderate elevation. At the back of the northern half of the Coorong there is a belt of grassy hills overgrown with casuarina, and between them numerous plains of moderate extent with a good soil; fresh water is found at a moderate depth under ground, rarely exceeding six feet. This belt is bordered on the north-east by the desert. At the back of the southern half of the Coorong there is a succession of salt swamps and low shrubby hills. A low range, called the Wambat Range, runs for twenty miles parallel to the Coorong, at a distance of about three miles. Behind this range is an extensive fresh-water swamp, several miles across, which appears to be subject to annual inundations. The soil of this swamp is similar to that of the flats of the river Murray. There are in the swamp many small sandhills, well wooded and grassed.

The Coorong terminates near 36° 30′ S. lat., but in the line of its continuation are a number of lakes, which are separated from the sea not by sand-downs, but by grassy flats. At the back of the lakes are several grassy plains with a good soil, and wooded hills. South of Cape Bernouilli (near 37° S. lat.) the country improves. It consists of several ranges of wooded hills, generally running parallel to the shores, which are separated from each other by low level grounds, a great portion of which is subject to inundation; but the soil is excellent, and in many places these flats are dry and available for pasturage or agriculture.

The south-eastern portion of South Australia will certainly become a very valuable country. A line drawn from Rivoli Bay nearly due east to the boundary-line divides it from the desert, which is farther north. Near the sea-shore low narrow ranges of wooded hills alternate with grassy plains and a few swamps. In approaching the higher country plains occur, which are of considerable extent, and covered with luxuriant forests, consisting of trees of great size, blackwood, gum, stringy bark, and mahogany. They extend to the foot of Burr Range, a mountain-tract divided into several ridges, which cover a great extent of surface, and are pretty well wooded. The highest point of this range rises to about 1000 feet above the sea. Between this range and the isolated mountains called Mount Gambier and Mount Schank lies a well-wooded tract with large timber-trees, and an excellent soil. The two last-mentioned summits are of volcanic origin. Three distinct craters are visible on Mount Schank, which is between 800 and 900 feet above the sea. Mount Gambier is higher, and has also a crater on its summit. The soil of this region is of the richest description, being mostly a black brown loam, and the vegetation luxuriant. The value of this country for settlers is still increased by having a good and safe harbour in Rivoli Bay.

Kangaroo Island, which lies before the entrance of the Gulf of St. Vincent, is about 80 miles long from east to west, and on an average about 20 miles wide, which gives an area of 1600 square miles. It rises gradually from the sea, and does not attain a great elevation, the interior being occupied by extensive plains. Close to the shore, within a quarter to half a mile from the sea, it is covered with a thick forest, but when this belt of wood is passed, an open country presents itself, which is covered with grass, and there are often hundreds of acres without a tree. In these plains are numerous ponds, and, near the shore, lagoons which are generally filled with fresh water, but some are salt. On the shores of Nepean Bay is a salt lagoon, on the banks of which large masses of crystallized salt are found. It would seem that nearly the whole of the island is available for agriculture or pasturage. On its north-eastern shore is Nepean Bay, where vessels may ride in perfect security during the western gales.

It is true that by far the greater part of the territory of South Australia will never produce any food for man or animals, but the rapid survey of the country shows that there are also several very good tracts of land. It is probable that one-twentieth of the whole will either be brought under the plough or used as pasture-ground for sheep and cattle. This would give an area of 16,000 square miles of available land.

As this country has only lately been settled, we are but imperfectly acquainted with its climate. No series of meteorological observations has reached us, and we must content ourselves with some general observations. The seasons are divided into dry and wet. The dry season begins at the end of August and continues to the end of March. In December and January, corresponding to our June and July, the heat is very great, and the ground so arid, that the least breeze raises clouds of dust. During the wet season, from the end of March to August, it rains frequently and sometimes very heavily. The long droughts, with which New South Wales is periodically visited, are not known in South Australia. It appears that the rain diminishes greatly as we proceed inland, and it is probable that it ceases entirely before it reaches the northern boundary-line of the colony. During the rains the wind blows from the west or south-west, and frequently in hard gales. In the dry season northern and north-eastern winds prevail. Frost has never been experienced, nor any fall of snow.

During the rainy or cold season a great number of whales visit the coasts of the colony, and are chased by British, American, and French vessels. The black whale is most frequent, but the sperm-whale also occurs. The native animals are the kangaroo, the wallobi, a smaller species of the same genus, the opossum, and the dingo, or Australian dog. Birds are numerous, and distinguished by their beauty. The emu, several kinds of parrokets, of cockatoos, partridges, and quails are common. The most common sea-fowl are pelicans, black swans, wild ducks, divers, waders, cormorants, and Cape-pigeons (Procellaria Capensis). Several kinds of fish are taken in the sea, as salmons, snappers, porpoises, and large and small sharks. There are several kinds of snakes and lizards; among the latter the iguana, which is eaten; among shell-fish, oysters and periwinkles are mentioned as plentiful.

The colonists have imported horses from Tasmania and New South Wales, and ponies from the island of Timor in the Indian Archipelago; cattle and sheep from the Cape, Tasmania, and New South Wales; hogs from New Zealand. Fowls are common, both the common species and the larger one from the countries of the Malays. The kangaroo-dog is a cross-breed of the bull-dog and greyhound, and used for chasing the emus and kangaroos; such a dog is often sold for 25 or 30 pounds sterling.

The woods of South Australia contain many large trees, but the timber is not much valued; and this article is imported from New South Wales and New Zealand. All kinds of grain have been introduced, and appear to succeed pretty well: maize grows well, and also potatoes; melons, water-melons, pumpkins, and cucumbers attain an uncommon size, and also cauliflowers. Onions are cultivated to a great extent in Kangaroo Island. Our fruit-trees do not appear to grow well, except the peach, and there is a small kind of lemon; for apples, pears, &c. the climate appears to be too hot and dry. The vine has not succeeded, but probably it will. No edible fruit is indigenous, except some berries, which are eaten by the natives.

It appears that South Australia is rich in minerals. Iron-ore has been found in many places, especially in the deserts; but it will probably never be turned to account, for want of fuel in these parts. Copper-ore has also been found at some places in the vicinity of the settlements; and a quantity has already been shipped for England. It is stated that this year (1846) gold has been discovered. Salt occurs in many places. There are numerous deposits of salt in the deserts; and there is also a salt-lagoon on Kangaroo Island, and others on the coast of the colony which lies to the east of Lake Victoria.

The natives of South Australia, like those of New South Wales, belong to that race which is called Negro Australian; but it appears they have not yet attained an equal degree of civilization with the native population of the eastern coast of Australia. This however may partly be the effect of the shorter duration of their communication with Europeans. When their hunger is satisfied, nothing can induce them to work, but when pressed by want of food they are ready to do any kind of labour for the colonist, especially carrying water or wood. It seems therefore that by able management they perhaps could be accustomed to some regular work, especially to guarding herds of cattle or flocks of sheep. Though it appears certain that all the natives of the southern and eastern coast of Australia speak the same language, a marked difference exists in the dialects spoken in different parts. Three such dialects are used within the territories of South Australia: one is spoken by the few isolated families which live in the eastern districts west of 136° E. long.; another by the tribes inhabiting the vicinity of Adelaide; and the third by those who wander about on the banks of the Murray River. A native of King George's Sound, in West Australia, who accompanied Mr. Eyre in his expeditions, did not understand the language spoken by the families on the Australian Bight.

The settlement of Adelaide was founded in 1835; but six or nine months previously some families had settled on

Nepean Bay, on Kangaroo Island, at a place called Kingscote. At first the emigration to this colony was very great: and in 1840 the number of the white population was estimated at 15,000. In 1838 the colonies of Port Phillip and New Zealand were founded; which offered greater advantages to the settler; and the current of emigration ran to these countries; and since 1840, very few have gone to South Australia. The white population at present probably does not exceed 20,000 individuals. The greater number of them are settled in the fertile country in the vicinity of Adelaide. A settlement exists at a place a little above the influx of Murray River into Lake Victoria, called Wellington. The settlement at Kingscote has been mentioned before. There is also another on Spencer's Gulf, at Port Lincoln.

(Flinders' *Voyage to Terra Australis;* Sturt's *Two Expeditions into the Interior of Southern Australia;* Eyre's *Expeditions of Discovery in South Australia,* in *London Geogr. Journal,* 1843, Frome's *Report on the Country to the Eastward of Flinders' Range,* in *London Geogr. Journal,* 1844; Burr's *Account of Governor Grey's Exploratory Journey along the South-Eastern Sea-board of South Australia,* in *London Geogr. Journal,* 1845; Kœler's *Notizen über die Eingebornen an der Ostküste des St. Vincent's Golfs in Süd Australien,* in *Berliner Geographische Monatsberichte,* 1842 and 1844.

SOUTH SEA BUBBLE. The original conception and establishment of the South Sea Company was a project of Queen Anne's minister, Harley (afterwards Earl of Oxford), soon after he came into power in August, 1710. The object was to provide the means for paying interest at 6 per cent. upon, and eventually discharging, certain arrears which had accumulated upon the navy, victualling, transport, ordnance, and other departments, amounting, together with a new loan of 500,000*l.*, to 9,471,325*l.* in all. For this purpose the crown was authorized by stat. 9 Ann. c. 21, entitled 'An Act for making good deficiencies and satisfying the public debts, and for erecting a corporation to carry on a trade to the South Seas, and for the encouragement of the Fishery,' &c., to incorporate all the persons interested in any of the bills, tickets, debentures, or certificates, or other public debts, deficiencies, or sums of money, intended to be provided for by the act, into a company; whose stock should consist of the said debts, or claims upon the public; and in which should be vested, from the 1st of August, 1711, for ever, 'the sole trade and traffic into, unto, and from all the kingdoms, lands, countries, territories, islands, cities, towns, ports, havens, creeks, and places of America, on the east side thereof, from the river of Aranoco to the southernmost part of the Terra del Fuego; and, on the west side thereof, from the said southernmost part of the said Terra del Fuego, through the South Seas, to the northernmost part of America; and into, unto, and from all countries, islands, and places, within the said limits, which are reputed to belong to the crown of Spain, or which shall hereafter be found out or discovered within the said limits, not exceeding 300 leagues from the continent of America, between the southernmost part of Terra del Fuego and the northernmost part of America, on the west side thereof; except the kingdom of Brazil, and such other places on the said east side of America as are now in the actual possession of the crown of Portugal, and the country of Surinam in the possession of the States-General of the United Provinces.' On the 8th of September, 1711, a charter was granted establishing the company by the name of 'The Governor and Company of the Merchants of Great Britain trading to the South Seas and other parts of America.'

The establishment of the South Sea Company went for a time under the name of the Earl of Oxford's masterpiece. It was anticipated that it would pour a continued stream of gold and silver into England from the mines of Mexico and Potosi. In point of fact however, the trade which the Company carried on was from the first extremely insignificant. 'By the peace of Utrecht,' says Coxe (*Memoirs of Sir Robert Walpole,* i. 127), 'Spain and the Indies being confirmed to Philip V., that monarch was too jealous to admit the English to a free trade in the South Sea; and, instead of the advantageous commerce which Oxford had held forth, the Company obtained only the Assiento contract [P. C., ii. 503], or the privilege of supplying the Spanish colonies of America with negroes for thirty years, with the permission of sending to Spanish America an annual ship, limited both as to tonnage and value of cargo, of the profits of which the King of Spain reserved one fourth, and five per cent. on the other three-fourths. But this disappointment was attempted to be counteracted by the declaration made by Oxford, that Spain had permitted two ships, in addition to the annual ship, to carry merchandise during the first year to the northern coasts of Spanish America, and a pompous nomination of the several ports where the Company had leave to trade and settle factories. But the grand benefits of this commerce were never realized. The first voyage of the annual ship was not made till 1717, and in the following year the trade was suppressed by the rupture with Spain. Their effects, factories, and servants were seized and detained, notwithstanding the agreement in the Assiento which allowed, in case of a rupture, eighteen months for the removal of their effects.'

This was the state of its affairs when, in the end of the year 1719 or beginning of 1720, the ministry of Sunderland and Stanhope secretly entered into arrangements with the Company for having the whole amount of the National Debt, amounting to above 30,000,000*l.*, transferred into its stock upon certain conditions. In conformity with what had been agreed upon between the parties, the Directors of the Company, on the 22nd of January, 1720, sent in their proposal to the House of Commons, engaging to pay 3,500,000*l.* for the liberty of increasing their capital by being thus constituted the sole national creditor. The ministers however were disappointed in their expectation of the scheme being at once assented to by the House. It was suggested that other proposals should be invited; and Walpole, who had already great weight in the House, having supported that suggestion, it was agreed after some debate that the matter should be thrown open to competition. In consequence, on the 27th the Bank sent in a proposal in which they offered to pay 5,500,000*l.* Upon this, at a General Court of the members of the South Sea Company, the Directors were instructed to obtain the preference *cost what it would;* and on the 1st of February they sent in a second proposal to the House of Commons offering to pay 7,567,500*l.* The Bank also sent in a second proposal on the same day, which was supported by Walpole; but on the representations of Aislabie, the chancellor of the exchequer, it was resolved that the proposal of the South Sea Company should be accepted. A bill to that effect was forthwith brought in, which, after several debates, passed the Commons on the 2nd of April, by a majority of 172 to 55, and the third reading of which was carried on the 7th in the Lords without a division. The same day it received the royal assent, and became the statute 6 Geo. I. c. 4.

The imaginary advantages accruing to the Company from this arrangement instantly produced a great rise in the market value of its stock. The profits of the scheme are enumerated by Coxe as being expected to arise from—'1, The exclusive advantages of the trade, which, although precarious, and depending on a peace with Spain, were stated at no less than 200,000*l.* a year; 2, The allowance for the charge of management, which was to be proportioned to the augmentation of their stock; 3, The difference of receiving five per cent. for the money expended in purchasing the public debts, when the usual interest was only four per cent.; 4, The great addition to their wealth from the constant rise in the price of the stock in consequence of the artifices used to enhance its value; on which the whole success of the scheme depended.' 'The promoters of the scheme,' adds Coxe, 'highly exaggerated the profits; rumours were at the same time spread that the Company, by monopolizing the fund of the whole national debt, would reduce Government to the necessity of applying to them for loans, which would be advanced on their own terms; and it was even insinuated that the proprietors would obtain, by the weight of their wealth, a majority in the House of Commons, and make and depose ministers.' The consequence was that the price of the stock, which at Christmas, 1719, had stood at 126, had risen by the 14th of April to 325, and by the end of August to above 1000. Meanwhile however a vast multitude of other projects had been started by the rage and fury of speculation which this rapid ascent of the Company's stock had excited; and all or almost all of these also, incredibly visionary and absurd as many of them were, were attended with a measure of temporary success. In Anderson's History of Commerce a list of nearly two hundred of these minor bubbles is given. About Midsummer it was calculated that the value of the stock of all the different companies and projects at the current prices exceeded five hundred millions sterling. Now however the South Sea Company, envious in the midst of its own prosperity of that of its rivals, procured writs of *scire facias* to be directed against certain of the other companies. The effect was instantaneous and universal. Alarmed by the apprehension of prosecutions by the law officers of the crown, the subscribers to the projects that had been specially attacked hurried to sell their shares for whatever they would bring, more eagerly than they had done to purchase them; the panic quickly spread through the whole extent of the share-market: the proprietors of stock, even in the legally incorporated companies, sobered by the general aspect of things around them, began to perceive that their stock too must have its point of highest elevation, from which it would as inevitably descend as would after a certain time a stone thrown into the air; and under this impression South Sea stock itself soon began to tumble down. By the 22nd of August it had fallen to 820; by the 30th it was at 780; by the 8th of September at 680; by the 20th at 410; by the 29th at 175. The bubble had burst.

It would require a great deal of space to tell the rest of the story of this remarkable financial infatuation and fever. A searching parliamentary investigation into the proceedings of the directors of the company followed in the next session, which produced many most scandalous disclosures, some of them affecting the most eminent persons in the country. The directors were all mulcted of the greater part of their fortunes; Aislabie, the chancellor of the exchequer, was expelled from the House of Commons; Craggs, the secretary of state, would probably have shared the same fate if he had not died of small-pox in the course of the proceedings, his son being carried off by the same disease about the same time; Sunderland was with difficulty saved by the influence of Walpole; Stanhope, who was not supposed to be implicated in the fraud and bribery, burst a blood-vessel while speaking upon the subject in the House of Lords, and expired the next day. Not only the royal mistresses, but the Prince of Wales, and even the king himself, were believed upon strong grounds to have profited largely by stock which they were favourably placed for selling at the most advantageous moment, and all or the greater part of which they had obtained without purchase.

The storm thus raised was weathered and allayed, and public credit restored, principally by the great financial talent of Walpole, who assumed the direction of affairs as first lord of the treasury and chancellor of the exchequer in February, 1721, and kept his post at the head of the government for the next twenty-one years. Even the affairs of the South Sea Company were by the measures which he adopted restored to some degree of real prosperity for a time; but its commercial operations never became of any consequence; and the members became at last mere government annuitants, till, all their claims having been satisfied, the company was finally dissolved only a few years ago.

It is not to be forgotten that the South Sea Bubble in England was coincident in point of time with the later stage of the famous Mississippi scheme of Law in France; but what real connection there may have been, if any, between the one and the other, may admit of question.

(Postlethwayt's *Historical State of the South Sea Company*; Anderson's *Chronological Deduction of Commerce*; Macpherson's *Annals of Commerce*; Craik's *History of British Commerce*; Coxe's *Memoirs of Walpole*; Malcolm's *History of London*; *Parliamentary History*; *Statutes at Large*, &c.)

SOUTHEY, ROBERT, LL.D. The little that there is to be told of the life of Southey beyond the account of his literary performances may most conveniently be given by itself in the first instance. He was one of several sons of a linen-draper in Wine-street, Bristol, where he was born, as the date is commonly given, on the 12th of August, 1774, but, according to the inscription on his tombstone, on the 4th of October in that year. His first teachers were, a Baptist clergyman named Foote, said to have been a man of no ordinary ability, to whose school he was sent when he was six years old; then a Mr. Flower, at Corston, near Newton St. Loe; then a Mr. William Williams, a Welshman (something dropped into his mind by whom, possibly, may have long after suggested the subject of his *Madoc*). At last, in 1788, he was placed at Westminster school, the expense of his education from this time, it is intimated, being borne by Mr. Hill, a brother of his mother, who in other accounts however is called a Rev. Dr. Herbert. His father, we suppose, was now dead. In 1792, leaving a distinguished reputation at Westminster, where however he had incurred censure for taking part in a rebellion against the head master, Dr. Vincent, in 1790, he was sent to Baliol College, Oxford, his uncle's intention being that he should enter the church. But it was almost unavoidable that his enthusiastic temperament should precipitate him into the so-called liberal opinions both in religion and politics which the French Revolution, yet in its morning of promise, had spread both in France and in this country; he went to the extreme of free-thinking on both subjects; and in 1794 he left Oxford. He and a fellow-townsman, a young Quaker named Robert Lovell, now, in this same year, published a volume of poems, under the names of Bion and Moschus. It was soon after this too that Southey became acquainted with Coleridge. Lovell had married a Miss Fricker, of Bristol; and in November, 1795, Southey and Coleridge on the same day united themselves to her two sisters. The three had formed a plan to go out together to the wilds of North America, and there to set up what they called a Pantisocracy, in which they were to live without either kings or priests, or any of the other evils of old world society, and to renew the patriarchal or the golden age. But this fancy was never even attempted to be carried into effect. Southey soon after set out for Portugal with his uncle, the Rev. Mr. Hill (or Herbert), who had been appointed chaplain to the English factory at Lisbon. He returned to Bristol in the summer of 1797; in 1798 he removed to London, and entered himself a student of Gray's Inn; but he never prosecuted the study of the law; and all that is further related of him for some years is, that he was again in the Peninsula in the years 1800 and 1801, and that on his return home in the latter year he went over to Ireland as private secretary to the Right Hon. Isaac Corry, Chancellor of the Irish Exchequer (other accounts say to Mr. Foster, that is, we suppose, the Right Hon. John Foster, who however did not become Chancellor of the Exchequer till 1804). He is stated to have retired from office with his patron, and then, returning to England, to have established himself at Greta, near Keswick, in Cumberland, where he spent the rest of his days. As Mr. Corry ceased to be Chancellor of the Irish Exchequer in August, 1804, this account agrees very well with the inscription on the monumental tablet commemorative of Southey in the church of Crosthwaite, which records that he had resided nearly forty years at Greta Hall in that parish. Wordsworth had, we believe, taken up his residence in this lake country before Southey; and they were soon after joined by Coleridge, who however left them in 1810, leaving Mrs. Coleridge with Southey, whose hospitable roof also sheltered his wife's other sister, Mrs. Lovell, now a widow.

Long before this time Southey had abandoned his democratic and half-deistical creed, and taken up with one diametrically opposite. For all the rest of his life, as is well known, he was an ardent, uncompromising, and somewhat intolerant monarchist and churchman, promulgating and maintaining doctrines, both ecclesiastical and political, which were in some respects even something beyond conservative.

In November 1813, on the death of Mr. Pye, Southey was appointed Poet Laureate; and in 1821 he received the degree of LL.D. from the University of Oxford. In 1835 a pension of 300*l.* a-year was bestowed upon him by the government of Sir Robert Peel. It is understood that he had before this been offered a baronetcy, and that he had also more than once declined being brought into parliament. Having lost his first wife, he contracted a second marriage on the 4th of June, 1839, with Caroline-Anne, daughter of the late Charles Bowles, Esq., of Buckland, North Lymington, a lady long well known in the literary world. But soon after this his hitherto incessantly active and probably overtasked mental faculties began to give way, and he sunk into a condition which gradually became one of deeper unconsciousness till death removed him, on the 21st of March, 1843. He left a son and three daughters, with property amounting to about 12,000*l.* in money, besides a valuable library, which was afterwards disposed of by auction in London.

Southey's publications are very numerous. The following list of those of them that appeared separately is probably not quite complete, although we have taken great pains to make it so; but it is, we believe, much the fullest that has been drawn up:—

In 1794, Poems, in conjunction with his friend Lovell (as stated above on the authority of the *Gentleman's Magazine*), under the names of Bion and Moschus.

In 1795 (according to Lowndes's *Bibliographer's Manual*), Poems, containing the Retrospect, Odes, Elegies, Sonnets, &c., by Robert Lovell, and Robert Southey, of Baliol College, Oxford, 2 vols. 8vo.

In 1796, Joan of Arc, an Epic Poem, 4to.

In 1797, Poems, 8vo.—Letters written during a short residence in Spain and Portugal, 8vo.

In 1799 and 1800, The Annual Anthology (a miscellaneous collection of poetry, of which he was the editor and principal writer), 2 vols. 8vo.

In 1802, Thalaba the Destroyer, a Metrical Romance, 2 vols. 12mo.

In 1803, Amadis de Gaul (a prose translation from the Spanish version by Garcia Ordoñez de Montalvo of that romance, which Southey contends to have been originally written in Portuguese by Vasco de Lobeira), 4 vols. 12mo.—The works of Thomas Chatterton (in conjunction with Mr. Amos Cottle, the Life, originally printed in the second edition of the Biographia Britannica, being by Dr. G. Gregory), 3 vols. 8vo.

In 1804, Metrical Tales, and other Poems, 8vo.

In 1805, Madoc, a Poem, in Two Parts, 4to.

In 1807, Specimens of the Later English Poets, with Preliminary Notices, 3 vols. 8vo.—Palmerin of England, translated from the Portuguese, 4 vols. 8vo.—Letters from England, by Don Manuel Velasquez Espriella (pseudonymous), 3 vols. 12mo.—Remains of Henry Kirke White, with an account of his Life, 2 vols. 8vo.

In 1808, The Chronicle of the Cid, Rodrigo Diaz de Bivar, from the Spanish, 4to.

In 1810, The Curse of Kehama, a poem, 4to.—The History of Brazil, vol. i. 4to.

In 1812, Omniana, 2 vols. 8vo.

In 1813, Live of Nelson, 2 vols. 8vo.

In 1814, Carmen Triumphale for the commencement of the year 1814, 4to.—Odes to the Prince Regent, the Emperor of Russia, and the King of Prussia, 4to.—Roderick, the Last of the Goths (a poem), 4to.

In 1816, The Lay of the Laureate; Carmen Nüptiale (a poem on the marriage of the Princess Charlotte), 12mo.—A Poet's Pilgrimage to Waterloo, 8vo.

In 1817, Wat Tyler, a Dramatic Poem (written, in a vein of ultra-Jacobinism, in 1794, and now surreptitiously published), 12mo.—A Letter to William Smith, Esq., M.P. (on the subject of the preceding publication), 8vo.—Morte Arthur (a reprint of Sir Thomas Malory's prose romance), with Introduction and Notes, 2 vols. 4to.—History of Brazil, vol. ii. 4to.

In 1819, History of Brazil, vol. iii. 4to.

In 1820, Life of John Wesley, 2 vols. 8vo.

In 1821, A Vision of Judgment (a poem in English hexameters), 4to.—The Expedition of Orsua and the Crimes of Aguirre (partially printed in 1812, in the Second Part of the Third Volume of the *Edinburgh Annual Register*, for 1810), 12mo.

In 1822, Letter to the Editor of the *Courier* Newspaper, dated Keswick, January 5th, and published in the *Courier* of January 11th (in reply to a note appended by Lord Byron to his tragedy of the *Two Foscari*).—Remains of Henry Kirke White, vol. iii. 8vo.—History of the Peninsular War, vol. i. 4to. (an expansion of what had been originally published in the *Edinburgh Annual Register*, 1810, &c.).

In 1824, The Book of the Church, 2 vols. 8vo.

In 1825, A Tale of Paraguay (a poem), 12mo.

In 1826, Vindiciae Ecclesiae Anglicanae, &c., 8vo.

In 1827, History of the Peninsular War, vol. ii. 4to.

In 1829, Sir Thomas More; or, Colloquies on the Progress and Prospects of Society, &c., 2 vols. 8vo.—All for Love, or The Sinner well Saved; and The Pilgrim to Compostella, or A Legend of a Cock and a Hen, 12mo.

In 1831, Attempts in Verse by John Jones; with Introductory Essay on the Lives and Works of our Uneducated Poets, 8vo.—Selections from the Poems of Robert Southey, Esq., LL.D., 12mo.

In 1832, Essays, Moral and Political, 2 vols. 8vo.—Selections from Southey, Prose, 12mo.—History of the Peninsular War, vol. iii. 4to.

In 1833, Naval History of England, vol. i. 12mo. (in Lardner's *Cabinet Cyclopaedia*); completed in 5 vols. in 1840.

In 1834, Dr. Watts's Poems, with a Life of the Author (in Cattermole's *Sacred Classics*), 12mo.—The Doctor (anonymous, and never acknowledged, but believed to be by Southey), vols. i. and ii. 8vo.

In 1835, The Doctor, vol. iii., 8vo.—The Works of William Cowper, with a Life of the Author, vol. i. 12mo.; completed, in 15 vols., in 1837 and 1838.

In 1837, The Poetical Works of Robert Southey, collected by himself, 10 vols. 12mo.—The Doctor, vols. iv. and v. 8vo.

Life of the Duke of Wellington, post 4to. (according to Lowndes, who however gives no date).

To these works, making in all above a hundred volumes of various sizes, are to be added numerous papers upon history, biography, politics, morals, and general literature, published in the Quarterly Review, to which he was a constant contributor from its establishment in 1809, till head and hand would work no longer. He also wrote for some years the historical portion of the 'Edinburgh Annual Register,' and contributed other matter to that work, which began to be published in 1810, and was discontinued in 1824. He was besides one of the most regular and voluminous of letter-writers; and large collections of his letters are understood to be in existence, which it is to be hoped will, ere long, be given to the world. Some have already appeared in Robberds's 'Memoirs of the Life and Writings of William Taylor, of Norwich,' 2 vols. 8vo., 1843.

As a poet, Southey cannot be placed in the first rank even of the poets of his own time. Wordsworth and Coleridge, Shelley and Keats, Byron and Scott, Moore and Crabbe and Campbell, whatever differences of opinion there may be as to their relative merits or their positions in reference to one another, will be generally admitted to have each and all evinced more or less of a *mens divinior* which was wanting in him. The light which was original and self-sustained in them, seemed, even when it shone the strongest, to be only reflected light in him. In mere fertility he was equal to any of them. But his mind, although a teeming, was not an inventive or creative one. It returned manifold the seed deposited in it, but communicated to it comparatively little of any new nature or quality. His imagination might even be said to be both opulent and gorgeous; still there was wanting the true spirit of life, that which distinguishes a real thing from a painted show. No natural human voice coming from the poet himself animated his verse; but rather an artificial sound, as from a flute or an organ. Such poetry may be both beautiful and majestic; but it fails permanently to interest, and will not live. For there is nothing so alien from and so fatal to poetry as any admixture of the mechanical. It acts like a dead substance imbedded in a living body. Witness such an instance as that of Darwin. There is much rhetorical splendour however in parts of Southey's poetry; especially in his 'Curse of Kehama,' and in his 'Roderick.' And some of his ballads and other shorter pieces, flowing on as they do in the easiest and purest English, are very happy.

In his prose writings the great merits of his style show to all advantage. It is essentially a prose style, and one unsuited to poetry, at least to poetry of any high order, by some of the very qualities that constitute its characteristic excellence. Its facility and fluency, running into some degree of diffuseness; its limpid perspicuity; its equability and smoothness; even its very purity, are unsuited for the passion, the rapidity, the boldness, the novel combinations of poetry. Both in its merits and in its defects Southey's style may be compared to glass, which perfectly transmits the light, but refuses to conduct the lightning. It does not often rise to any splendour of eloquence; it has little or no brilliancy of any kind; but whether for narrative, for exposition, or for animated argumentation, it was perhaps the most effective English style of the time. It combines in a remarkable degree a somewhat lofty dignity with ease and idiomatic vigour, and is equally pliable to the expression of sprightly and playful as of severe and indignant sentiment.

He certainly was not nearly so great a thinker as he was a writer. He had no subtlety of intellect, and he took rather a passionate than a reasoning view of any subject that greatly interested him. Much of his political and economical speculation is now probably regarded as altogether wrong-headed, even by the most ardent of his admirers. But there can be no question that he was thoroughly honest and in earnest in whatever opinions he at any time professed. He was, by the universal testimony of those to whom he was best known, of a sincere, generous, high-minded nature, and in all the relations of private life a man worthy of the highest estimation.

(Memoir in *Gent. Mag.* for June, 1843; *Dictionary of Living Authors*; Chambers's *Cyclopædia of English Literature*; *Literary Gazette*; *Athenæum*; and the works mentioned in the article.)

SOWENS. [AVENA, P. C. S.]

SPACE, POWER OF PENETRATING. [TELESCOPE, P. C., p. 163.]

SPALDING, SAMUEL, was born in London on the 30th of May, 1807. He furnishes an example of success attendant on the persevering pursuit of knowledge, in the absence of any remarkable ability or aptness for its attainment. According to the testimony of his friends, it was only by means of great labour that he could perform his daily tasks while at school; though his steady application, resulting very much even at this early period of his life from a sense of duty, the effect of moral and religious training, enabled him to acquit himself with great respectability; and the moderate estimate he always entertained of his own powers appears to have done much towards forming those habits of unremitting application which constituted one of the strongest features of his intellectual character. At a suitable age he was placed in a mercantile house; but his mind soon became too deeply interested in the study of theology to allow him to entertain the idea of spending his life in a secular profession. He now examined the evidences of Christianity with the most assiduous care, and the work of Dr. Chalmers on this subject, together with the splendid discourses of the same writer on the relation of revelation to the discoveries of modern astronomy, inspired his mind with such elevated views of the grandeur of Christianity and the expansive benevolence of its design, that he resolved to devote himself to the pastoral office in the religious connexion to which he belonged, that of the Congregational Dissenters. He consequently applied himself to study with fresh ardour, though he had to contend with a naturally feeble constitution, in which there is little doubt that the seeds of organic disease early existed. 'The chief feature in his moral character,' writes one of his near relations, 'was benevolence. In him it extended from the worm, which he would stoop to pick up lest it should be trodden on, to the highest order of beings. Whatever was capable of suffering or enjoyment excited his sympathy.'

With a view to promote his object of qualifying himself for the ministry, Spalding devoted his time, for two years, to the study of the Greek and Latin languages, in private; and afterwards entered as a student at University College, London, where he made himself an exact Greek scholar. During his academical course here he obtained, in addition to high certificates of honour in other classes, five first prizes in the classes of Hebrew, French, Natural Philosophy, and the Philosophy of the Mind and Logic. Of the last subject his pursuit was ardent, his diligence and ability, as manifested in his essays and examinations, being such as to mark him out as a student of unusual merit. In the year 1839, symptoms of incipient pulmonary disease induced him to try the effect of a warmer climate, and he spent the winter in the South of France. On his return he underwent tho examination for tho Master's degree in the University of London, in May, 1840. In the Transactions of the University, his name is mentioned with honour for his examinations in Animal and Vegetable Physiology, and in the Hebrew and Greek originals, and the History of the Holy Scriptures. He is also recorded as having 'passed a distinguished examination' in Logic, the Philosophy of the Mind, and Moral Philosophy. In consequence of this success he was urged by the examiners to write on some of these subjects; and this recommendation encouraged him to compose his work, entitled 'The Philosophy of Christian Morals.' In the autumn of 1840 Spalding went to Italy, where he remained nearly two years. It was during this period that the above-mentioned work was written, the subject of which however had occupied his mind for many years. On his return to England, in 1842, he purposed superintending the publication of his Treatise, but was prevented by the progress of his disease; and as a last resource he tried a sea-voyage, and went to the Cape of Good Hope, where he died on the 14th of January, 1843, about three weeks after his arrival. His work was published during the same year, by his friends, in one volume, octavo. We have not space for any criticism of Spalding's theory of morals: we must restrict ourselves to a bare summary of his principal doctrines. They are as follows:—Our primary notions of virtue and vice are derived from those feelings of moral approbation and disapprobation which we experience in viewing the conduct of others. These notions acquire new force and become more distinct in consequence of the emotions which we experience in the review of our own conduct. The objects of moral obligation are, first, virtue itself; and, secondly, the mode in which virtue ought to be displayed in the outward conduct. The great rule of action is the will of God, either as supernaturally revealed or as inferred from the end and object of the virtuous affections themselves. The notion of moral obligation is an immediate consequence of the testimony of our moral emotions. The great object of moral approbation is the principle of benevolence, chosen as the highest and most valuable principle in our nature. All other virtues are necessarily contained in this principle of benevolence; apart from which even sympathy itself is merely pathological, not moral. The moral character of volition depends entirely on the object of choice. In short, Spalding's theory may be characterized by its referring conscience ultimately to emotion, not to moral judgment; by its asserting the necessity of there being other moral agents in existence besides ourselves, before we can have the notion of virtue or of vice, and by its reduction of all the forms of virtue to the one principle of benevolence. Without pronouncing either one way or the other on the merits of this theory, we will only add that the work possesses considerable originality, and abounds with passages of genuine power and beauty; and that it is characterised throughout by an elevation of thought and sentiment which distinguish it even among books on ethical subjects. The author writes with the glowing warmth of one whose heart is in his work, sometimes with an intense ardour of feeling. Tho book is therefore of a popular cast, though it often discusses principles ably and profoundly. It exhibits also in a striking manner the real harmony subsisting between the Christian precepts and the genuine dictates of the moral faculty, notwithstanding apparent or supposed discordances. It is wholly free from all sectarian and party feeling, and exhibits very advantageously the benevolence which was a distinguishing characteristic of the author's mind.

SPARTI'NA, a genus of grasses belonging to the tribe Chlorideæ. It has upright 1-flowered spikes in racemes, the glumes unequal, the upper long and acuminate; the paleæ unequal, the outer boat-shaped, compressed, retuse; the styles elongated, united half-way up; the stigmas filiform, protruding at the summit of the floret. There are two British species, the *S. stricta* and *S. alterniflora*. The former grows in muddy salt-marshes, the latter has been found only on the mud-flats of the river Itchin at Southampton.

(Babington, *Manual of British Botany*.)

SPATHO'DEA (from σπάθη, a spathe, in reference to the form of the calyx), a genus of plants belonging to the natural order Bignoniaceæ. The calyx is spathaceous, cleft and toothed or entire on the other side. The corolla is funnel-shaped, with a 5-lobed rather unequal limb. The 4 stamens are divided into 2 long and 2 short, with tho addition of a fifth sterile filament. The capsule silique-formed, falcate, falsely 4-celled, and corky. The seeds are furnished with membranous wings. The species aro erect shrubs or trees, rarely climbing shrubs. The flowers somewhat panicled, orange-coloured, yellow, or purple.

S. Rheedii has downy impari-pinnate leaves, roundish downy leaflets, terminal erect racemes, and a much-curved slender corolla. The shoots are covered with a whitish down. The racemes the length of the leaves. The flowers white and pretty large. The limb spreading. The fruit about a foot long, pendulous, twisted in various forms.

S. Roxburghii has its leaves three in a whorl or scattered impari-pinnate. The leaflets from 4 to 5, in pairs, serrated and smooth. Tho panicles erect, terminal, dense, downy, and many-flowered. The fruit narrow and 4-celled. The calyx generally 2-parted, with the upper lip 2-cleft and downy. It is native of the Circars. The branches are very spreading. The back grey, with a few scabrous spots. The flowers large, rose-coloured, and delightfully fragrant. The limb of the corolla nearly equal, and elegantly waved at the edges. This species is remarkable on account of its serrated leaves. The wood is employed for many purposes by the natives.

S. longiflora is an arboreous plant, and has large spreading terminal panicles, a bilabiate corolla, long pendulous slender sub-cylindrical follicles, with sharp edges and variously curved. The flowers are large, yellow, and very fragrant. The follicles very long. The wood of this tree is high-coloured, hard, durable, and of much use amongst the inhabitants of the hills about the coasts of Coromandel and Malabar, where it is plentiful.

The species are splendid plants when in blossom. A mixture of loam and peat suits them best, and cuttings will strike readily in heat under a glass.

(Don, *Gardener's Dictionary*.)

SPATULARIA, a genus of fishes of the Sturgeon tribe, remarkable for the form of their snouts, which are enormously prolonged and leaf-like in form. The paddle-fish of the Mississippi is the type.

SPEAKER. [PARLIAMENT, P. C.]

SPECIAL OCCUPANCY. [OCCUPANCY, P. C.]

SPECIALTY, SPECIALTY DEBT, or debt by special contract, is a debt which becomes due or is acknowledged to be due by an instrument under seal. [DEED, p. 730.]

The nature of a debt by simple contract is explained under SIMPLE CONTRACT.

Blackstone (ii. 464) considers a debt of record, that is, a debt which appears to be due by the judgment of a court of record, as a 'contract of the highest nature, being established by the sentence of a court of judicature.' This is, however, an erroneous view of the matter. It is simply a rule of law that a debt for which the judgment of a court of record has been obtained has a priority over other debts.

SPECIFIC HEAT is the quantity of caloric which a substance of any kind absorbs, or which it gives out, when it undergoes a change of temperature; being determined, in a substance of any kind, with relation to the quantity which a substance of another kind, as water, absorbs or gives out in undergoing a like change of temperature. This designation, which is said to have been first used by the Swedish philosopher Wilcke, has nearly replaced the less proper one of *Capacity of Heat* which was given by Dr. Black, who first remarked that in order to bring different substances to equal temperatures different quantities of heat must be applied.

Dr. Black conceived that heat exists in all substances in two different states: one state he supposed to be that in which the heat is so united to the substance that it is insensible or inappreciable; and the other to be that in which the heat is sensible, or is capable of being made evident to the senses, and of being measured by the thermometer: the former is that which is now designated specific heat. The term capacity for heat is considered as objectionable, because it seems to imply that the heat existing in any substance is contained in the pores of the substance; and, if it were so, it should follow that the capacities of substances for heat are directly proportional to the porosities of the substances or inversely proportional to their densities, which is far from being the fact, though it is well known that the more dense substances contain smaller quantities of heat than those which are less so.

In determining the relative specific heat of substances, either the substances when heated to a certain temperature are plunged in cold water and the augmentations which they occasion in the temperature of the water are observed, or the instrument called a Calorimeter [HEAT, P.C., p. 89] is employed. With this instrument, since the ice surrounding the heated substances which are separately introduced in it continues at a temperature expressed by 32° (Fahr.) till it is entirely melted, it is evident that the quantities of water (at 32°) arising from the dissolution of part of the ice by the different substances, whose temperatures had been previously raised to equal heights, must be proportional to the caloric lost by those substances in the process of cooling; and thus the specific heats of the substances are determined. When, as is usual, heated water is one of the substances introduced in the calorimeter, the ratio between the specific heat of water and that of the substance may be obtained.

If the body whose specific heat is to be determined is a solid, it is first heated to any convenient number of degrees of temperature, suppose 212° Fahr.; it is then placed in the calorimeter, and allowed to remain there till it is reduced to the temperature of ice (32°): then the quotient arising from the weight of the water obtained from the melting of the ice surrounding the body, divided by the product of 180° (=212° − 32°) multiplied by the weight of the body, will express the required specific heat. The specific heat of water or any other liquid is determined by the calorimeter in a similar manner; the liquid heated to 212°, for example, being contained in a glass vessel, and care being taken to deduct from the total quantity of water produced by the melted ice that part of it which, by experiment, is found to depend on the cooling of the vessel containing the liquid.

The specific heats of solids and liquids are found to be greater at high than at low temperatures; and, from careful experiments made by MM. Dulong and Petit, the specific heats of different solids, that of water at 212° being unity, were found to be as in the following table:—

	(Between 32° and 212° Fahr.)	(Between 32° and 572°)
Platinum	0·0355	0·0355
Silver	0·0557	0·0611
Zinc	0·0927	0·1015
Copper	0·0949	0·1013
Iron	0·1098	0·1218

The difference between the specific heats at different temperatures is ascribed to the dilatations which the substances experience by an increase of heat: every change in the constitution of a substance is accompanied by a change of specific heat; a solid body, for example, has a smaller specific heat than the same substance in a liquid state. Thus the specific heat of water being unity, that of ice is 0·9.

With respect to liquids, Lavoisier and La Place have given a table of their specific heats, of which the following is an extract:—

Mercury	0·029
Sulphuric acid (spec. grav. = 1·87058)	0·334596
A mixture of sulphuric acid and water in the ratio of 4 to 3	0·603162
Nitric acid (spec. grav. = 1·29898)	0·661391
Water	1·0

The specific heats of gases are still subject to much uncertainty, though many attempts have been made by eminent philosophers to determine them. The method employed by MM. Delaroche and Bérard for this purpose was to transmit through the calorimeter a constant current of gas in a serpentine tube, the gas having been heated to the temperature of boiling water: the tube was surrounded by cold water in the instrument; and the gas, parting with its excess of sensible heat above that of the surrounding water, issued from the tube at the temperature of the water, the temperature of the gas at the entrance and exit being ascertained by means of thermometers. The following table contains the results of some of their experiments on different gases, the weights of the quantities of gas being equal and the specific heat of water being unity:—

Carbonic acid gas	0·2210
Oxygen gas	0·2361
Atmospheric air	0·2669
Nitrogen gas	0·2754
Olefiant gas	0·4207
Aqueous vapour	0·8470
Hydrogen gas	3·2936

The specific heats of volumes of the same gas, having equal weights, are found to vary with the density and elasticity of the gas.

SPECKTER, ERWIN, was born in 1806, at Hamburg, where his father, a native of Hanover, was settled as a merchant. During the siege of Hamburg, in the winter of 1813-14, his parents took refuge with their family in the house of the banker Dehn, in Altona, where there was a good collection of pictures, and where Erwin made the acquaintance of the painter Herterich, who was also living in the banker's house, and had a studio there. In this studio, in which he spent nearly all his time, Erwin Speckter acquired his first instruction in art, and his natural taste rapidly developed itself. In 1818 his father and the painter Herterich erected a lithographic press, the first which was established in North Germany, and young Speckter made some attempts in portraits, and in drawings to illustrate the old Reineke Fuchs, or Reynard the Fox.

In 1822 Von Rumohr returned to Hamburg from his second visit to Italy, and, being struck with admiration of the promising talents of Speckter, urged him on in his career, and particularly to study the monuments of art in and about the neighbourhood. This led to an artistic tour which he performed in 1823, with a brother and another artist friend, through Schleswig and the neighbouring country. The chief objects of this journey were the carved altarpiece of Hans Brügman at Schleswig (lithographed by Böhndel) and the picture of Memling at Lübeck, the latter of which Speckter and his brother Otto published in lithography. These early works gave Speckter's mind the peculiar bias which at that time characterised the majority of the younger artists of Germany, and the arrival of Overbeck's picture of Christ's Entry into Jerusalem, for the Marien Kirche of Lübeck, confirmed this tendency, and for a time enlisted Speckter among the young enthusiasts who appear to be devoted to the restoration of the sentimental symmetrical art of the renaissance in Germany, with the addition of academical drawing. Overbeck's picture has been lithographed by Otto Speckter. At this time Speckter's chief labours were indiscriminate studies from nature of every description, and portraits: his first oil-picture was a view of the town-house of Mölln. His adoration of Overbeck's picture seems to have kept him by a species of awe from attempting such high subjects himself; he was also always guided in his studies by Rumohr.

In 1825 he visited Munich, and placed himself under the direction of Cornelius, who expressed great admiration for his ability; and, after the completion of his cartoon of the Resurrection of Lazarus, allotted him one of the vaults or loggie in the corridor of the Pinacothek, which were to be painted in fresco with incidents from the lives of the greatest modern painters. Cornelius selected Fra Giovanni da Fiesole for Speckter, as peculiarly suited to his taste. Speckter, then about twenty-one years of age, received the commission with exultation, but he did not livo to execute it, for the Pinacothek was not ready for the frescoes until many years after this date.

In 1827 Speckter returned to Hamburg, chiefly to be in the vicinity of the above-mentioned work by Overbeck, while he painted his picture of Christ and the Woman of Samaria; but the deep impression made upon him by Overbeck's picture had a very prejudicial effect npon him, through his inordinate striving after abstract ideal representation. His own dissatisfaction with this work may be inferred from his immediate but still gradual change of manner; for in his next work, the Women at the Tomb, there is a far greater attention to dramatic probability, and a more prominent part given to colour. He painted at this time also several beautiful miniatures from sacred subjects. In 1830 he appeared in entirely a new character in his arabesqne and mythologic decorations of the house of the Syndicus Sieveking near Hamburg. In September of this year, after the completion of these decorations, he set out by Berlin and Munich upon his long-intended journey to Italy. The constrained taste which had hitherto possessed him, though it was gradually yielding to his own experience, was finally subjected by the contemplation of the great Italian works in the Museums of Berlin and Dresden, especially those of Fra Fillppo Lippi, Raphael, and the great Venetian masters.

Speckter arrived in Rome in January, 1831, after a short stay at Venice, from which is dated the first of his very interesting series of Letters from Italy, which, by the advice of Rumohr, have been recently published. He remained in Italy, chiefly at Rome and Naples, until the summer of 1834, when he was called to Hamburg to paint in fresco the villa of Dr. Abendroth, then recently constructed by A. de Chateauneuf. In Rome Speckter confined his labours almost exclusively to studies, and these are in the general spirit of Italian art, and quite in a different stylo from his early efforts. The only oil-paintings he painted in Rome were two of Albano Women, in ideal characters, and a large picture of Samson and Dalilah, which was purchased by Rumohr.

In the spring of 1835, though suffering greatly from asthma, Speckter commenced his frescoes; he had in the interim completed three of the principal cartoons: the subjects are from Grecian mythology, and the figures are half the size of life. The three subjects were—1, Minerva receiving the winged Pegasus from the Muses, and the Hippocrene fountain which sprung fom the kick of the horse (M. de Chateauneuf describes the nymphs or goddesses of this piece as the Graces, &c., and terms the spring the Castalian fountain); 2, the Graces, in a grove of laurels, decorate the bow and quiver of Cupid, and offer him a cnp of ambrosial drink; and 3, the Fates, lulled by the lyre of Cupid, have ceased their labours, and recline on cushions; the distance is concealed hy a curtain. The first of these designs, distinguished for the exquisite beauty of its forms, was completed in fresco, and the second was partly executed; the third was not commenced. His weak state forced Speckter to leave his work at the beginning of November, and he died on the 23rd of that month in 1835, deeply lamented by his friends, and by none more than Rumohr, who wrote a short account of the character of his genins, which is inserted in the biographical notice of him which precedes his letters. These letters, published in 1846, under the title of 'Letters of a German Artist from Italy' ('Briefe eines Deutschen Künstlers aus Italien,' 2 vols. 12mo., Leipzig, 1846), are full of interesting matter and reflections on art. Speckter's whole career is a remarkable instance of the power of nature over convention, where the love of art was real. The essential attractions of art itself gradually drew him from an abstract conventional system, in which art was only secondary to a peculiar sentiment independent of it, to the art itself, and for its own sake. Speckter's transition from convention to nature is not singular in the history of modern German art.

(*Briefe*, already mentioned.)

SPECTRUM, in optics, is a name applied to the elongated image of the sun which is formed on a screen in a darkened room when a slender beam of the sun's rays passing through a perforation in the wall or in a window-shutter has been afterwards transmitted through a prism formed of any transparent medium [DISPERSION, P. C.; and, for the dark lines observed in spectra, see FRAUNHOFER, P. C. S.]

If a prism of crown-glass, and one of flint-glass, have their refracting angles of such magnitudes that the spectrum formed by one shall be of the same length as that which is formed by the other; on combining them so that their refractions may be in contrary directions, the red and violet rays of the spectrum will be united so as to proceed parallel to one another in the emergent pencil, but the dispersions of the intermediate rays, though much diminished, will not be wholly corrected, and some colour will still remain in the image formed on the screen which receives the refracted pencil. This circumstance was first observed by M. Clairaut; and the coloured image was called by Dr. Blair a secondary spectrum.

When a spectrum is formed by a prism of crown-glass, the mean refracted ray meets the screen at the boundary-line between the blue and green spaces; but if a spectrum of equal length be formed by a prism of flint-glass, the mean ray, instead of being at that boundary, will be much nearer the red or least refracted end of the spectrum; consequently, with flint-glass, the rays which suffer the least refraction occupy a less, and those which experience the greatest refraction occupy a greater length in the spectrum than they, respectively, occupy in a prism formed of crown-glass. On the other hand, in a spectrum formed with a prism of rock-crystal the mean ray is nearer the violet end than it is in a spectrum formed with a prism of crown-glass, so that the least refrangible rays occupy a greater, and the most refrangible rays a less extent than they respectively occupy in the spectrum produced by the latter medium. Hence, if a pencil of white light be made to pass through two prisms, one formed of crown and the other of flint glass, their refracting angles being such that the red and violet rays of the spectrum are united, there will be formed on the screen a short or secondary spectrum, its upper part, or that which is near the violet end, consisting of the green light which remains uncorrected, and the lower part consisting of the light formed by the union of the red and violet rays. If the bar of a window-frame be observed through two such prisms combined together, the upper side will appear to be fringed with green and the lower side with a purple tint arising from the blending of the red and violet rays.

But if a pencil of white light be made to pass through two prisms, one formed of crown-glass and the other of rock-crystal, their refracting angles being such that the red and violet rays of tho first spectrum are united, there will be formed a secondary spectrum in which the lower part is green and the upper part purple: or, if the bar of a window-frame be viewed through two such prisms, the lower side will appear to be fringed with green and the upper with purple.

This dispersion of light, which remains after the rays have been refracted through an object-glass composed of two lenses (formed with crown and flint glass) is an insuperable obstacle to the perfection of what are called achromatic telescopes: the fact of the dispersion will be evident in any such telescope if the eye-piece be drawn out beyond the point at which a luminous object as the moon appears distinct, or be pushed nearer the object-glass than that point; for, in the former case, the object will appear to be surrounded by a bright margin of green light, and, in the other, it will be surrounded by a fringe of purple light. (Brewster, *Treatise on New Philosophical Instruments*, p. 358.)

Prisms of three different media might be formed which would unite the rays of three different colours; the uncorrected colours would then produce a spectrum much smaller than that which remains when two differently coloured rays only are united, and Sir John Herschel, in the 'Encyclopædia Metropolitana' (art. Light, No. 446), proposes to call it a tertiary spectrum. Spectra of higher orders might be formed by using a greater number of prisms, for the purpose of uniting with the former the rays of other colours; but the diminution of light caused by the employment of so many media would become an evil greater than that which it is proposed to correct.

Sir David Brewster has given the name of tertiary spectra to the images formed by the uncorrected colours which remain when the red and violet rays are united by causing a pencil of white light to pass through two prisms of the same medium, as flint-glass, with their refracting angles in opposite positions: in this combination the refracting angle of one prism is greater than that of the other, and the pencil of light is made to fall on the prism having the smaller angle with such obliquity to the surface as to render the dispersion of the red and violet rays in that prism sufficient to allow it to be exactly corrected by the contrary dispersion produced by the other prism. Sir John Herschel proposes to call spectra so produced subordinate spectra.

The celebrated Fraunhofer first observed that when a beam of light from the sun, after passing through a narrow slit (about $\frac{1}{100}$ in. in breadth) in the wall or in the window-shutter of a darkened room, and then through a still narrower aperture in an opaque screen placed a few inches from the object-glass of a telescope (the two apertures being parallel to one another), was allowed to fall on the object-glass; the coloured fringes produced by the diffraction of light at the edges of the aperture, being viewed through the telescope, assumed the appearance of spectra similar to those produced by the refraction of light through a prism of some transparent medium. To these images Fraunhofer gave the name of spectra of the first class; they are composed of variously coloured light, the tints melting into one another by insensible gradations, and they exhibit dark lines as in the usual prismatic spectra.

When there was placed before the telescope a grating consisting of many very slender wires parallel to one another and to the aperture in the wall, and having very narrow intervals between them, there appeared in the field of view a dark space on either side of the image of the aperture in the wall, and beyond this, on each side, a series of spectra each consisting of variously coloured spaces, of homogeneous light, separated from one another by dark lines; these he called spectra of the second class.

When two linear apertures only were made in the screen at the object end of the telescope, there appeared in the field, between the image of the aperture in the wall and the first of the spectra, on each side, what Fraunhofer designated imperfect spectra of the second class; these consisted of coloured spaces similar to those in the spectra of the first class, but without the dark lines; and when three linear apertures only were formed in the screen, there appeared, between the image of the aperture and the nearest imperfect spectrum of the second class, other spectra less distinctly formed than the latter, and, like them, without the dark lines; these he denominated spectra of the third class. No other classes of spectra than those which have been mentioned were observed on increasing the number of apertures in the screen.

Many beautiful varieties of spectra were observed by Fraunhofer when the light was transmitted through three or a greater number of small circular apertures in a metal plate, and also through two frames, each carrying a number of slender wires parallel to one another; the frames being placed so that the wires in one were at right angles to those in the other.

SPECULA'RIA (so called from Speculum Veneris, Venus's Looking-glass, the old name of one of the species), a genus of plants belonging to the natural order Campanulaceæ. It has a rotate corolla, a linear-oblong prismatical capsule opening by lateral pores between the calycine segments. In other respects this genus resembles that of Campanula, from which it has been separated by recent systematists. The species are small annual plants inhabiting the regions of the Mediterranean and the temperate parts of Europe. One species, the *S. perfoliata*, is a native of North and South America.

S. hybrida has a simple or branched stem, the leaves slightly crenate, wavy, oblong, sessile, the lower leaves spathulate; the calyx scabrous, the segments lanceolate, longer than the corolla, shorter than the ovary. This plant is a native of the corn-fields of Great Britain, and is found commonly throughout the region of the Mediterranean. There are several other species of this genus, all of which are worth cultivating on account of their showy flowers. The seeds should be sown in the open ground, where it is intended the plants should remain. By sowing the seeds in the autumn an early blossoming may be ensured in the following summer, and by successive sowings in the spring and summer they may be made to blossom for several months during the summer.

(Don, *Gardener's Dictionary*; Babington, *Manual of British Botany*.)

SPENCER, JOHN CHARLES SPENCER, THIRD EARL, will be best remembered by the title of courtesy, Viscount Althorp, which he bore from his birth, through, it may be said, the whole of his public life, and until within a few years of his death. He was the eldest son of George John, second Earl Spencer, and Lavinia, eldest daughter of Charles Bingham, first Earl of Lucan; and was born on the 30th of May, 1782. Like his father, who was distinguished for his love of literature and his munificent expenditure in the collecting of rare books, he was educated at Harrow; whence he was sent to Trinity College, Cambridge, where he took the honorary degree of M.A. in 1802.

In April or May, 1804, towards the close of the second session of the second Imperial Parliament, Viscount Althorp entered the House of Commons as one of the members for Oakhampton. A vacancy appears to have been made for him by the resignation of James Strange, Esq. On the 11th of February, 1806, on the formation of the Whig ministry of Mr. Fox and Lord Grenville, in which his father Earl Spencer took office as Secretary of State for the Home Department, Lord Althorp was appointed one of the Junior Lords of the Treasury; and this appointment having vacated his seat, he offered himself for the University of Cambridge, which had been represented by the late premier, Mr. Pitt; the other candidates being Lord Henry Petty (now Marquess of Lansdowne), who was the new Chancellor of the Exchequer, and the present Lord Palmerston. The votes were, for Lord Henry Petty 331, for Lord Althorp 135, for Lord Palmerston 128.

To the next parliament, which met in December, 1806, Lord Althorp was returned at the head of the poll for the county of Northampton, after a severe contest. The numbers were, for his lordship, 2085; for the other member, William Ralph Cartwright, Esq., 1990; for Sir William Langham, Bart. (the defeated candidate), 1381. After this his lordship continued to be returned for Northamptonshire to every parliament down to the passing of the Reform Bill. In the first Reformed Parliament, which met in January, 1833, he sat as one of the members for the southern division of that county.

Lord Althorp, of course, lost his seat at the Treasury Board when the Grenville administration was dissolved in March, 1807; nor did he again hold office till the accession of Lord Grey and his friends to power in November, 1830. During all this interval, although he did not come forward in debate so frequently as some other members, he was regarded as one of the steadiest supporters of the Opposition in the House of Commons; and, while he was making his way to the highest place in the confidence of his party, it may be safely affirmed that there was no man on either side of the House whom the public generally held in greater respect for his universally admitted patriotism and freedom from the narrowness and rancour of faction. Yet he was no temporizer or half-and-half politician. On all the great questions of the day he took a decided part; and on most of the occasions on which his party made a stand against the government, he went as far with them as any other. In 1817, for instance, we find him supporting an address to the throne for a reduction of the number of the Lords of the Admiralty, and opposing the suspension of the Habeas Corpus Act, the maintenance of so large a standing army in time of peace, the continuation of the Alien Act, and the additional grant to the Royal Dukes; in 1819 moving for an inquiry into the State of the Nation; in 1823 moving for a repeal of the Foreign Enlistment Bill, and opposing the renewal of the Irish Insurrection Act; in 1824 moving for a Committee of Inquiry into the general state of Ireland; in 1825 opposing the Suppression of the Catholic Association; in 1828 moving the first reading of the bill to repeal the Test and Corporation Acts, and opposing the grant of 2000*l.* per annum to the family of the late Mr. Canning.

Lord Althorp was also prominent for several years, about this period, in a series of economical attacks upon the Tory administration, and his house was the resort of a powerful section of the Whig party, who considered him their leader in the House of Commons. There were few questions of public importance, over and above those already mentioned, in which he did not take a practical and useful share; and his sound judgment, under all the vicissitudes and excitement of Parliamentary affairs, amply justified the confidence and attachment with which he was regarded by the party. There was about him, indeed, so much reality of purpose, such unostentatious manners, a bearing and simplicity so characteristic of the English nation, that a few sentences from him were equivalent to eloquent orations from less consistent statesmen; and though he was not fortunate enough on all occasions to escape censure, we believe it may be truly said that such censure generally emanated from individuals whose views had been frustrated by his plain dealing; and that when he left politics, he was not less in charity with all men than they were in charity with him. 'Honest Lord Althorp' was the current phrase by which his Lordship was recognised by the House of Commons and the public for many years.

The House, it is true, has been often led by what are called abler men, and the Whig party in particular has never been wanting, any more than it was during his leadership, in distinguished talents and rare oratorical ability. We doubt however whether amongst the many distinguished persons who formed Lord Grey's administration, a single individual could have been selected who would have combined in the support of the great measures of the day so much popular confidence and support, and would have carried them through parliament with an industrious patience and an earnest equanimity equal to Lord Althorp. To the honour of the House of Commons, character in public men has an authority there which stands its possessor in lieu of more striking qualities; and no Englishman of our age need be ashamed, on being reminded of the great orators of the last generation, that for several years the public business was conducted by a gentleman whose language was as plain as his appearance, but who never spoke without effect, because his hearers well knew that he had no object but the honour and prosperity of his country.

In respect to the great questions which have risen into public importance and exercised so vital an influence for the last four years on the legislation and statesmen of the day, we mean those connected with the emancipation of trade and commerce, we have reason to know that Lord Spencer warmly sympathised with the progress of the principles of free trade; and there cannot be a doubt that his influence and support would have been given to the policy and measures of 1846.

It will be remembered that upon the address to the crown in the House of Lords in August, 1841, when the Whig budget and the stability of Lord Melbourne's government were at issue, he moved the address on that occasion, and emphatically declared himself in favour of free trade. There was an occasion also, within a short period of his death, when he lost the confidence of a portion of his agricultural friends by an open declaration in favour of a total repeal of the corn laws; and we question whether Mr. Cobden ever made greater progress amongst the middle or the upper classes of society than when he could appeal to the recorded sentiments of so devoted and so distinguished a farmer as Lord Spencer.

But to return to the narrative: In November, 1827, the Whig section of the Goderich cabinet fixed upon Lord Althorp to be chairman of a Committee of the House of Commons, which it was proposed to appoint to take into consideration the general state of the national finances, and the premier (the present Earl of Ripon) appears to have given a qualified assent to that arrangement. But it was defeated, after a communication had been made to Lord Althorp, and his lordship had signified his conditional acceptance of the intended nomination, by the opposition of Mr. Herries, the chancellor of the Exchequer. This affair led to the resignation of their offices both by Mr. Herries, and Mr. Huskisson, secretary for the colonies, and to the breaking up of the administration on the 8th of January, 1828. For full details the reader is referred to the 'Annual Register' for 1828, pp. 3-12.

On the accession to power of the Grey administration in November, 1830, Lord Althorp was appointed chancellor of the Exchequer. His position, and the sound ability which he evinced in the management of great political and economical questions, with the universal confidence in his integrity, made him the ministerial leader in the House of Commons. No man probably had ever filled the latter post who possessed less of the gift of oratory; but the clearheadedness and sound sense of Lord Althorp were considered amply sufficient to make up for that deficiency. Nor were the expectations of his friends disappointed. The task of carrying through the House both the Reform Bill and the Poor Law Amendment Bill devolved principally upon him; and not only the candour and patience and complete command of temper (often in very trying circumstances) which he never failed to evince, but his mastery of both measures in all their details, the readiness and accuracy of his recollection, and even the talent of exposition and advocacy which he displayed, produced a general conviction that the difficult work he had undertaken could hardly, looking to all considerations, have been placed in better hands.

The appointment of Lord Althorp to a high ministerial office in the House of Commons was attended with the serious drawback, that his father, Earl Spencer, having already attained to the age of seventy-two, Lord Althorp was very liable to be soon and suddenly called away both from the House of Commons and from his office, which could only be held by a member of that House. In point of fact, the death of Lord Spencer, which took place on the 10th of November, 1834, by occasioning this change, broke up the ministry. [WILLIAM IV.] When the administration of Sir Robert Peel and the Duke of Wellington, which succeeded, was obliged to resign in April following, and the Whigs came again into power under the premiership of Lord Melbourne, Lord Althorp, now Earl Spencer, was, as well as Lord Brougham, left out of the new cabinet. It was understood that he declined to take office again; and indeed that he had been reluctantly induced to resume the Chancellorship of the Exchequer after giving in his resignation when Lord Grey finally retired in July of the preceding year. There can be no doubt that in losing him, the remnant of the original Reform cabinet, now deprived also of Lord Durham, Lord Stanley, Sir James Graham, Lord Ripon, the Duke of Richmond, Lord Carlisle, Earl Grey, and Lord Brougham, lost one of its chief stays, notwithstanding that Lord Lansdowne, Lord Melbourne, Lord Palmerston, Mr. Grant (now Lord Glenelg), Lord Auckland, Lord Holland, and Lord John Russell still remained.

What is said of Lord Althorp by the writer of the Memoir in the 'Gentleman's Magazine' is the more valuable as the testimony of a political opponent:—'His sincerity was never doubted, nor the integrity of his motives. . . . Up to the hour of his quitting office, his honesty of purpose retained him the esteem of the House, if he did not support his popularity; and no minister ever retired into private life accompanied with warmer wishes for his happiness, or a more general feeling of good will.'

Earl Spencer had always been strongly attached to agricultural pursuits; and now that he was not only relieved from official occupation, but had nearly withdrawn altogether from politics and public life, he devoted his greater leisure with more eagerness than ever to practical farming, the rearing of cattle, the patronage of agricultural associations, and whatever promised to advance his favourite science. 'Regardless of expense and of personal inconvenience,' says the authority we have just quoted, 'he was almost invariably present at all the great agricultural meetings throughout the country.' Indeed he may be said to have been the father of many, as he certainly was the patron of all. He was for many years President of the Smithfield Cattle Club; and, in the year 1837, in the course of his address to its members, he suggested the formation of the Royal Agricultural Society. . . . . . Earl Spencer was the first President of this Society in 1838-9, when the meeting was held at Oxford, and again in 1844, when the meeting took place at Southampton. In the formation and operations of the Yorkshire Agricultural Society he also enacted a part no less prominent than useful—no less marked by zeal than by a sound discrimination. His Lordship was President of the Yorkshire Society when its meeting was hold at Doncaster in 1843.'

Lord Spencer was one of the original members of the Roxburghe Club (for the reprinting of rare and curious tracts), of which his father was the first President. He was also Vice-Chairman of the Council of the Society for the Diffusion of Useful Knowledge; and he was a liberal contributor to the fund raised for the 'Biographical Dictionary' which the Society commenced. Lord Brougham dedicated to him his 'Discourse on Natural Theology,' published in 1835, in an address in which he says, 'I inscribe the fruits of those studies to you . . . . . because you have devoted much of your time to such inquiries—are beyond most men sensible of their importance —concur generally in the opinions which I profess to maintain—and had even formed the design of giving to the world your thoughts upon the subject, as I hope and trust you now will be moved to do all the more for the present address. Lord Brougham's 'Dialogues on Instinct,' first published in his 'Supplement to Paley's Natural Theology,' in 1839, are also supposed to be carried on with Lord Althorp, neither whose political nor agricultural pursuits, he says, had 'ever at any time prevented him from cultivating a sound philosophy, in the study of which much of his leisure is always consumed.'

Lord Spencer died at his seat of Wiseton Hall, in Nottinghamshire, on the 1st of October, 1845. He had married, on the 14th of April, 1814, Esther, only daughter and heiress of Richard Acklom, Esq., of Wiseton; but she died on the 11th of June, 1818, without issue; and his lordship was succeeded in the peerage by his next surviving brother, Frederick, now Earl Spencer.

(*Memoir in Gentleman's Magazine for Nov.* 1845; *Annual Register; Private Communication.*)

SPHÆRA, a genus of Dimyarian fossil Conchifera, from the Cretaceous system of Kent. (Sowerby.)

SPHÆREDA, a fossil plant from the Yorkshire coast.

SPHÆROCOCCITES, a genus of fucoidal fossil plants, from tho oolitic series of the Yorkshire coast. (Presl.)

SPHÆ'RODUS, a fossil genus of fishes from the oolitic and cretaceous strata. (Agassiz.)

SPHÆRONITES, a group of fossil Echinodermata from the Silurian and Devonian strata. (Hisinger.) Von Buch includes them in his family of Cystidea.

SPHENACANTHUS, a fossil genus of fishes from the coal formation of Scotland. (Agassiz.)

SPHENONCHUS, a genus of fossil fishes from the lias and wealden series of England. (Agassiz.)

SPHENOPH'YLLUM, a fossil genus of plants from the coal formations of Europe and North America. (Brongniart.)

SPHYRÆ'NODUS, a genus of fossil fishes from the London clay. (Agassiz.)

SPIDER. [ARACHNIDA, P. C.] The habits of spiders have recently formed the subject of an interesting and valuable report drawn up at the request of the British Association for the Advancement of Science, by Mr. Blackwall. This report, which is printed in the Transactions of that body for 1844, is full of new and curious matter. It touches on many points in the economy of spiders hitherto mistaken or imperfectly understood. There are also some valuable memoirs on the same subject in the later volumes of the Linnean Transactions, and several papers on new forms in the 'Annals of Natural History,' by Mr. Adam White; also an important and elaborate account of the anatomy of some species by Mr. Tulk.

Of the discoveries of Mr. Blackwall the most interesting and extraordinary relate to the sexual intercourse of these animals, and to the purposes served by their palpi in aiding in the continuation of the species. The facts made known on this subject are among the most singular discoveries of late years. For them we must refer to the report mentioned. We shall quote only a passage respecting the reproduction of the amputated palpi:—

'When the palpi of male spiders which had been amputated before the penultimate moult are reproduced, the sexual organs, perfect in structure, are reproduced also. (See experiments 8, 10, 11, 14.) Unexceptionable evidence in support of this singular fact is to be found in their reduced dimensions and integrity of form; but it will scarcely be denied that the original germs of those organs must have been removed with the detached palpi. That the function of the sexual organs is not in the least affected by their reproduction there exists the most satisfactory proof. In the last of those experiments, having for their object tho determination of the seat of the sexual organs in male spiders, recorded in this report, the male Tegenaria civilis, stated to have possessed the right palpus only when introduced to the female, is identical with that which was the subject of experiment 8 in the foregoing series; consequently its sexual organs had been reproduced, yet the fertility of its mate bore ample testimony to the unimpaired efficiency of their generative agency.'

Mr. Blackwall adds some very curious facts respecting the reproduction of spiders' limbs generally:—

'Physiologists, in conducting researches relative to the reproduction of the limbs of spiders, seem to have limited their investigations to the legs of those animals; whereas in the experiments detailed above, the palpi and spinners, as well as the legs, were operated on; and all these parts are found to be renewed, and afterwards to have their dimensions enlarged at the period of moulting only; it appears also, that if a part of a limb be amputated, as the tarsus of a leg or the digital joint of a palpus, the whole is reproduced, all the joints of the new limb, though small, being proportionate to those of the corresponding limb on the opposite side, with the exception of the digital joint of the palpi of male spiders when tho sexual organs are not reproduced, which is usually somewhat modified in size and form by that circumstance.'

Tho following observations respecting the monstrosities occasionally presented by spiders, are of no small consequence in their bearing on specific determinations:—

'Variations in the colour and size of spiders of the same kind, resulting from differences in age, sex, food, climate, and other conditions of a less obvious character, as they conduce largely to the introduction of fictitious species, have long engaged the attention of arachnologists, while those arising from extraordinary organic modifications, in consequence perhaps of their less frequent occurrence, have been almost entirely overlooked. The importance which cases of the latter description possess, in relation to physiology and systematic arrangement, will be best illustrated by a few examples.

'1. A supernumerary eye, situated between the two small ones constituting the anterior intermediate pair, has been observed in an adult female *Theridion filipes*. The total number of eyes possessed by this individual was nine, and their arrangement symmetrical.

'2. An immature female (*Thomisus cristatus*) had the two lateral pairs of eyes only; the four small intermediate were altogether wanting, not the slightest rudiment of them being perceptible even with the aid of a powerful magnifier.

'3. A short but perfectly formed supernumerary tarsus, connected with the base of the tarsal joint of the right posterior leg on its outer side, has been noticed in an adult female *Lycosa campestris*.

'4. Deficiency of the right intermediate eye of the anterior row has been remarked in an adult male *Lycosa cambrica*.

'5. The left intermediate eye of the posterior row was perceived to be wanting in an adult female *Epeïra inclinata*, and the right intermediate row was not half the usual size.

'6. An adult female *Ciniflo atrox* was found to be without the left intermediate eye of the posterior row.

'7. The right intermediate eye of the posterior row in an adult female *Epeïra inclinata* had not one-eighth of the natural size, being merely rudimentary.'

SPIKENARD. [NARDOSTACHYS, P. C. S.]

SPILANTHUS (from σπῖλος, a spot, and ἄνθος, a flower, because of its dotted or speckled flowers), a genus of plants belonging to the natural order Compositæ and the suborder Corymbiferæ. It has a many-flowered head, either heterogamous with the florets of the ray ligulate, or homogamous with all the florets tubular and 5-toothed; the involucre is in two rows, appressed, shorter than the disk, the outer scales somewhat leafy, the inner rather membranous and folded up.

S. oleracea has a branched diffuse stem, opposite stalked broadly ovate leaves, obtuse at the base, truncate or somewhat cordate. The pedicels are one-headed, longer than the leaf. The heads thick, ovate, and discoidal. The achænia ciliated at the angles, bi-aristate or awnless. The whole plant, but especially the involucre and receptacle, acts as a powerful stimulant of the salivary organs.

(Lindley, *Flora Medica.*)

SPINELLI, PARRI, a celebrated old Italian painter, was the son of Spinello Aretino, and was born at Arezzo, apparently about 1388-90, though his father was then very old, upwards of seventy. This conjecture however rests only upon Vasari's statement respecting the age of Spinello, and the assertion that Parri died when he was fifty-six years of age, and on the date 1444, which is on the altar-piece of San Cristofano at Arezzo, which is attributed to him.

He was first instructed by his father, and was afterwards employed by Lorenzo Ghiberti in Florence as an assistant in preparing the celebrated gates of the Baptistery of San Giovanni, which were executed between 1402 and 1424. He painted chiefly in Arezzo, and Vasari enumerates many of his works, but few now exist. He returned to Arezzo, says Vasari, upon the death of his father, and after many years' absence, from which it would appear that the fathor lived further in the fifteenth century than is at present supposed: he is known to have been living in 1408, and his death is supposed to have happened about this time. Vasari's statement that he died in 1400 is probably a misprint as well as an error, as the account of Parri's assisting Ghiberti and returning to Arezzo at the time of his father's death and after many years' absence, is a complete contradiction to it.

Parri was an excellent colourist, and was the best practical fresco painter of his time; his draperies were also good, but his figures were too long in proportion; Vasari says some of them measured as many as eleven heads in height, and yet they were not ungraceful.

(Vasari, *Vite de' Pittori*, &c.)

SPI'RIFER, the earliest generic name assigned by Sowerby to a large group of fossil Brachiopoda, from the Palæozoic strata. (Delthyris, Orthis, &c., have since been dissevered from the group.)

SPIRITUAL COURTS [ECCLESIASTICAL COURTS, P. C. S.]

SPIRO'GLYPHUS, a genus of fossils from the mountain limestones of Ireland. (M'Coy.)

SPIRO'PORA. [Cricopora, P. C. S.]

SPONG'ARIUM, an undetermined probably Zoophytic genus of Silurian fossils. (Murchison.)

SPRANGER, BARTOLOMAEUS, a great mannerist, but a celebrated painter in his time, was born at Antwerp in 1546. His father was a wealthy merchant, and after he had received instruction from several masters at Antwerp, he visited Paris and Italy, where at Milan he placed himself with Bernardo Gatti, called Soiaro. From Milan he went to Rome, where he found a patron in the Cardinal Farnese, who introduced him to Pope Pius V., who commissioned Spranger to paint him a picture of the Last Judgment, gave him apartments in the Vatican, and appointed him his painter. This picture of the Last Judgment, which contained about five hundred heads, was painted on a large sheet of copper, and after the death of the pope it was fixed over his tomb in the church of Santa Maria Maggiore, but must have been long since removed.

In 1575 Spranger left Rome to enter the service of the Emperor Maximilian II., at Vienna, to whom he had been recommended by John of Bologna. After the death of Maximilian he remained in the service of Rudolph II., who ennobled him in 1588. He visited his native place in 1602, after an absence of thirty-seven years, and was treated with great distinction by his countrymen. He returned again to Prague, and died there about 1625, according to Von Mechel. There are nineteen pieces by Spranger in the gallery of Vienna, and many in other German collections. He painted with facility, but his figures are heavy, gross, and distorted; he was fond of allegorical and mythological subjects, which were utterly unfit for his style.

(Fiorillo, *Geschichte der Malerei*, &c.)

SQUALORA'IA, a genus of fossil fishes from the lias of Dorsetshire. (Riley.)

SQUARCIO'NE, FRANCESCO. This painter, celebrated for his superior acquirements as well as his great school and rich collections of works of art, was born of a good family at Padua, in 1394, and after performing many tours in Greece and Italy, lived there in great affluence and distinction until his death in 1744. His house was one of the chief attractions in Padua. He was the master of Andrea Mantegna, who lived some time in Squarcione's house. From his very numerous school (he had 137 scholars) he was called the father and primo maestro of painters. He appears to have been more engaged in teaching than in practising the art. [Venetian School of Painting, P. C., vol. xxvi. p. 212.] Vasari terms him erroneously Jacopo Squarcione.

(Ridolfi, *Vite de' Pittori Veneti*, &c.)

SQUATI'NA, a genus of cartilaginous fishes, of which the Angel or Devil Fish of our seas is the type. They differ from all the other sharks in the position of the mouth, which is cleft at the extremity of the snout, and not placed below, and in the position of the eyes, which, instead of being on the sides, are on the summit of the flattened head. The body is broad and flattened horizontally; the head is round. The dorsal fins are placed farther back than the ventrals, and there is no anal fin present.

STADE DUTIES are so called from Stade, in the kingdom of Hanover, a town situated on the right bank of the Schwinge, three or four miles from where it falls into the Elbe, and 22 miles west by north from the city of Hamburg. The name *Brunshausen Tolls* is now more commonly used, from the village of Brunshausen, at the mouth of the Schwinge, where there is a custom-house and a royal guard-ship, and where the duties are collected which are levied on vessels and merchandise passing up the Elbe. The original duties, which were regulated by a treaty made in 1691, were light, but were gradually increased by the Hanoverian government till they amounted to about 40,000*l.* a-year. The duties levied were about ½ per cent. *ad valorem*, more on some articles and less on others. British vessels by a proclamation of Geo. II., December 1, 1736, were allowed under certain regulations to sail directly up to Hamburg, without coming to anchor at the mouth of the Schwinge, as other foreign vessels were obliged to do.

By a convention between the King of Hanover and the other Elbe-bordering states (Emperor of Austria, King of Prussia, King of Saxony, King of Denmark, Duke of Mecklenburg-Schwerin, Duke of Anhalt-Cœthen, Duke of Anhalt-Dessau, Duke of Anhalt-Bernburg, Free and Hanseatic town of Lübeck, and Free and Hanseatic town of Hamburg), dated April 13, 1844, in conformity with articles 108 and 116 of Act of Congress of Vienna, of June 9, 1815, the Brunshausen Tolls were revised, regulated, and settled according to a Toll-Tariff agreed upon by the contracting parties.

By a treaty of commerce and navigation between the Queen of England and the King of Hanover, signed at London, July 22, 1844, British and Hanoverian vessels arriving at, remaining in, and departing from the ports of the two countries, are mutually subject to no other or higher dues or charges than those which are now or shall hereafter be imposed upon the national vessels of the two countries on their arrival at, remaining in, or departure from such ports. All articles of the growth, produce, or manufacture of Great Britain or Hanover, which are or shall be permitted to be exported or imported in British or Hanoverian vessels, are mutually allowed to be exported or imported in the vessels of either country, and no distinctions of duties or drawbacks shall be made. By article 6, 'From and after the 1st day of October, 1845, no other or higher duties or tolls shall be levied, as regards the tolls or charges known by the name of the Stade or Brunshausen tolls and charges, on British vessels passing up the Elbe to the point where the tolls of the Upper Elbe commence (that is to say, up to and including the town of Hamburg), or upon the cargoes of such vessels, than the tolls and duties which are specified in the convention between the Elbe-bordering states, which was signed at Dresden on the 13th of April, 1844, and in the separate articles, regulations, and five tables annexed thereto.' With respect, however, to the following articles of British produce and manufacture (that is to say, yarn, thread, manufactures of cotton, wool, and linen, tin and tin plates, articles of iron and steel, treacle or syrup, earthenware, copper and brass, and similar alloys of metals and manufactures thereof), it is agreed that the duty or toll to be levied, whether in British vessels or in vessels of any of the Elbe-bordering states, shall be only two-thirds of the duty or toll specified in the tables.

The treaty is to continue in force till January 1, 1854.

STAINING. [Dyeing, P. C., p. 225; Paper-Hangings, P. C., p. 215; Glass Painting, P. C. S., p. 654.]

STANHOPE, PHILIP, Captain, a brother of the celebrated James, Earl Stanhope [Stanhope, James, P. C.], was from early youth brought up to the sea-service, and in 1704 was appointed to the command of the Hastings frigate. From this vessel he was promoted to the Milford, in which ship he served under Sir Stafford Fairbourne at the siege of Ostend, and was chosen by that commander to bring home the news of the surrender of that fortress to the allies. He afterwards served in the Mediterranean, under the command of Capt. Carey, on which station he remained till the close of his life; he there earned the reputation of an active and intelligent officer. In August, 1708, it was determined in a council of war held on board the Elizabeth, at the request of Charles, who had taken the title of King of Spain [Succession, War of, P. C. S.], that the ships, the York and the Milford, should assist in conveying the transports, which had on board General Stanhope and a large body of Catalonian troops, to Minorca, the reduction of which island was an object of importance to the success of the allied cause. Capt. Stanhope, who was desirous of emulating his brother's glory, served as a volunteer in the expedition, and fell in the moment of victory at the assault of the Spanish lines at Port Mahon, Sept. 17, 1708. He is referred to in the Article Anne, P. C., under the name of Admiral Stanhope.

The details of his life are derived from Rees's 'Cyclopædia,' vol. xxxiii., London, 1819; Campbell's 'Lives of the Admirals,' vol. iv., p. 82, note; London, 1761; and Boyer's 'Life of Queen Anne,' p. 350, folio, London, 1735.

STANLEY, ST. LEONARD, a village, formerly a market-town (and described as still being one in the Article Gloucestershire, P. C.), in the lower division of Whitstone hundred, in the county of Gloucester, about 3 or 3½ miles W.S.W. of the town of Stroud, and about 12 S. by W. of Gloucester. The adjunct to its name, St. Leonard, serves to distinguish it from two other Stanleys in the county, namely, the adjacent parish of King's Stanley and the parish of Stanley Pontlarge, near Winchcombe, in the northern part of the county. The area of the parish is 910 acres; the population at the different enumerations was as follows:—1801, 590; 1811, 538; 1821, 757; 1831, 942; 1841, 864. The number of houses at the latest enumeration was 201, namely 182 inhabited, and 19 uninhabited. There were none building. The village consists of three or four small streets meeting at the church, which is dedicated to St. Swithin, and is an antient cross-church, with a tower at the intersection. The architecture is partly of the early English period, partly of later date. This church formerly belonged to a Benedictine priory founded here by the Berkeleys of Dursley, which afterwards became a cell to Gloucester Abbey. There are some remains of the conventual buildings, which have been converted to domestic purposes. St. Leonard Stanley was antiently of more consequence, and had a market: its decay was produced or accelerated by a fire which, in A.D. 1686, destroyed nearly the whole town: it has some share in the clothing manufacture of the district, and has two yearly fairs, but they are of little importance. The living is a perpetual curacy of the clear yearly value of 200*l.*, but without a glebe-house fit for residence, in the rural deanery of Stonehouse, in the Archdeaconry of Gloucester, in the diocese of Gloucester and Bristol. There were in the parish, in 1833, three small day-schools; one, with a small endowment, contained 14 children, the other two contained 42, giving a total of 56 children (25 boys and 31 girls), or only one in seventeen of the population, according to the census of 1831, under daily instruction. There were two Sunday-schools with 305 children, namely, 141 boys and 164 girls. The parish of St. Leonard Stanley is included in the parliamentary borough of Stroud.

(*Parliamentary Papers; Ordnance Map;* Fosbroke's *Gloucestershire.*)

STANZIO'NI, MA'SSIMO, Cavaliere, a celebrated Italian painter, was born at Naples in 1585. He was the pupil of Caracciolo, but became afterwards the imitator of the great Bolognese painters, especially Guido Reni; he was called the Guido of Naples, and is considered the most correct of the Neapolitan painters. He was an excellent portrait painter, and was also distinguished for his frescoes. There are several excellent works by Stanzioni in the church of the Cortosa, now an hospital, at Naples, especially the picture of St. Bruno presenting the rules of his order to his monks. In the same church is a picture of a dead Christ and the Marys, which, as it had somewhat darkened, Spagnoletto, through jealousy, persuaded the Carthusians to wash with a corrosive water, which completely spoilt it. Stanzioni, disgusted with the baseness of the act, would not restore it, preferring to leave it as a monument of Spagnoletto's meanness. Stanzioni died at Naples in 1650. He had a numerous school, and he left many notices of Neapolitan painters, which were used by Dominici.

(Dominici, *Vite de' Pittori Napolitani*, &c.; Lanzi, *Storia Pittorica*, &c.)

STARS, SHOOTING. [SHOOTING STARS, P. C. S.]

STA'TICE (from the Greek στατική, intended to be used in the active sense, 'to stop,' so named from its supposed property of restraining hæmorrhages), a genus of plants belonging to the natural order Plumbagineæ. It has spiked flowers with a 5-parted corolla, the calyx scarious above, the capsules not bursting.

S. caroliniana has narrow obovate leaves on long petioles, smooth, veinless, obtuse, mucronated, level, and flat on the margin. The scape is round, smooth, slightly scaly, and terminated by a panicle of numerous branches, which bear the flowers on the upper side only. The flowers are alternate, erect, mostly in pairs, but appear singly in consequence of one expanding before the other. The calyx is funnel-shaped, scarious, and pink at the edge, 5-angled, the angles ciliate, and ending in long sharp teeth. The petals are obtuse, longer than the calyx, and of a bluish purple colour. This species is a native of North America, where it is called the Marsh Rosemary. The root is a very powerful astringent, and is used as an application in aphthæ and similar affections of the mouth and fauces; it has been employed with success in cynanche maligna.

S. Limonium, Sea Lavender, is a British species, and has much divided corymbose branches curved outwards; the ultimate subdivisions short, unilateral, ascending, and densely flowered. The calyx segments entire, acute, with intermediate teeth, the outer bracts pointed and small. The roots possess astringent qualities.

S. rariflora is found near the sea in England and the coast of Galloway; it has oblong lanceolate stalked leaves, the branches divided, the panicle ascending or incurved, the ultimate subdivisions elongated with unilateral rather distant flowers; the calyx segments acute, denticulate, with intermediate teeth; the bracts obtuse, the outer ones large, the margins tinged with pink.

S. spathulata has spathulate leaves narrowed into a broadly winged stalk; the calyx segments blunt, entire, and without intermediate teeth.

S. reticulata has spathulate leaves narrowed into a flat stalk, mucronate behind the point; 3-ribbed below; the scape panicled almost from the base with numerous slender zig-zag much-divided branches, of which the lower are barren; the calyx segments acute, denticulate. It is found in muddy salt marshes in Norfolk.

(Babington, *Manual of British Botany;* Lindley, *Vegetable Kingdom.*)

STATUTE (*Scotland*). It would be difficult to explain the character of the older legislation of Scotland, the method in which it was sanctioned, or the constitution of the bodies by which it was passed. All the light that probably is to be obtained on the early history of the statute-law has lately been embodied by Mr. Innes, in his preface to the edition of the 'Scottish Statutes and old Laws,' published by the Record Commission. 'Whatever,' he says, 'may be the case in other countries, it is not easy in Scotland to distinguish the antient legislative court or council of the sovereign from that which discharged the duty of counselling the king in judicial proceedings. The early lawgivers, indeed, enacted statutes by the advice of the "bishops, earls, thanes, and whole community," or "through the common counsel of the Kynryk;" but during the reigns previous to Alexander III. we find the king also deciding causes in a similar assembly of magnates: while laws of the greatest importance, and affecting the interests of whole classes of the community, bear to be enacted by the king and "his judges."' It is probable that the practice of the assembly, legislative or judicial, of the principal barons, though irregular, was in general an imitation of the parliament of England. Before the war of independence the lands of the southern districts of Scotland had been in a great measure partitioned among Norman adventurers, some of whom owed a double allegiance to the crowns both of England and Scotland; and it was natural that they should bring with them the practices and opinions of the country with which they were earliest connected. A large proportion of the lowland population of Scotland were at the same time Saxon refugees from England. So early as the reign of David I. (1125) we begin to find that the municipal corporations had a voice in the ratification of the laws. 'The parliament,' says Mr. Innes, 'assembled by John Balliol at Scone, on the 9th of February, 1292, was probably the first of the national councils of Scotland which bore that name in the country at the time, although later historians have bestowed it freely on all assemblies of a legislative character. We have no reason to believe that any change in its constitution occasioned the adoption of the new term, which soon became in Scotland, as in England, the received designation of the great legislative council solemnly assembled. It was not till a few years later, on occasion of negotiating an alliance with France, that Balliol, probably at the desire of the French king, procured the treaty to be ratified, not only by the prelates, earls, and barons, but by certain of the burghs of his kingdom. That treaty was finally ratified at Dunfermline on the 23rd day of February, 1295; and the seals of six burghs were then affixed to the deed, along with those of four bishops, four monasteries, four earls, and eleven barons. Notwithstanding this very formal ratification, however, it may be doubted, both from the peculiar phraseology of the deed itself, and from the silence of historians as to any meeting of a parliamentary nature in which it could have been voted, whether the parties stated as consenting, and especially whether representatives of those six burghs, were actually present as in a national assembly of parliament.'

The acts which were thus sanctioned—sometimes, perhaps, by the separate adhesion of the principal interests of the country, sometimes in assemblies—were of a mixed character. Some were judgments in particular disputes, accompanied probably by the announcement of a principle on which such questions should thenceforth be decided; others were acts of executive authority: and others might be regulations having the character of fixed and general laws. When these proceedings related to matters of private right, the recording instrument would be put into the hands of the party interested. 'When the proceedings of the national council,' says the authority already cited, 'related to matters of a more public nature, such as negotiations with foreign states, its earliest records were probably of a similar kind, and consisted of nothing more than the indentures or other diplomacy which embodied the results of its deliberations. Perhaps the earliest instances of this kind that now remain are those important deeds of the reign of Alexander III., when, however, a more artificial system must have been beginning to prevail. It would be still more interesting to ascertain the modes in which the more general ordinances and laws of the realm were enacted and recorded; but on this head the loss of every original document had left us entirely to conjecture. Judging, however, from the mutilated and imperfect transcripts of a later age, and from the analogy of the other states of Europe, it would appear that the more important and general statutes were framed into snort capitulars, and ingrossed into a writ, addressed, in the name of the king, to the chief ministers of the law in the different districts of the kingdom, requiring the publication and observance of them. The laws of the burghs, the assizes of David I. and of William, and the statutes of Alexander II., as found in the old manuscript compilations of lawyers, seem to be the fragments of various capitulars of this kind.' The assizes of David I., 'Assisé Regis David,' are reported to be the oldest fragments of legislation in Scotland, and are partly, hut not entirely, traceable to so early a period as the reign of the king with whose name they are associated. The burgal laws, 'Leges Quatuor Burgorum,' constitute tho oldest systematic collection of laws. They too may be referred to the reign of David, and though historians give him the credit of having planned the whole system of the municipal corporations, it is more likely that this code of laws embodies the privileges and restrictions which had gradually come into existence with the growing influence of the burghs. The coincidence between these early vestiges of Scottish legislation and the old law of England is remarkable. Both in the assize, and In the burgh laws, technical phraseology is frequently nsed, which still helongs to the law and practice of England, but has long been disused in Scotland. Indeed, it is very clear that, before the attempt of Edward I. to be master of Scotland, there was much harmony in tone and spirit between the two nations, and that Scotland generally followed or accompanied England in all her constitutional progress. There is a still more remarkable coincidence of legislation in the celebrated *Regiam Majestatem*, or general code of the old laws of Scotland. It was, like the fragments mentioned above, attributed to David I., who had obtained the character of the Justinlan of Scotland; but It is undouhtedly of later date. In the sixteenth and seventeenth centuries it was very popular, as an undoubted early national code; hut it was subsequently discovered to have many features in common with the compilation 'De Legihus et Consuetudinibus Angliæ,' attrihuted to Ranulph de Glanvil, justiciar of England, and then it acquired the evil reputation of being a code prepared by Edward I., for the purpose of subjecting Scotland to the law of England. 'Upon an accurate collation of the books,' says Mr. Innes, 'it appears that the fourteen books of Glanvil contain in systematic arrangement, with some inconsiderable exceptions, the same matter, almost in the same words, which the compiler of the 'Regiam' has put into four books (in imitation of the Institutes of the Rŏman law), but divested of all systematic order. Many minute variations are found, and when these are intentional, they are plainly caused by a desire to snit the text of the English law-book to the local circumstances of Scotland; when they have happened accidentally, the vltiated or unintelligible text of the Scotch book is readily corrected by a comparison with the English author. There are, however, chapters in the 'Regiam' which are not in Glanvil. Part of these are extracts from the civil and canon law, and the remainder, joined inartificially to the surrounding text, appear to be genuine chapters of antient Scotch laws, most of which can be traced to their sources in the statutes of the early kings now collected.' Mr. Innes does not believe in the theory that the 'Regiam' was prepared under the authority of Edward I., but thinks its resemblance to the English compilation may be attributed to the spirit of imitation.

The 'Regiam Majestatem,' so named from the words with which it commences, is, with the burgh laws, and other vestiges of early legislation, printed in the first volume of the edition of the Scottish statntes issued by the Record Commission. None of the contents of this first volume, however, come within the description of the accepted statute law of Scotland. They are curious vestiges of constitutional hlstory; and If it be necessary for ascertaining the just application of any settled principle of law by a reference to its origin, these old collections are sometimes referred to; hut they are not admitted as direct authority in the substance of the law. In 1566 a commission was issued for the collection and puulication of the statute law, and they speedily published a series of statutes reaching from 1424 to 1564. It is at the former date that the statute law, properly speaking, commences, and It proceeds thence in a regular series to the Union with England. Several of the most important statutes still In force—as, for instance, that which secures to the agricultural tenant the continuance of his lease, notwithstanding the death of the landlord hy whom it may have been granted—date back to the earlier part of the fifteenth century. The Scottish acts are referred to hy the date of the parliament in which they are passed, and their numerical order; as, 'The Act 1424, c. 25;' 'The Act 1661, c. 16.' The early statutes are brief and sententious, and were admired by Bacon for 'their excellent brevity.' The following are two successive Acts of the Parliament of 1424, given in full:—

'Item, it is decreeted be the haill parliament, and forbidden be our soveraine lorde the king, that ony leagues or bandes be maid amongst his lieges in the realme; and gif onie has bene maid in time hygane, that they be not keeped nor halden in time to cum.'

'Item, it is ordained that na horse be sauld out of the realme, quhill at the least they be three yeir auld outgane, under the peine of escheitte of them to the king.'

From the date of the accesslon of Bruce, after the war with England, the Scots long entertalned a feeling of national jealousy and enmity towards England; and though some of the kings introduced Southern practices, we do not find that steady imitation and adoption of the constitutional movements of the English parliament which characterise the earlier period, but rather an isolated creation of, and adherence to national peculiarities. The Scottish parliament was not divided like the English into two houses, but the three estates—the clergy, the barons and other freeholders, and the burgesses—formed one assemblage. The method of conducting legislative business was very different from that which came into use in England. At the commencement of the sittings a commlttee was chosen, called Lords of the Articles, who had the duty of preparing and arranging the matters to be laid before the House for its approval. It thus appears to have generally happened that the full assemblage only met on the first and the last days of a session: on the former the lords of the articles were chosen; on the latter, the statutes or other proceedings prepared hy this committee were voted on, and sanctioned or rejected. The royal assent was given by touching the act with the sceptre; but some constitutional writers maintain that this was a mere court ceremony, and that an act which had passed the three estates became law without any sanction from the king. It became a principle which widely distinguished the legislation of Scotland from that of England, that in the former country statutes might cease to be law hy merely falling into desuetude. Of the statutes of the Scottish parliament, those only are now law which are said to be *in viridi observantiâ*. By this principle the statute law has silently modified itself to the character of the times; and, though not formally repealed, the barbarous laws of periods of bigotry or violence have ceased to be enforceable. Since the Union of 1707, it has been considered, in conformity with the English doctrine, that an act passed by the British parliament must be held as law, and judicially enforceable, until it is repealed.

The law of Scotland, the judicial and executive system, and the ecclesiastical polity, being quite distinct from the corresponding institutions of England, many statutes are from time to time passed by the British legislature solely applicable to Scotland, prepared by persons professionally acquainted with the institutions of that part of the empire. The revenue laws of Scotland were formerly distinct; but now, with few exceptions, one system embodied in one series of acts applies to the United Kingdom. In matters of national policy, and frequently in the criminal law and in legislation for internal economy, acts are made applicable both to England and Scotland at the same time. In these departments of legislation much confusion has arisen from its either heing left doubtful whether a statute applies to Scotland, or from terms being used which are not the proper technical phraseology of Scottish law. This uncertainty has heen a considerable source of litigation in Scotland; and the courts have been, from the want of uniformity in the composltion of the statutes, hitherto unablo to form any rule serving as a criterion for the extension of such acts to Scotland. In many cases—such as the Bankrupt Act, tho Tithes Commutation Act, &c.—the institutions to which the legislation refers distinctly limit its application to England. In other instances, however, general laws are made which are as applicable to Scotland as to England, while tho machinery by which the act directs them to be enforced is to be found only in England. In many instances these acts have only been capable of enforcement in Scotland by reading, instead of English institutions, those of Scotland, which most nearly correspond with them—as, by substituting 'The Court of Session' for 'The Courts of Record at Westminster.' The remedy for this evil appears to be, to incorporate with each act a clause stating the territorial extent of its application; and whenever it is intended that it shall apply to Scotland, to have clauses especially applicable to its enforcement in that part of the empire.

STATUTE (*Ireland*). [Parliament of Ireland, P.C.]

STATUTE OF FRAUDS. This name is applicable to any statute the object of which is to prevent fraud, but it is particularly applied to the 29 Car. II. c. 3, which is entitled 'The Statute of Frauds and Perjuries.' One object of the statute was to prevent disputes and frauds by requiring in many cases written evidence of an agreement. Before the passing of this statute many conveyances of land were made without any writing as evidence of the conveyance. An estate in fee-simple could be conveyed by livery of seisin, accompanied with proper words, and a use could also be declared by parol. No writing was necessary to convey any estate in possession, for such estate is technically said to lie in livery; but a reversion could only be conveyed by deed. The statute of frauds declared that all leases, estates, and interests of freehold or terms of years, or any uncertain interest in any lands or hereditaments, made by livery and seisin only, or by parol, and not put in writing and signed by the parties, &c., shall have the force of leases or estates at will only. But leases for not more than three years, whereon the rent reserved shall be two-thirds of the full improved value of the thing demised, are excepted by the statute. Further, no lease, estates, or interest either of freehold or terms of years, or any uncertain interest, not being copyhold or customary interest, shall be assigned, granted, or surrendered, except by deed or note in writing. Another section of the statute provides that all declarations or creations of trust or confidences of any land, tenements, or hereditaments, shall be manifested and proved by some writing signed by the party who is by law enabled to declare such trust, or by his last will in writing, or they shall be void. The 5th section of this statute declared that all devises of lands or tenements, as more particularly described in this section, should be in writing and signed in the manner here prescribed by three or four credible witnesses; and the 6th section related to the revocation of a devise in writing of lands or tenements. Both these sections are repealed by the last Wills' Act, 1 Vict. c. 26, which makes alterations in other provisions also of the Statute of Frauds.

There are several other important provisions in this statute, which may be omitted here, as the object is to show merely that the purpose of the statute is to prevent fraud by requiring the evidence of writing, which is a better kind of evidence than men's memory.

STATUTE MERCHANT. [Acton Burnell, Statute of, P. C. S.]

STATUTE STAPLE. [Staple, P. C.]

STEAM-VESSEL SCREW. While much has been done since the publication of the notices of screw-propellers under Screw of Archimedes, P. C., p. 111, and Steam Vessel, P. C., p. 510, in the practical application of such apparatus to steam-vessels, and results have been obtained which lead to the conclusion that this mode of propulsion is practicable upon a very large scale as well as in small vessels, and that it possesses some very important advantages over the use of paddle-wheels, the invention yet remains in too experimental a state to justify any attempt to deal with it as with a settled branch of science. Since the date of the articles referred to, in addition to vessels of more ordinary dimensions, the screw-propeller has been brought into use in the immense iron steam-ship now called the Great Britain, but which, while building, at Bristol, was sometimes referred to as the Mammoth, the dimensions of which, as given in the 'Athenæum' for 1845, p. 118, are 320 feet long and 50 feet broad in the widest part, drawing 16 feet water. Its capacity is about 3000 tons, and the engines, consisting of four cylinders of 88 inches diameter and 72 inches stroke, are of 1000-horse power. This great ship, by far the largest ever launched, was fitted, on her completion in 1845, with a screw-propeller 15½ feet in diameter, with six arms, mounted in the stern, and capable of being turned with great rapidity by means of a chain-wheel of 18 feet diameter, which was immediately connected with the engines, and communicated its motion through an endless chain to a much smaller wheel fixed on the shaft, which constituted the axis of the propeller. The propeller was thus turned with a velocity exceeding that of the crank-axis in a ratio determined by the relative diameters of the larger and smaller chain-wheels. Thus mounted, and furnished with six masts, five of which were stepped on deck so as to be removable at pleasure, with wire rigging, and with every requisite for taking advantage of favourable winds, the Great Britain sailed from Liverpool on the afternoon of July 26th, 1845, on her first trans-Atlantic voyage, and reached New York on the afternoon of August 10th. After her fourth voyage (the second homeward trip), during which she was left for some time wholly dependant upon her sails, in consequence of the shattering of the propeller, she was fitted with a new and much stronger propeller, weighing seven tons, of the same diameter as before, but consisting of only four arms or vanes; and she was at the same time fresh rigged, her number of masts being reduced to five, and the whole stepped upon the keelson. With these alterations, in an experimental trip made on the 30th of May, 1846, the Great Britain attained a speed of 11⅝ nautical, or about 13½ statute-miles per hour.*

An important discussion upon screw-propellers, suggested by an account of a new steam-vessel called the Liverpool Screw, submitted to that body, was carried on during three successive meetings of the Institute of Civil Engineers, in February, 1844. In the course of this discussion, of which a full report was published in the 'Mechanics' Magazine,' vol. xl. pp. 291-299, it was remarked by Mr. Rennie that the principal point to be obtained in a screw-propeller is a form which shall offer but little obstruction to the water, and yet act upon it so as to exert full power in propulsion; and that 'a large portion of a complete screw having no useful effect, had induced the introduction of propellers with several blades; thus doing away with the useless part of the surface.' A perusal of the discussion alluded to will show that the engineers who took part in it were not quite agreed in their views of the action of such propellers, especially with reference to what is termed the 'slip,' by which appears to be meant the amount of motion absorbed by the propeller cutting its way through the water, instead of pushing the water from it, or the difference between the speed of the vessel as it might be deduced from the number of revolutions made by the screw, and the actual way made through the water. Without attempting to unravel this somewhat difficult question, upon the true comprehension of which the best shape, size, position, and velocity of the propellers must depend, we may observe with Mr. Farey that while the advantageous action of ordinary paddle-wheels is greatly impaired by variations in the degree of immersion, the submersed screw propeller, being wholly under water at all times, does not appear to be sensibly affected by any such alterations in the depth of immersion as are likely to take place in the roughest waves, or the greatest variations of draught arising from changes in the lading of the vessel. 'When all circumstances were considered,' Mr. Farey observed, 'it might be safely concluded that vessels fitted with revolving submersed propellers would answer well for making regular sea voyages, either in winter or summer; and, on an average, he thought that their passage would be performed at least as well (if not better) than those of any steam-vessels now in use; and with an economy of fuel, arising from such vessels making a more advantageous use of their sails, and less of their engine-power.' The absence of the ponderous paddle-wheels and paddle-boxes of an ordinary steamer greatly improves the sailing qualities of a screw-propelled vessel, while the arrangement of the machinery may be such as to render the vessel far more commodious, and, if desired, to leave the upper decks open from end to end. These, among other advantages, recommend this mode of propulsion for steam-frigates, and other vessels of war. The Princeton, an American steam-frigate, launched about the commencement of 1844, and mounted with Ericsson's transversal screw-propeller, affords a good example of the advantages of the invention as applied to such vessels. This vessel, which, according to an account quoted in the 'Athenæum' for 1844, p. 205, from the 'New York Herald,' is of 700 tons burden and 250-horse power, has a submerged propeller making 36 or 37 revolutions per minute, and is capable of making its way through the water at the rate of 14 miles per hour, or even somewhat more, is said to have beaten the Great Western in speed, although drawing at the

* Since the above was written this noble vessel has run aground in the Bay of Dundrum, between Belfast and Drogheda. The accident occurred on her outward voyage, in the night of September 29, 1846; and though the spring-tides have since taken place, the vessel has not yet (Oct. 24, 1846) been got off.

time four feet more water, and exercising only two-thirds of her steam-power. The dimensions of the vessel are not given in the article quoted, but Mr. Braithwaite stated them, at the discussion above referred to, to be 164 feet long, 30 feet beam, depth of hold 22 feet 6 inches, and draught of water 17 feet 6 inches. He also, if the report we have quoted be correct, stated the power of the engines as 400 instead of 250 horses, and the velocity of the screw and speed of the vessel as rather less than we have stated. In the absence of proof as to which statement is correct, we may observe that while Mr. Braithwaite's would indicate a very unusually high proportion of power to tonnage, that of the 'New York Herald' shows about the common proportion for fast vessels. The engines, according to Mr. Braithwaite, are of peculiar construction, 'having two steam cylinders or chests, containing vibrating pistons or flaps, with cranks upon the ends of the suspending pivots;' these are coupled by connecting-rods to a main crank on the driving shaft, and the length of the first-mentioned cranks is so proportioned that their alternate vibrations shall give a rotatory motion to the main crank, and thus act directly upon the propeller, without the intervention of bands or gearing. In a subsequent stage of the discussion this point was reverted to by Mr. Galloway, the advantage of turning the propeller by the direct action of the engines being, he said, generally acknowledged; indeed, he added, 'the method of driving it was nearly the only problem remaining for solution, and that difficulty being once overcome, screw-propellers must necessarily, from their vast advantage over paddle-wheels, in every respect but that, be universally adopted.' Returning to the Princeton frigate, we may observe that it is evident, as stated in the 'New York Herald,' how greatly steam-vessels so mounted would have the advantage over those of the usual construction in active service; for in that vessel the whole of the machinery, cranks, boilers, and furnaces, as well as the propeller itself, are below the water line, the top of the highest plates of the boilers being as much as four feet below, and therefore pretty secure against injury from shot, while in the Great Western, and other steam-ships of the ordinary kind, the boilers and machinery, as well as the paddle-wheels themselves, are within destructive range. We may mention, although not directly affecting the use of the screw-propeller, that the Princeton is supplied with furnaces for burning anthracite, to avoid the production of smoke, and that she is ship-rigged, and so constructed that in favourable weather her screw may be unshipped, when she will sail well under canvas, a facility which can never be so perfectly attained with the use of paddle-wheels.

The Liverpool Screw, an account of which formed the basis of the discussion to which we have referred, is a small iron vessel, 65 feet long, 12 feet 6 inches beam, and drawing 3 feet 9 inches water. She was mounted originally with a screw of 3 feet 10 inches diameter, but it had been enlarged at three several times, and was, at the date of Mr. Grantham's account to the Institute, 5 feet 4 inches diameter by 20 inches long, of wrought iron, and consisted of four short arms whose united area amounted to 16 square feet, of which 13 only were immersed; a part of the propeller being constantly above the water. It was turned with a velocity of 95 revolutions per minute, by means of two high-pressure oscillating engines, working one crank upon the main driving shaft, without the intervention of gearing or bands; and the nominal power of the engines was 20 horses, though the effective power rarely exceeded 18½ horses. Though the proportions of this little vessel were not deemed favourable to a high speed, her length being only five times her beam, and her sectional displacement 28 feet, she was found, in a number of experiments, capable of beating all the steamers upon the Mersey, excepting the large sea-going vessels, and was proved to have a great superiority over other steamers in towing vessels out in a heavy sea.

Many observers have stated that the usual position of the screw-propeller, immediately before the stern-post, does not appear either to be disadvantageous for the application of the propelling power, or to interfere with the action of the rudder, and some have even contended that the propeller has the effect of increasing the efficiency of the rudder. Under the impression however that a contrary result takes place, it was proposed, in Maudslay's patent of 1843, to put the propeller behind the stern-post, in the position usually occupied by the rudder, and to employ two rudders, placed beneath the stern quarters, a little in advance of the propeller.

An important use to which screw-propellers have already been applied in a few instances, and for which it is highly probable that they may be extensively adopted, is as a mere auxiliary power, for occasional use during calms and contrary winds, to vessels which are ordinarily moved by sails alone, and which are not therefore to be regarded exactly as steam-vessels. An interesting example of this application is afforded by the new American packet-ship called the Massachusetts, which, though in all other respects a regular sailing vessel, fitted with conveniences of a very superior order, is provided with a small Ericsson propeller, 9½ feet in diameter, and has towards the stern of the vessel a steam-engine which can be set to work when required, of 170-horse power, capable of producing a speed of about 9 miles per hour in smooth water. The propeller is so constructed as to be raised out of the water when not in use. In sailing from Liverpool to America this vessel, in her voyage performed between October 22 and November 18, 1845, gained from five to thirteen days as compared with five other ships which sailed either on the same or on the following day. The cost of the motive power in this vessel was about two-sevenths of her total cost, which was about 16,000*l*. In a similar way an auxiliary screw-propeller is ordered to be fitted to the Amphion frigate, which was launched at Woolwich in January, 1846, and which, though she is to be furnished with a screw of 15 feet diameter, and engines of 300-horse power, which will render her quite efficient as a steam-vessel, has been built as a sailing ship, her construction having been commenced as long since as 1830. We believe the Amphion will be the first steam-vessel in the British navy with her machinery entirely below the water-line, as in the American frigate Princeton.

Those desirous of investigating the history of screw-propellers will find, in addition to much information in the report of the discussion which we have quoted, an ample chronological list of patents and inventions relating to the subject, from 1727, about which time a plan for propelling vessels up a river by means of a screw was contrived in France by M. Duquet, to the year 1843, in the 'Mechanics' Magazine,' vol. xxxix. p. 292, with addenda on pp. 340 and 360 of the same volume.

STEENHA'MMERA, a genus of plants belonging to the natural order Boragineæ. The calyx is divided into 5 deep segments. The corolla bell-shaped, with a short cylindrical tube with 5 minute protuberances in its throat. The stamens protrude beyond the throat, the filaments elongated.

S. maritima, the only British species, differs but little from *Lithospermum* except in habit. It has a procumbent branched stem, ovate, acute leaves, with rough, hard dots, glabrous, fleshy, and glaucous, having a taste resembling oysters. The nuts are smooth. The flowers in racemes and of a purplish blue colour.

(Babington, *Manual of British Botany*.)

STELLA, JACQUES, was born at Lyon, in 1596; his father, François Stella, who was also a painter, died when he was only nine years old. Notwithstanding the early age at which he lost his father, Stella is said to have had no other master. At the age of twenty he went to Italy, and at Florence he was employed by the Grand-Duke Cosmo II. to execute the decorations which were designed for the celebration of the marriage of his son Ferdinand II. Stella made many designs and painted several pictures for the grand-duke, who gave him apartments and allowed him a similar pension to that which he gave to Callot the engraver. After living seven years in Florence, Stella went to Rome, in 1623, and contracted a friendship with Poussin, of whom he became also an imitator.

While in Rome he was, by some treachery or misunderstanding, thrown into prison, and while in confinement he amused himself with drawing on the wall, in charcoal, the figure of the Virgin with the infant Jesus in her arms. A report of the excellence of the drawing reached the Cardinal Barberini, who went to see it, and from that time a lighted lamp was suspended over it and the prisoners performed their devotions before it.

In 1634 Stella returned by Venice and Milan to France, with the intention of visiting Spain. At Milan they offered him the directorship of the Academy with a view of retaining him in that city, but his object was to go to Spain, whither he had been invited by the king. Cardinal Richelieu however succeeded in detaining him in Paris; he procured him apartments in the Louvre, with the title of painter to the king and an annual pension of 1000 francs. In 1644 he was decorated with the cross of St. Michel and was elevated to the rank of principal painter to the king. He died at Paris in 1657.

Stella remained an imitator of the style of Poussin, but he did not go beyond the drawing and colouring of Poussin, and in the latter respect he exaggerated the defect of Poussin: many of his pictures are very red. He excelled in pastoral pieces, and in the sports of infants; he was also excellent in perspective and architecture. His chief defect was a want of expression. There are however several good pictures by him in some of the churches of Paris, and there are a few at Lyon.

The prints after Stella amount to several hundreds: his niece Claudine Stella has engraved fifteen pastoral pieces, fifty-two sports of infants, and three books of ornaments. Edelinck, the Poillys, Melan, and others have engraved some of his greater works. He etched five plates himself, which are very scarce, namely, the Descent from the Cross; a Madonna; a Saint George; a genre piece with infants dancing; and a large print of the ceremony of the Presentation of Tribute to the Grand-Duke of Tuscany, of the date 1621, which is very rare. Many woodcuts, apparently by P. Maupin, are marked 'Stella fecit,' but this alludes to the design, not the woodcut.

(Felibien, *Entretiens*, &c.; D'Argenville, *Vies des Peintres*, &c.; R. Dumesnil, *Peintre-Graveur Français*.)

STENEOSAU'RUS, a crocodilian genus of fossil Saurian animals from the Kimmeridge clay near Oxford. (Geoffroy.)

STENELY'TRA (Insects), the third family of heteromerous Coleoptera in the arrangement of Latreille. *Helops*, *Cistela*, *Dercæa*, and *Œdemera* are examples. They are usually oblong convex insects, with long legs and antennæ, which are thickened at their extremities. They live under the bark of old trees, or on leaves and flowers.

STERNBE'RGIA (Brongniart), the generic name for a singular group of fossil plants, supposed to be of the Palm tribe by Brongniart. Mr. Dawes has compared it to the interior of some tree stems in which the pith is transversely divided by diaphragms. It has been also named *Artisia* by Presl. It occurs in the coal formation.

STERNOPTYX, a genus of small fishes belonging to the order *Salmonidæ*, though very different in aspect from salmons or trouts. They have very elevated and much compressed bodies. They live in the warmer regions of the Atlantic Ocean.

STEWING is a process in cookery by which meat or vegetables are made fit for food by immersion in water of a high temperature for a considerable period of time. It differs from boiling by the temperature of the water not being allowed to reach 212° Fahr., and by being continued for a longer time. The effect is that of very thoroughly softening the substance used and the retention to a great degree of the flavour of the meat or of the spices added. These ends are accomplished by employing vessels with very closely fitting lids. The material of which these vessels is made is commonly copper; but for a small stew-pot silver is preferable, or the 'German enamelled stewpans, so safe, and so well suited, from the extreme nicety of the composition, resembling earthenware or china, with which they are lined, to all delicate compounds.' (Acton's *Cookery*.) Copper pans must be kept very clean, and the tinning always perfect. If this be rubbed off acid and saccharine liquids form poisonous compounds, which produce serious and occasionally fatal effects.

When several stews or made-dishes are prepared at the same time, a *bain-marie*, or water-bath, is the best apparatus. This is a flat vessel containing boiling water: all the stewpans are put into the water, which is to be kept always very hot, but it must not boil; the effect of this is to keep everything warm without altering either the quantity or the quality, particularly the quality.

'Gentle stewing is incomparably the best—the meat is more tender, and the soup better flavoured. By quick and strong boiling the volatile and finest parts of the ingredients are evaporated, and fly off with the steam, and the coarser parts are rendered soluble; so you lose the good and get the bad. The full flavour of the ingredients can only be extracted by long and slow simmering; during which, take care to prevent evaporation by covering the pot as closely as possible.' (Dr. Kitchener's *Cook's Oracle*.)

STICTA. [LIVERWORTS, P. C. S.]

STIEGLITZ, CHRISTIAN LUDWIG, was born December 12th, 1756, at Leipzig, in which city both his grandfather and father were persons of station, the former, who died in 1758, having been burgomaster, and the other holding the office of proconsul. Surrounded at home with objects of art, for his father possessed both a collection of pictures and a cabinet of medals and minerals, Stieglitz imbibed from them almost in his childhood those tastes which he so assiduously cultivated throughout life, although they were altogether remote from his other studies and occupations. Though he lost his father early (May 4th, 1772), in conformity with his wishes he applied himself to jurisprudence and other studies at the university of his native city, where he attended the courses of all the most eminent professors of that day, Ernesti, Winkler, Platner, &c.; and took his bachelor's degree in 1777, and in 1784 that of doctor of laws, on which latter occasion he produced his dissertation 'De Causis cur Jus Feudale Germanicum in Germania neglectum sit.' In the meanwhile he devoted all his leisure to literature and art, and in 1775 made his first essay in poetry, in which, if he did not distinguish himself, he continued occasionally to exercise his pen, for he contributed many pieces to a collection of Kriegslieder, or War Songs, published in 1778; and in 1801 he published 'Wartburg,' a poem in eight cantos, which appears to have attracted so little notice, that though bibliography has preserved its title, the production itself has obtained no permanent record in literary history. He also published some tales of romance and chivalry; but it was in a very different field from that of the poet or novelist that he gained his reputation and rendered essential service to a branch of literature which is more indebted to the labours of non-professional writers in it than of those who practise the art. It was in 1786 that he appeared, though then anonymously, as an architectural writer, with his 'Versuch über die Baukunst.' He next contributed to the 'Neue Bibliothek der Schönen Wissenschaften' several essays and minor treatises on various subjects relative to the æsthetics of architecture and decoration, one or two of which appear to have been also published separately. In 1792, the same year in which he was made a member of the Rathscollegium, or Council of Leipzig, he first brought out his 'History of the Architecture of the Antients' ('Geschichte der Baukunst der Alten'); and immediately afterwards engaged in a work of some extent, namely, his 'Encyclopædia of Civil Architecture,' in five volumes, the first of which appeared in 1792, the last in 1798. In the interim he brought out a work upon Modern Gardening, which came to a second edition in 1804. His next production was his 'Artistische Blätter' (1800), a collection of papers on Decoration. In 1804 he began to publish, under the title of 'Zeichnungen aus der schönen Baukunst,' a series of engravings, plans, and elevations, intended as select specimens of modern architecture; but though it was exceedingly well received—for not only did it come to a second edition, but there was also a French one—the choice compromised both his judgment and taste, the majority of the specimens partaking of that feeble and insipid mannerism which had just before prevailed in this country; and a great many of the subjects were taken from English publications—those, for instance, of Adam and Lewis—or showed English buildings, and among others such examples as the Trinity House, London, and the County Hall at Chelmsford. How he could reconcile them with his own theoretical principles is difficult to be understood.

Whether it was owing to his being satisfied with what he had then done for architecture, or afterwards dissatisfied with his last work, some years elapsed before he again published anything on the subject, turning in the interim to studies more professedly archæological; the fruits of which were an essay on 'Medals and Collections of Coins,' 1809, a treatise on the 'Pigments employed by the Artists of Antiquity,' 1818, and 'Archæologische Unterhaltungen,' 1820. In the same year with the last-mentioned publication came out his excellent work on 'Ancient or Mediæval German Architecture' (Alt-Deutsche Baukunst), which contributed not a little to direct attention to and inspire that taste for mediæval art and its monuments which has since struck root and grown up in Germany. His next work was his 'Geschichte der Baukunst,' a valuable compendium of the history of architecture from the very earliest periods, and among all nations; the first edition of which appeared in 1827, and the second, a greatly enlarged one, in 1837. Contrary to the opinion of Hirt [HIRT, P. C. S.], Stieglitz contends very strongly that Grecian architecture must have derived its principles and characteristics from an original construction of stone, and not of timber or wooden framing. The list of his literary labours is farther extended by his 'Distributio Nummorum familiarum Romanarum,' 1830, and his 'Beiträge zur Geschichte der Ausbildung der Baukunst,' 2 vols., 1834; and it would be prodigiously increased were it possible to enumerate all the various articles which he contributed to the 'Hermes,' the 'Kunstblatt,' and other journals; and to Ersch and Grüber's Encyclopædia. After having held the office of proconsul in the magistracy of Leipzig, and other appointments connected with the town government, Stieglitz retired from public duties in 1830, though he retained the title and distinction of proconsul; and in 1834 the '*jubilee*' or fiftieth anniversary of his obtaining his doctor's degree was celebrated by his townsmen, and a silver medal was struck and presented to him on that occasion. He died July 17th, 1836.

In Förster's 'Bauzeitung' for 1838 there is a portrait of Stieglitz accompanying a full memoir of him, which we have made use of for this article.

STIGLMAYER, JOHANN BAPTIST, the late distinguished director of the Royal Brass-foundry of Munich, was born October 18, 1791, at Fürstenfeldbruck, a small market-town near Munich, where his father carried on the business of a blacksmith. At Fürstenfeldbruck is an old convent founded by Ludwig the Strong, of Bavaria, in atonement for the hasty execution of his innocent wife Mary of Brabant, in 1250. This convent, which had undergone various changes, and had been at various times extensively decorated, was the school and academy of the barefooted blacksmith's son, though in his time it was a military stable for foals (Militär-fohlenhof). It contained stucco decorations by E. Asam, frescos by Appiani, statues by Roman Boos, and other works of the last century. This building, as already observed, was Stiglmayer's academy, and his collection of prints were the woodcuts of a book on natural history, which, with a catechism and prayer-book, constituted the whole library of his father. These woodcuts and the decorations of the convent were diligently copied by Stiglmayer, who, after many untiring visits (he was obliged to go daily for milk), at length ventured to introduce himself to the superintendent of the establishment, Herr Pfeiffer, who he had heard was not only himself a draftsman, but possessed also a collection of prints. Pfeiffer admired the boy's energy, and gave him some regular elementary instruction in design. After this he was placed by his parents with a goldsmith at Munich, of the name of Streissl, and he attended in the meanwhile the holiday school (Feiertagsschule), in which he obtained the first prize for industry and good conduct, amounting to 100 florins (8 guineas), by which he attracted the notice of M. Leprieur, the director of the Bavarian mint, who from this time took much notice of Stiglmayer, procured him admission into the academy in 1810, and became in a manner his patron. From the date of his admission into the academy, he pursued the regular course of study requisite for a statuary and sculptor, and at the same time practised seal and medal engraving. He was very successful in 1814 in a medal with Von Langer, the director of the Academy, on one side, and Moses making the water flow from the rock on the other, for which he was appointed one of the engravers of the mint, and he was sent in 1819, at the king's expense, to Italy to complete his studies.

It was in Rome that Stiglmayer's great patron, Ludwig, the present King of Bavaria (then crown prince), first became cognizant of his high abilities, and appears himself to have directed Stiglmayer's attention principally to metal-founding, in preparation for his own great undertakings already projected by him. In reference to this future occupation Stiglmayer repaired to Naples to witness the casting of the bronze colossal equestrian statue of Charles III., to be directed by Francesco Righetti and his son Luigi, from the model by Canova; tho Italian sculptor's reserve and jealousy however rendered Stiglmayer's journey in vain as regarded its principal object; he did not allow him to see the casting. But in another respect he was fully recompensed; after considerable trouble he obtained permission to erect a smelting-oven in his cellar, and having procured the assistance of Beccali, an experienced founder, then to be found in few even of the principal cities of Europe, he undertook the casting of several works himself. The first wholly failed, but the second, a cast from Thorwaldsen's bust of Ludwig I., then crown prince, was completely successful, so much so, that the journeyman, Pasquali, in his ecstacy kissed the lips of the bust before they were cool, and seriously burnt his own. After casting a few other works, and thus perfecting his practical acquaintance with the art, he left Naples for Germany, but on his road he had the misfortune to fall in with some banditti who robbed him even of his sketch-books. He returned to Munich in 1822, but was at this time employed chiefly in his capacity as engraver for the mint, and on some unimportant works of sculpture for the new Sculpture Gallery or Glyptothek then in progress. To the medals of this time belong that in commemoration of the marriage of the Queen of Prussia, for the minister Von Zentner, and the historical medal of the Royal family of Bavaria. Among his busts were those of King Maximilian I. and the Queen Theresa, Count Dörring, the ministers Baron Von Zentner, and Lerchenfeld, Bishop Streber, and others.

In 1824 he commenced preparations for his great series of metal castings, and from this time he was exclusively employed in founding the numerous monumental works which have been executed for Ludwig I., the present King of Bavaria, some of which are the most extensive castings of modern times. In order to be as well prepared as possible for his arduous tasks previous to casting any great monument, he visited Berlin in 1824, to witness the casting of Rauch's statue of Blücher, by Reisinger, who showed him everything in his power. Stiglmayer's great activity commenced with the reign of Ludwig I., in 1826, in the foundry established and afterwards much enlarged by the king, expressly for his own numerous undertakings in that important branch of art; and he left many, and the most considerable still unfinished, at his death. He was created in 1839 Knight of the Bavarian order of St. Michael.

The following is a brief summary of his labours:—from his own designs—the monument to the Brazilian children Juri and Isabella, and the reclining figure of the Fräulein Von Mannlich, in the cemetery at Munich; the monument of Maximilian I., in Bad Kreuth; and the monument of the parting of Otto, king of Greece, from his mother Theresa, queen of Bavaria, at Aibling: after Schwanthaler—the twelve colossal fire-gilded statues of the ancestors of the King of Bavaria, ten feet high, set up in the new throne-room of the palace of Munich; the statue of General Bekkers for his monument in Munich; the colossal monumental figures of Jean Paul in Bayreuth, Mozart in Salzburg, the Margrave Frederic of Brandenburg in Erlangen, and the Grand-Duke Ludwig of Darmstadt; and the gilt bronze pieces of table-service, with designs from the Nibelungen and Amelungen, for the crown-prince of Bavaria: after Thorwaldsen—the statue of Schiller at Stuttgardt, and the colossal equestrian statue of the elector Maximilian I. of Bavaria, at Munich: and, after Rauch, the monument of King Maximilian I. of Bavaria, before the theatre at Munich. He executed also the following architectural casts from models made in the foundry, chiefly from the designs of Von Klenze; the obelisk, 100 Bavarian feet high, in commemoration of the 30,000 Bavarians who fell in the Russian campaign of Napoleon in 1812; the bronze gates of the Glyptothek and the Walhalla; the great constitutional column at Gaibach; the interior pediments of the Walhalla, with the northern deities; the gilded candelabra in the new throne-room in Munich; the monument to the brave Oberländer, who fell at Sendling, in the cemetery at Munich; and the tomb of King Maximilian in the royal vaults (Fürstengruft) at Munich, after a design by the architect Ziebland. Besides the above works, which are completed, are the following important monuments which were in progress at Stiglmayer's death:—the colossal statue of Goethe, for Frankfort, after the model by Schwanthaler; and from the model of the same sculptor, the enormous colossal figure of Bavaria, nearly sixty feet high, to be placed before the Bavarian temple of Fame, or Ruhmeshalle (now in progress in the suburbs of Munich, and which will be completed in 1850). It is the largest statue in the world, measuring, with its pedestal, eighty feet; also, by Schwanthaler, tho monument of the late Grand-Duke of Baden, with a pedestal and four allegoric figures of the four circles of the dukedom; and the statues of Marshals Tilly and Wrede, for the new marshals' Loggia or Feldherrnhalle at Munich; and casts from Tenerani's models of the statues of Ferdinand, king of Naples, for Naples, and of Bolivar, for Bolivia, in South America.

Stiglmayer died March 2, 1844, on the day on which the statue of Goethe was cast by his nephew and assistant Ferdinand Miller. Stiglmayer had suffered from illness two years previous to his death, and many supposed it was owing to the unhealthy system of gilding by fire; but he died of cancer in the stomach, which Breslau, the king's physician, had previously declared to be the cause of his illness.

(*Kunstblatt*, 1844; Soeltl, *Bildende Kunst in München*.)

STIGMA'RIA, a genus of fossil plants allied to Lycopodiaceæ. Its dichotomous branches lie most frequently under beds of coal, whether Sigillariæ stand over these beds or not. It is most abundant in the lower parts of the true coal formation. (Brongniart.)

STILL, JOHN, the son of William Still, of Grantham, in Lincolnshire, was born in 1543, and became a student of Christ's College, Cambridge, where he took his degree as Master of Arts. In 1570 he was appointed Lady Margaret's Professor in the University: he afterwards held livings in Suffolk and Yorkshire, and was successively Master of St. John's and Trinity Colleges. In 1588 he was chosen prolocutor of the convocation; and, in 1592, he was raised to the bishopric of Bath and Wells, which he held till his death in 1607. Bishop Still is said by Fuller to have been 'one of a venerable presence, no less famous for a preacher than a disputant.' He left a large fortune, chiefly derived from lead-mines discovered in the Mendip Hills during his possession of the see. The historians of the drama concur in believing him to have been, in his youth, the author of a coarse but humorous play, which, till the recent discovery of 'Ralph Royster Doyster,' was held to be the earliest extant work known in England by the name of a comedy. It is called, 'A ryght pithy, pleasaunt, and merio Comedie, intytuled, *Gammer Gurton's Nedle:* played on stage not long ago, in Christe's Colledge in Cambridge. Made by Mr. S., Master of Art,' 1575. 'Gammer Gurton's Needle' is in Hawkins's 'Origin of the English Drama,' and in the second volume of Dodsley's 'Old Plays.'

STIPA, a genus of grasses belonging to the tribe Stipaceæ. It has stalked florets, the paleæ coriaceous, the inner entire.

S. *pennata*, the only British species, has a very long twisted feathery awn, with a glabrous base. It is a very beautiful plant, and is common in our gardens. Found on rocks in Long Seadale near Kendal.

(Babington, *Manual of British Botany*.)

STOCKADE, in Fortification, is the name given to a wall constructed by planting upright in the ground squared trunks of trees, or rough *piles* of timber, so as to inclose an area which is to be defended. The trunks or piles are planted close together; and at intervals of three feet from one another loop-holes are cut through them, or notches a few inches long are cut down, vertically, from the top, through which the defenders may direct a fire of musketry on the assailants. An inclosure of timber so planted is sometimes called a *Palanka*, from a name which is said to have been given by the Turks, when they first entered Europe, to their field-redoubts or small entrenched camps.

Stockades are still frequently constructed as temporary fortifications in countries which abound with timber, as in North America and the East Indies; and, among uncivilized nations, these, and rude parapets of earth, are the only kinds of fortification which have been executed. They were also, in general, the means employed by ancient armies while besieging towns, to protect themselves or to prevent the escape of the garrison. The walls with which the Peloponnesians surrounded Platæa during the siege and the blockade of that city were stockades consisting of palisades planted close together in a double line with a certain interval between the lines (Thucydides, ii. 75); and the fortresses of the Drilæ, a people inhabiting the shores of the Euxine Sea, are described by Xenophon (*Anab.* v. 3) as spaces surrounded by a ditch and embankment, on the latter of which were palisades and wooden towers.

The description of the Pahs, or Hippahs, of New Zealand, which is given in the accounts of Captain Cook's voyages, would nearly serve for the stockades within which the natives of that country very recently resisted the assault of a British force. It is stated that the works consisted of trunks of trees planted close together, with a small inclination towards the interior space; and that at intervals from one another, particularly at the angles of the works, there were scaffolds whose heights from the ground were three feet less than that of the top of the wall, so that the defenders were able to see the ground at the foot of the wall while they were concealed from the view of the enemy. In the interior there was usually a hollow place in which the women and children, with the provisions, were deposited. The pahs are generally on the summits of heights, and they are sometimes strengthened by outworks of a similar nature.

On the frontiers of the United States of North America, during a war, stockades consisting of roughly-hewn trunks of trees planted close together in upright positions and pierced with loop-holes for musketry, are very frequently constructed for the purpose of inclosing an area which is to be defended; and at each of the angles of the inclosure a sort of block-house, serving as a bastion to flank the stockade, is constructed with very thick logs of timber placed horizontally: these block-houses are sometimes formed with an upper story, the angles of which project over the sides of the lower one, so that by loop-holes in the projecting part of the floor a fire of musketry may be made upon the enemy when at the foot of the wall.

STOCKINGS. [WEAVING, P. C.]

STONE FOR BUILDING. The durability of stone may be examined in several ways, and results of much importance in the arts have been actually obtained by some late investigations set on foot for the purpose of determining on a proper stone with which to construct the New Houses of Parliament. In their natural repositories the surfaces of rocks are exposed to waste from chemical and mechanical agencies connected with the atmosphere and dependent on the climate. Rocks which are composed in any considerable degree of carbonate of lime or carbonate of magnesia—or which contain minerals into whose composition silicate of potash enters largely (as felspar),—are in general liable to be wasted by the solvent action on these substances of the carbonic acid gas in the atmosphere; and if such materials are transferred to buildings in great towns, the air, loaded with sulphureous and other acidulated vapours, is still less favourable to their preservation. Not only the feebly consolidated chalky rocks (like that of Mesterham), but the more solid Oolites of Bath and Portland, have failed to withstand the injurious atmosphere of London; nor is even the firmest mountain limestone of Derbyshire or half-crystallized and half-coralloid marble of Plymouth capable of preserving its edges and angles from slow decay and erosion, even in the pure air of the elevated and stormy Peak or the comparatively low and tranquil regions of Devonshire. Even the purest crystallized marbles of Attica or Carrara, which may endure in the sunny regions of their birth, cannot be exposed without injury to the moist and variable climate of Britain.

If, despairing to find a perfectly durable limestone, we turn our attention to other classes of rocks, we find other causes of decay equally influential on them. The most abundant of these is the class of sandstones which comprises every degree of bad quality, but scarcely the highest degree of good—the imperceptibly decaying millstone grit of the Druidical Pillars at Boroughbridge, and the rapidly mouldering red sandstone to which the architectural beauties of Carlisle, Chester, and Coventry have been unfortunately trusted.

Granite scarcely merits universally, nor even generally, the reputation of a very durable stone in Britain. Some of the Cornish and Devonian granite is of little permanence, much of that in Cumberland and the island of Arran is quite perishable, nor is all the stone of Killiney, near Dublin, free from the same reproach.

The decay of granite is usually ascribable to the unequal action of the atmosphere on its dissimilar and unequally resisting ingredients. The felspar often decays through the chemical action of carbonic acid on the potash, and then the powers of heat and cold, of alternate wetness and dryness, sunshine and shade, complete the disintegration. Similar remarks apply to many sandstones, for these often contain disseminated felspar, and in a state more easy to be acted on than that which is compacted with the quartz and mica of granite. The arenaceous rocks however yield with too much facility to the hygrometric and other changes of the atmosphere, and except we can obtain almost purely quartzose sandstones with almost confluent grains we cannot be confident of their durability. Now, such sandstones, like the harder granites, are unfitted for architecture, however useful for walls, paving, and other rough purposes.

STONE FIT FOR BUILDING must in general be freestone firm enough to sustain great pressure, and yet so aggregated as to admit of being worked with facility by ordinary tools, and of receiving correct surfaces in any direction. It must in general yield masses of great dimensions. Its colour is of consequence to the architect, who is necessarily attentive to this element of effect: and the colour which belongs to the stone is very often, indeed generally, modified in buildings by the growth of lichen, the access of moisture, and the change of oxidation of the contained iron. By so many conditions, indeed, is the choice of stone limited in a particular case, that very few samples can be really placed in competition.

In the great variety of limestones and sandstones which are adapted for building purposes, we remark, by the aid of the microscope, three principal modes of molecular aggregation: *mixtures* of grains; *segregated concretions* of grains; and *compacted* crystallizations.

To give an idea of the applicability of this classification, we may shortly review a small series of examples of limestones and sandstones arranged in a geological sequence. None are mentioned except such as have been extensively used. Those which are not really freestone or which have not been found tolerably durable are inclosed in parenthesis.

Geological age.	Sandstones	Limestones.
Cainozoic	Sarsen stone used in Stonehenge. A *mixed* mass. It hardens on the surface by exposure.	(The fresh water limestone of the Isle of Wight, and the crag of Suffolk are used, but are not freestone.)
Mesozoic	(The freestone of Surrey; a mixed mass. It has decayed in the churches of London.)	(The white chalk, though not durable, is used. It is a *mixed* mass.)
	The 'calcareous grit,' as it is called, of Yorkshire. It is a mixed mass (with little or no carbonate of lime). It is used at Duncombe Park; hardens by exposure.	The *concretionary* oolites of Purbeck and Portland, of very unequal quality; some durable, as the castle at Weymouth. Whitehall is an example of decay in Portland stone.
	The 'Kelloway' rock of Yorkshire: a soft mixed mass, very slightly calcareous; hardens by exposure. Durable in the vicinity of Hackness.	(The oolite of Oxford; concretionary, but not generally durable.)
	The ferruginous sandstone of the inferior oolite: a mixed mass; is much used in the Midland Counties, and is often found in old churches well preserved, *e. g.* Northamptonshire.	The oolites of Bath, the most purely *concretionary* of the class. Ketton stone, which appears durable, is a mass of globular concretions. Bath stone is partly even in texture, and partly 'rag' or uneven. The latter was used by the Romans, and is the most durable. Barnack stone is like it, and is very durable in churches near Stamford. Much of the oolite of Lincolnshire is very good, and its grains are immersed in clear calcareous spar. The Romans quarried it at Ancaster. The same spar cemented oolite occurs in other counties.
	The new red-sandstone of Penrith, mixed, durable in the old Castle, Giant's grave, &c. (Other specimens of finer grain are among the worst stones of the kingdom.) A light coloured sort, called 'Keuper,' quarried near the Malvern Hills, is durable.	
Palæozoic	(Few of the sandstones of the coal-formation are of much durability, though many are of great beauty.) In the lowest part of the coal strata are good firm, rather coarse-grained, mixtures, as near Leeds; and below these the well known millstone-grit, the base of the northern coal-fields. This stone was used by the Britons and Romans in the north of England. In the natural rocks of Brimham, the Devil's Arrows of Boroughbridge, and the abbeys of Kirkstall and Fountains, it has not well resisted the atmosphere; but its decay is slow.	The magnesian limestone, a *crystallized* mass, varies in its *compactness*. It varies also in texture, from a confused aggregation of crystallized grains, to a small cellular texture, the walls of the cells being composed of small crystals; and finally to a largely cellular mass, the interstices of the cells being either compactly crystallized or filled with a soft earthy mass. In fine examples of this stone, as those of Mansfield, Bolsover, Anston, Roche, and Huddersfield, the chemical constitution is nearly the same (one atom of carbonate of lime to one atom of carbonate of magnesia), and it is in the mode of aggregation that we are to seek the explanation of the very superior durability of these to nearly all the other magnesian limestones.
	In the series of strata above the mountain-limestone of Derbyshire, the sandstone in the vicinity of Chatsworth and Darley Dale is remarkable. Firm, of good texture and colour, and very extensively deposited; its use at Chatsworth and Buxton has made it well known. It is generally durable, but particular cases of failure occur. Stones of nearly corresponding age and of great durability have been much quarried near Barnard Castle and Bowes.	The thick beds of the mountain-limestone are often used for building, but seldom very tractable in ornamental work, except the processes of the marble-mason are adopted or imitated. It is one of the most durable of limestones, though generally only a mixture of grains. These are in a considerable proportion of organic origin. The magnesiferous varieties of Derbyshire have more the character of ordinary freestone than the other varieties.

In considering even the few cases here adduced, we find mixed, concretionary, and crystalline textures, some of which are durable, others perishing. Mixtures of very unequal or very dissimilar parts, as millstone-grit; concretions which have earthy textures in their interstices, as some oolitic limestones; crystallizations which do not produce compactness, as in some magnesian limestones,—are not in general durable. But equal mixtures, as the Sarsen sandstone, the Craigleith sandstone, and some mountain-limestones; concretions of adherent globules, as the oolite of Ketton; concretions of globules cemented by sparry interstices, as the oolite of Ancaster; and crystallizations with uniformly adherent grains, as in the magnesian limestone of Bolsover,—these appear to be durable. The microscope may determine in many cases between one class and the other. Additional evidence may be obtained by exposing masses of stone to frost and sunshine, rain and wind, to imbibition of salts which expand in crystallization, and to mechanical pressure. And there remains one further class of evidence more important than all the rest—and that is *experience*. By observing how the various sandstones and limestones have behaved in castles and abbeys, and churches, we may attain with the highest probability a correct estimate of their intrinsic durability.

The commissioners (Mr. Barry, Sir H. De la Beche, and Dr. W. Smith) who reported on the choice of stone for the construction of the New Houses of Parliament, have neglected none of these considerations, and their report, certainly the most valuable document which has ever appeared on this subject, embodies a great mass of valuable statistical information on the most famous quarries; accurate notices of the most remarkable buildings which were constructed from them; and chemical analyses and mechanical experiments on the stone. The strength of several sorts of stone, as measured by the weight necessary to be applied for breaking and crushing them, appears below:—

	Resistance to Fracture.	Resistance to Crushing.	Name of Stone.
Sandstones	60	111	Craigleith.
	88*	106	Darley Dale.
	56	107	Park Spring.
	48	70	Keaton.
	38	71	Binnie.
Oolites	50	127*	Ketton rag.
	30	55	Portland.
	22	57	Hambill.
	24	33	Ancaster.
	16	25	Barnack.
	18	21	Box.
Magnesian Limestones	70	117	Bolsover.
	36	74	Mansfield.
	34	61	Huddlestone
	24	55	Roche.
	20	23	Cadeby.

The asterisk is placed to two numbers. One refers to the sandstone of Darley Dale, which bore the greatest weight previous to the first fracture, and the other to the Ketton rag, which bore the greatest weight before crushing (this can hardly be an average specimen of the stone). Of sixteen specimens selected, the stone most absorbent of water was proved to be the Bath oolite from Box; that most injured by Brard's artificial process of disintegration was the Barnack stone: and that which was most easily crushed was the Bath oolite from Box. Generally speaking, sandstones were least absorbent, magnesian limestones least disintegrating; sandstones appeared to be strongest, though choice magnesian limestones (as that of Bolsover, finally recommended by the Commissioners) were fully equal in this respect, and were almost as little absorbent. (*Report of the Commissioners*, 1839.)

A few remarks on the appearance presented by stones in decay may be of service to guide further observation. Stones of uniform texture commonly decay by disintegration at the surface, losing grain by grain in proportion to time and exposure. But they sometimes suffer a singular change, as if *baked* at the surface. An external enveloping crust is thus formed, as at Stonehenge, where the interior is soft, but the exterior hard. This process appears to render such a stone durable. But if carried further, so as to produce a new texture of the surface, the external shell separates from the interior mass, desquamates and falls off, leaving a rough soft inner core. This happens even to moulded surfaces like those of balusters. Stones composed of parts unequally mixed suffer unequal waste in different parts. Shells, corals, concretions, and crystallized masses, thus appear prominent from earthy limestones, and indicate the general fact that, in proportion the force of molecular aggregation in the stone, is the resistance which it offers to decay.

Again, the circumstances under which a stone is exposed in a building influence its conservation. It is not the amount but the kind of exposure which governs the decay. The southern and western parts of our cathedrals yield, while the northern and eastern resist. Prominent cornices often are perfect, while below them the mouldings are reduced to shreds. The drip-moulding remains and is even hardened, while the parts which it was destined to protect have mouldered away. This has actually occurred to the observation of the writer in the space of only a few years. In fact since 1839 the same pieces of magnesian limestone remain perfect in the drip-moulding, showing every chissel-stroke, while the whole ornamented surface below is ruinously decayed.

STONE, NICHOLAS, master mason to Charles I., was born at Woodsbury, near Exeter, in 1586. He lived three years in London with one Isaac Jones, his master, and then went to Holland, where he worked for Peter de Reyser, whose daughter he married. He returned to England about 1614, and was for many years chiefly employed in making monuments for the nobility and gentry. In 1619, he was appointed master mason for building the new Banqueting House of Whitehall, on which he was engaged two years at 4 shillings and 10 pence per day; and in 1626, at the commencement of the reign of Charles I., he was appointed master mason of Windsor Castle. The patent is in Rymer's 'Fœdera,' vol. xviii. p. 675. The history of Stone's works is fully recorded by himself in a pocket-book, which was in the possession of a Mr. Hawksmore, and of which Vertue obtained a copy. This pocket-book contained a full account of the various monuments he had executed, with the sums of money he received for them, and the names of the persons for whom they were constructed.

According to this book, Stone erected in 1641 a monument to the Earl of Ormond, at Kilkenny, for which he received 400*l.* He received in the following year 500*l.* for a monument to Henry Howard, earl of Northampton, erected in Dover Castle. For a tomb made for Lucy Harrington, Countess of Bedford, 1616, he bargained for 1020*l.*, besides the charges for carriage and iron and setting up. This year he went to Scotland; and he gives the following account of his transactions there:—July, 1616, was I sent to Scotland, where I undertook to do work in the King's Chapple and for the King's Closett, and the organ, so much as came to 450*l.* of wainscot-worke, the which I performed and had my money well payed, and 50*l.* was given to drink, whereof I had 20*l.* given me by the king's command." He mentions drink-money on other occasions. Stone made several monuments for Westminster Abbey; among them one to Spencer, the poet, for which the Countess of Dorset paid him 40*l.*

In 1625, he made for the old Exchange of London four statues—Edward V., Richard III., Henry VII., and Queen Elizabeth, which was afterwards removed to Guildhall gate. For the three kings he received 25*l.* each, for the queen, 30*l.*; 25*l.* appears to have been Stone's ordinary charge for a statue, including the pedestal.

Stone received altogether nearly 11,000*l.* for the various monuments erected by him. The various sums for monuments noted in his pocket-book, amount altogether, according to his kinsman, Charles Stoakes, from whom Vertue acquired his information concerning Stone's family, to 10,889*l.* Walpole has given a list of the principal monuments, and mentions some architectural works by Stone. He died August 24, 1647, aged 61, and was buried in St. Martin's Church, where there is a slab to his memory with an inscription and his profile. His wife and his son Nicholas are buried in the same grave: they both died in the same year a few months after him. Stone had three sons, Henry, Nicholas, and John.

HENRY STONE, known as *Old Stone*, probably because he was the eldest, was a statuary and painter, but he was chiefly engaged in painting. He studied in Italy and the Netherlands, and made many excellent copies of celebrated Italian and Flemish pictures; there is a large copy at Hampton Court of the celebrated picture, by Titian, of the Cornaro Family, now in the possession of the Duke of Northumberland. He lived in Long Acre in the same house that was his father's, which he rented of the crown for 10*l.* per annum. He died in 1653, and was buried near his father; and the following inscription to his memory was placed in the church by his brother John:—"To the memory of Henry Stone of Long Acre, painter and statuary, who, having passed the greatest part of thirty-seven years in Holland, France, and Italy, atchieved a fair renown for his excellency in arts and languages, and departed this life on the 24th day of August, A.D. 1653, and lyeth buried near the pulpit in this church." Here follows some laudatory verses. Old Stone wrote a book, entitled the 'Third Part of the Art of Painting,' taken mostly from the ancients. Vertue, who saw this book, was uncertain whether the two former parts were composed by Stone, or by some other author.

NICHOLAS STONE, the second son, who was a statuary, also studied abroad and modelled many excellent copies of celebrated works. Mr. Bird, the statuary, says Walpole, had the 'Laocoon' and Bernini's 'Apollo and Daphne' in terra-cotta by him. He returned to England in 1642, and died in the same year as his father, as noticed above. Vertue saw a book of drawings by him of many buildings in Italy.

JOHN STONE, the youngest, was also a statuary, though he was originally designed for the church, and was educated at Oxford. In the civil war he entered the King's army, and narrowly escaped being taken. He concealed himself for a year in his father's house without his father's knowledge, and at length contrived to escape to France, where he probably took to the arts, as he was afterwards engaged in partnership with his brother Henry. He wrote a manual on Fortification, which he called 'Enchiridion'; it contained many small cuts etched by himself, but without his name. He died soon after the Restoration. In St. Martin's Church, below the inscription to Henry Stone, is the following addition, with the date June, 1699:—

'Four rare Stones are gone,
The father and three sons.

In memory of whom their near kinsman, Charles Stoakes, repaired this monument.'

(Walpole, *Anecdotes of Painting in England*, &c.)

STORM-SAILS. [SAILS, P. C. S.]

STORMS. [TORNADO, P. C.; WHIRLWIND, P. C.]

STORY, JOSEPH, a judge and juridical writer known to law students as Mr. Justice Story, was born on the 18th September, 1779, at Marblehead, in the State of Massachusetts, U.S. He received the rudiments of learning in his native town; entered Harvard University in 1795, and took a degree there in 1798. He commenced his law studies under Mr. Sewell, of the bar of Marblehead, subsequently chief justice of Massachusetts, and continued them under Mr. Putnam, of the bar of Salem, who became a judge of the same court. In 1801 he was called to the bar, and speedily obtained extensive practice. In an article in the 'Law Review,' the author of which enjoyed his friendship, it is stated that, 'from political considerations, he was very early engaged in important causes, in which he had to combat with the most eminent lawyers as his opponents; and, not unfrequently, he sustained the contest alone. His reputation at the bar has never been surpassed by that of any of the eminent lawyers of whom the United States can boast.' In 1805 he became a member of the State Legislature of Massachusetts, as representative of Salem. He continued a representative until his accession to the bench; and he then was elected to the office of Speaker. In 1809 he was chosen a member of Congress, as representative of the Essex South District. He acquired a high reputation as a politician and a forensic debater. In November, 1811, he was appointed an Associate Justice of the Supreme Court of the United States: 'The jurisdiction of this court,' says the authority already cited, 'both original and appellate, embraced an infinite variety of subjects. It had to administer, besides the municipal laws of the States, the common, and much of the statute law, as well as the system of equity jurisprudence of England; it had to administer parts of the law of Spain, and of the code civil adopted in the State of Louisiana. Again, it reviewed the final sentences of courts deciding questions of maritime and prize law. Its decisions, therefore, would be of still greater and more general importance, for they would contribute to the exposition of the law of nations. The peculiarities which in some important particulars distinguish the local laws of the different States also required a correct application of the principles which determined, when any case presented a conflict of those laws, the law which ought to be selected and govern the decision of the case.' These special advantages were an addition to the opportunities which the general character of the legal practice of America afforded, to one able to grapple with the subject, to treat the philosophy of international law with a wide view to its practical application. The American lawyers having to deal with a system of which the roots were diversified, although undoubtedly the law of England formed the principal proportion; requiring to adapt their practice to the mutual relations of the citizens of several states, each, to a great extent, entitled to make its own independent code of laws, while all were bound together by a mutual tie, and the usual means of finding redress where there were important legal conflicts—force—was inconsistent with the principles of their Union; inheriting, at the same time, that spirit of the strict interpretation of precedent which is so dear to English lawyers, and living among a free people, whose institutions could not easily be bent to meet expediency—it was clear that the American bar afforded the best opportunity for inquiries regarding international law on practical principles, whenever a genius sufficient for the task should there appear. It appeared in the person of Story, whose 'Commentaries on the Conflicts of Laws,' published in 1834, have passed through several editions, and have carried his reputation over all Europe. Even in England, where, owing to the vast extent of the domestic legal literature, that of other countries is less esteemed than in France, Germany, and Scotland, Story's work has obtained a high reputation; and on the occasion of his being expected to pay a visit to Britain, which bad health prevented, the masters of the benches of the inns of court in London resolved to invite him to a public entertainment. He wrote several other legal treatises—one on the law of Agency, in 1839; on the law of Partnership, in 1841; and on the law of Bills of Exchange, in 1843. In 1830, he was appointed to fill the newly founded chair of jurisprudence in Harvard University. It was during the time that he held this professorship that he wrote his numerous legal treatises; which besides those mentioned above comprehend a work on the Law of Bailments, one on Equity Jurisprudence, and a work on Equity Pleading. He died on the 10th September, 1845.

(*Law Review*, No. VI. 366-380; *American Almanac*, 1846.)

STOWELL, WILLIAM SCOTT, BARON, was the elder brother of Lord Chancellor Eldon, and the eldest son of Mr. William Scott, coalfitter, of Newcastle, by his second wife, Jane, daughter of Mr Henry Atkinson, who was of the same profession. [ELDON, EARL OF, P. C. S.] He was born on the 17th of October, 1745 (O.S.) at Heworth, a village on the Tyne, about three miles below Newcastle, and in the county of Durham, to which his mother had been sent a few days before, in the apprehension excited by the advance of the Scotch rebel army after the battle of Prestonpans. Egress in any common way being impracticable, they had been obliged, it is related, to hoist her in a sort of basket over the town wall, which then ran along the quay, separating Mr. Scott's house in Love Lane from the river, where a boat was in readiness to receive her. At Heworth she was safely delivered of twins; William, and a daughter, who was named Barbara and died in infancy.

William was educated with his two younger brothers, Henry and John, at the Royal Grammar-school of Newcastle, under the Reverend Hugh Moises. Moises is said to have been principally instrumental in getting both William and John sent to college. William entered the University of Oxford in February, 1761, standing for and obtaining a scholarship at Corpus Christi College, for which the circumstance of his having been born in the county of Durham rendered him eligible. Having taken his Bachelor's degree on the 20th of November, 1764, he was on the 13th of the following month elected a Probationary Fellow of University College; and it is remarkable that for his eligibility on this occasion likewise he was again indebted to the accident of his being a native of Durham. He was now also elected by the same society a College tutor in the room of the already celebrated linguist William (afterwards Sir William) Jones, who had recently left Oxford for the metropolis. In 1767 he took his master's degree; and in May, 1772, he proceeded B.C.L., having by this time determined upon following the profession of an advocate at Doctors' Commons. He had already, with a view to the study of the law, entered himself at the Middle Temple, in June, 1762. He was detained at the University however a few years longer than he otherwise would have been by being elected in 1774 by the members of convocation after a contest, to the office of Camden Reader of Antient History. The lectures which he delivered in this capacity attracted crowded audiences, and brought him into high and wide reputation. It is said that they still exist in manuscript.

At last, in 1776, he retired from the office of College tutor; but he still continued to reside at the University till after he had taken his degree of D.C.L., which he did in 1779. On this occasion, in the University phrase, he went out grand compounder, which means that he paid the higher fees exacted from graduates worth 300*l.* a-year. He had, no doubt, saved money from his income as Fellow, and his constantly increasing receipts during the twelve years that he held the office of College tutor; but it is to be remembered that he had also inherited a considerable property from his father, who died in 1776. It was probably the independence to which he was thus raised that determined him to resign his employment as a college tutor; but it appears that old Mr. Scott's wealth was not quite so great as it has been stated to be by Mr. Twiss in the first and second editions of his 'Life of Lord Eldon.' He left somewhat less than 20,000*l.*

He now entered at Doctors' Commons, and passed another year partly in Oxford, partly in London, the rule being that no one shall practise as an advocate till the expiration of that space of time after his admission, which accordingly is called his year of silence. Dr. Scott was called to the bar in February, 1780. He was admitted into the Faculty of Advocates at Doctors' Commons, according to Mr. Surtees in one place in November, 1779, in another place not till the spring of 1780 (*Sketch*, pp. 26 and 61). So early however as in December, 1778, he had been elected a member of the famous Literary Club, having been mainly indebted for that distinction to the favour of Dr. Johnson, to whom he had been introduced in University College by their common friend Chambers, afterwards Sir Robert, and now a judge in India. Scott soon became a favourite with Johnson, whom he had accompanied from Newcastle to Edinburgh, when the latter set out on his tour to the Hebrides, in the autumn of 1773. With the patronage of Johnson, and his own 'clubable' qualities, Scott rapidly made his way to distinction in the most intellectual society of the English capital.

His talents and learning, and the reputation he had brought from the University, brought him a large practice in his profession from his first entrance upon it. And his success as an Advocate in no long time led to promotion. In 1783 he was appointed to the office of Registrar of the Court of Faculties. In 1788 the Bishop of London appointed him Judge of the Consistory Court; and the Archbishop of Canterbury, his Vicar-General, or Official Principal. In the same year he was made Advocate-General, and knighted, and was also nominated a Privy Councillor. In 1790 he was nominated by the archbishop Mastor of the Faculties. Finally, in 1798, he was made Judge of the High Court of Admiralty.

Meanwhile, after having in 1780 been disappointed in his expectation of being sent into parliament as representative of the University of Oxford, and having been unseated on a scrutiny in 1784, when he had been returned for Downton, he had been a second time returned for that nomination borough, in 1790, through the influence of ministers with the patron, the Earl of Radnor. He was again returned for Downton to the next parliament, which met in 1796. At last in March, 1801, on a vacancy occurring by the retirement of Francis Page, Esq., he obtained the object of his early ambition by being elected member for his University; and that seat he retained as long as he continued a commoner.

He had had reason to expect that he would have been raised to the peerage in 1805; but some unexplained court intrigue interfered, and he was not ennobled till the 21st of July, 1821, when he was created Baron Stowell, of Stowell-park. He retained his place on the bench till Christmas, 1828. For the two last years of his life he was reduced to a state of mental imbecility; and he died at his seat of Early Court, Berks, after an illness of a few days, on the afternoon of Thursday, the 28th of January, 1836, in his ninety-first year. He had been twice married; first, in April, 1781, to Anna Maria, eldest daughter and co-heiress of John Bagnall, of Early Court, in the county of Berks, Esq., who died in September, 1809; secondly, on the 10th of April, 1813, to Louisa Katherine, Marchioness Dowager of Sligo (widow of the first Marquess and daughter of Earl Howe), his acquaintance with whom had originated, singularly enough, in the circumstance of his having presided in the preceding December at the Admiralty Sessions at the Old Bailey, on the trial of her son, the late Lord Sligo, for inveigling some seamen from one of the king's ships to serve on board his yacht (for which he was sentenced to pay a fine of 5000*l*., and to be imprisoned four months in Newgate). This last proved a very unsatisfactory connection; but the lady died in August, 1817. By his first wife Lord Stowell, besides a daughter who became the wife, first, of Thomas Townshend, Esq., secondly, of the late Viscount Sidmouth, had a son, William, who died at the age of forty-two, about two months before the death of his father.

Lord Stowell is the highest English authority in his own department of the law, including both ecclesiastical law and the law of nations, if not the highest of all authorities upon the particular questions which he had occasion to consider and decide; for, having produced no complete treatise upon either of the branches of jurisprudence which he administered, he must be distinguished from the great text-writers, between whom and him no comparison is properly admissible. His judgments in the Consistory Court have been reported very ably and carefully by Drs. Haggard and Phillimore; those delivered by him in the Court of Admiralty, in an equally superior manner, and, in part, with the advantages of his own revision, by Drs. Robinson, Edwards, Dodson, and Haggard. Their characteristics are the most complete mastery of all the learning of his subject, great comprehensiveness of view, a penetrating sagacity in the disentanglement of the essential points and governing principle of a case from the confusion and sometimes apparent contradiction of details and accessory circumstances, a remarkable faculty of luminous and striking illustration, and all this combined and set off with a diction generally of much precision, elegance, and expressiveness, though occasionally somewhat diffuse and rhetorical. Some of Lord Stowell's judgments may be called almost revelations of the law, being expositions of large and intricate questions which had never before been thoroughly investigated, but which he has completely cleared up and set at rest.

As a politician this distinguished lawyer was, like his brother, Lord Eldon, an uncompromising Conservative, shrinking from all change as only the beginning of universal ruin. Except, however, by giving his steady vote in support of his party and his principles, he very rarely took part in the proceedings of either House of parliament. During the first six years that he sat in the House of Commons, he only spoke once; of some two or three displays which he afterwards made, a speech of three hours' length, which he delivered on the 7th of April, 1802, on moving for leave to bring in a bill for amending the statute of the 21st of Henry VIII., respecting the non-residence of the clergy, was the most memorable. He was also instrumental, however, in carrying through the House several other measures having a reference to the established church, of which he was the supporter on all occasions, considering himself indeed as a sort of representative of the clergy, both in his quality of member for the University of Oxford, and from his office as an ecclesiastical judge.

(Memoir by Mr. Townsend in *Law Magazine*, No. xxxiii., reprinted, with some alterations and additions, in the *Annual Biography and Obituary* for 1837; article on Lords Stowell and Eldon in *Law Review*, vol. i.; Lord Brougham, *Historical Sketches of Statesmen*, second series; *Sketch of the Lives of Lords Stowell and Eldon*, by William Edward Surtees, D.C.L., 8vo. 1846; Anecdotes of Lord Stowell, in *Gentleman's Magazine* for October, 1846.)

STRATIO'TES, a genus of endogenous plants belonging to the natural order Hydrocharideæ. It has a 3-parted calyx and 3 petals. The male flower has 12 or more stamens surrounded by numerous abortive ones. The female has 6 deeply bifid styles. The berry is inferior, 6-celled, and many-seeded.

S. aloides, Water-soldier, has sword-shaped triangular ciliate spinous leaves. The root creeps extensively in the mud, and sends out rigid leaves like those of an aloe. The stalk is compressed, 5 or 6 inches high, with two leaves near its summit. The flower is white and delicate. It is a very ornamental aquatic plant, and is found in ditches in the east of England. It remains under water during the greater part of the year, but raises itself to the surface on special stalks during the season for fertilizing the seeds.

(Babington, *Manual of British Botany*; Burnett, *Outlines of Botany*.)

STRENGTH OF PILLARS. [FLEXURE OF COLUMNS, P. C. S.]

STREPSI'PTERA, a very extraordinary order of insects, remarkable for having the anterior wings transformed into a pair of short, slender, contorted appendages, whilst the posterior are very large and fold in the manner of a fan. The mouth is armed with two slender acute jaws and two 2-pointed palpi. The tarsi are 2- 3- or 4-jointed. The larva is vermiform and has no feet. The pupæ are inactive. They are all very small creatures, the largest not so long as a quarter of an inch. The larvæ are parasitic on the bodies of wasps and bees; the perfect insects are very short-lived, but very active.

These insects are the *Rhipiptera* of Latreille, the *Diptera Rhipidoptera* of Lamarck. Their systematic position has been much debated.

They were first observed by Mr. Kirby, who gives the following account of his discovery:—Observing acarus-like animals infesting the abdomens of various Andrenæ, he attempted to remove one, and to his surprise drew from the body of the bee a white fleshy larva a quarter of an inch long, the head of which he had mistaken for an acarus. 'How the animal receives its nourishment seems a mystery. Upon examining the head under a strong magnifier, I could not discover any mouth or proboscis with which it might perforate the corneous covering of the abdomen, and so support itself by suction; on the under side of the head, at its junction with the body, there was a concavity; but I could observe nothing in this but a uniform unbroken surface. As the body of the animal is inserted in the body of the bee, does that part receive its nutriment from it by absorption? After I had examined one specimen, I attempted to extract a second; and the reader may imagine how greatly my astonishment was increased when, after I had drawn it out a little way, I saw its skin burst, and a head as black as ink, with large staring eyes, and antennæ consisting of two branches, break forth and move itself briskly from side to side. It looked like a little imp of darkness just emerging from the infernal regions. I was impatient to become better acquainted with so singular a creature. When it was completely disengaged, and I had secured it from making its escape, I set myself to examine it as accurately as possible, and I found, after a careful inquiry, that I had not only got a nondescript, but also an insect of a new genus, whose very class seemed dubious.' (*Monographia Apium Angliae*, vol. ii. p. 111.)

Stylops and *Xenos* are the genera of this order. For full information consult the writings of Kirby, Curtis, and Westwood.

STRIGOCE'PHALUS, a genus of fossil Brachiopoda from the Devonian strata of Plymouth, the Eifel, &c. (Defrance.)

STROBILI'TES, a genus of fossil fruits from the Cretaceous and Oolitic strata of England. (Lindley.)

STROMATO'PORA, a fossil genus of corals from the Silurian and Devonian strata. (Goldfuss.)

STROMBO'DES, a fossil genus of corals from the Silurian, Devonian, and Carboniferous limestones. (Schwrigger.)

STRO'PHODUS, a genus of fossil fishes, including many species from the Oolitic and Cretaceous strata of England. (Agassiz.)

STUERBOUT, DIERICK commonly called DIRK VAN HAARLEM, was born at Haarlem, in the early part of the fifteenth century. He is perhaps the oldest of the Dutch painters, and one of the best of the early masters. The two large works by him in the Royal collection at the Hague are wonderful works for their time, and, independent of their age, are two of the most interesting pictures in the European collections. They were at one time attributed to Momling, whose works they somewhat resemble; their history however is now well known, as they and their master are mentioned in some MS. Annals and Antiquities of Louvain discovered by M. de Bast. The pictures were preserved at Louvain until 1827.

These pictures are called, in the catalogue of the gallery of the King of Holland, the first and second pictures of the Emperor Otho and the Empress Mary. Their subject is from a story of the old chronicles of Louvain, called the Golden Legend; the event took place in 985. The Emperor Otho III., on his return from a journey to Rome, condemned at Modena one of his courtiers, an Italian count, to death, in consequence of an accusation from the empress (which was false), that he had attempted her honour. The count was beheaded, but immediately afterwards his widow, with his head on one arm and a red-hot iron which she holds with impunity in her other hand (an infallible proof of her husband's innocence), on her knees supplicates the emperor for justice. The emperor, being convinced by the fire ordeal of the count's innocence, orders the empress to be burnt at the stake.

From this tradition Stuerbout painted two pictures for the Town-hall of Louvain in 1468, on wood, each 117 inches French, by 66; the figures are about the size of life. In the first picture the emperor is listening to the false accusation of the empress, and the count is being led out in his shirt to execution; the actual beheading is represented in the distance. In the second picture the widow is kneeling before the emperor with the head of her husband and the red-hot iron in her hand, and in the distance of this piece the empress is being burnt at the stake; in both pictures are various attendants. The execution is in the style of the Van Eyck school, and is extremely elaborate, especially in the second piece, which is superior to the first.

These pictures were fixed on the wainscoting of the Justice-hall at Louvain, and by each was a pannel containing an explanation of the subjects in the Flemish language, and in gold Gothic letters. They were very dirty, and fast approaching decay, when in 1827 they were purchased for a small sum by the late King of Holland, who presented them to the present king, then Prince of Orange. They were removed to and restored at Brussels, and were in the collection of the Prince of Orange there, until 1841, when they were placed in their present locality at the Hague.

In the above-mentioned MS. 'Annales et Antiquités de Louvain,' it is stated that Dierick Stuerbout painted these two pictures for the Council-hall in 1468, and that he was paid for them 230 crowns. In the same MS. it is stated that Stuerbout was on the 20th of May of the same year commissioned to paint a picture 26 feet long by 12 high, and another of the Last Judgment 6 feet high and 4 wide, both for the sum of 500 crowns. What has become of these pictures is not known: they have probably perished; but if Stuerbout died in 1470, the larger one was probably never painted; the other was completed, and for many years in the Town-hall. Van Mander mentions a picture by Dirk Van Haarlem which he saw at Leyden; in the centre was the head of Christ, and on two side-wings the heads of St. Peter and St. Paul. It was inscribed as follows in gold letters in Latin—'One thousand four hundred and sixty-two years after the birth of Christ, Dirk, who was born at Haarlem, made me at Louvain. Eternal peace abide with him.' From this inscription it is evident that the Dirk of Louvain mentioned by Guiciardini in his 'Description de tous les Pays-Bas,' Antwerp, 1568, is the same as Dirk Van Haarlem, though that writer mentions them as two painters. Vasari mentions Diric da Lovanio. Stuerbout must have resided some time at Louvain. He was also from his style probably a pupil of John Van Eyck, or of some of his scholars. These two great pictures prove that Stuerbout was a much better painter than many of the most celebrated of his followers; the proportions of his figures are better, his forms fuller and better modelled, and his heads are executed with less rigidity and sharpness of feature. M. Nieuwenhuys and others give 1410 and 1470 as the respective dates of Stuerbout's birth and death, but how the information is acquired is not stated; Van Mander, whose book was published in 1604, was not acquainted with either. They appear to have originated with Ottley, who makes some conjectures on the matter in his 'Early History of Engraving.'

(De Bast, *Messager des Sciences et des Arts*, Ghent, 1833; Passavant, *Kunstreise durch England und Belgien*, &c.; Nieuwenhuys, *Description de la Galerie des Tableaux de S. M. Le Roi des Pays-Bas*, 1843.)

STYLOPS. [STREPSIPTERA, P. C. S.]

SUBLEYRAS, PIERRE, a distinguished French painter, was born at Usez in 1699. His father, who was also a painter, was his first instructor, but at the age of fifteen he took his son to Toulouse and placed him with Antoine Rivalz, a painter of reputation in that part of France. In 1724 he went to Paris, and two years afterwards obtained the grand prize for painting given by the French Academy for a picture of the Brazen Serpent. He was accordingly sent in 1728 to Rome, with a pension from the then government, and he remained there the remainder of his life, and acquired a great reputation. In 1739 he married a Roman lady, Maria Felice Tibaldi, a distinguished miniature painter, and they were both a short time afterwards elected members of the academy of St. Luke. Subleyras was patronized by the popes Clement XII. and Benedict XIV., by several cardinals, and many of the Roman nobility. He painted Benedict's portrait, and was commanded by that pope to execute one of the altarpieces for St. Peter's, to be worked in mosaic. The picture, representing St. Basil celebrating mass before the Emperor Valens, who is seized with a fainting fit, was finished in 1745, and after being exposed in St. Peter's for three weeks, was removed to the mosaic offices, and completed in mosaic before the death of Subleyras. He died at Rome of pulmonary consumption May 28, 1749, aged fifty.

There are several fine pictures by Subleyras in Rome and in some other cities of Italy, and a few in France: there are eight in the Louvre. His execution was delicate, but he composed well, and was an agreeable colourist. He etched a few plates; among them three of the pictures which are in the Louvre—the Brazen Serpent, Mary Magdalen at the feet of Christ, and St. Bruno restoring an infant to life. There is also a Holy Family by him.

(D'Argenville, *Abrégé de la Vie des Peintres*, &c.; R. Dumesnil, *Peintre-Graveur Français*.)

SUBULA'RIA (from *subula*, an awl, from the form of the leaves), a genus of plants belonging to the natural order Cruciferæ and the tribe Subularieæ. It has an oval-oblong laterally compressed pouch, with boat-shaped valves.

S. aquatica, Awl-wort, is a little aquatic stemless herb, with fascicular simple white fibrous roots. The radical leaves are linear and awl-shaped, the scapes naked and few-flowered, the pedicels filiform and bractless. It is native of the colder parts of Europe, in ditches, lakes, and rivulets with a sandy or gravelly bottom. It is also found plentifully in the north of England, Scotland, and Ireland. Sir W. Hooker and Sir J. E. Smith agree in stating that the flowers always remain several feet under water, even during the time they are expanded, so that, contrary to the general rule, fertilization must take place in that element. This curious little plant only requires to be planted or sown in a pond or rivulet, with a sandy bottom, or it may be kept in a pot filled with sand or gravel, and then plunged in water.

(Don, *Gardener's Dictionary*; Babington, *Manual of British Botany*; Burnett, *Outlines of Botany*.)

SUCCESSION. This is a legal term derived from the Roman 'Successio,' which signifies a coming into the place of another, and Successor is he who comes into such place.

The Roman term signifies a coming into the place of another so as to have the same rights and obligations with respect to property which that other had. There might be successio either by coming into the place of a person living, or by becoming the successor of one who was dead. Gaius (iii. 77, &c.) gives instances of successio in the case of persons living, one instance of which is the Bonorum Cessio according to the Lex Julia. Succession was again either Universal or Singular. The instances of Universal succession (per universitatem) which Gaius (ii. 97) enumerates, are the being made a person's heres, getting the possessio of the bona of another, buying all a man's property, adopting a person by adrogatio, and admitting a woman into the manus as a wife; in all of which cases all the property of the several persons enumerated passed at once to the person who was made heres, or got the bonorum possessio, or bought the whole property, or adopted another by adrogation, or married the woman. An instance of singular succession is the taking of a legacy under a man's will.

The term Succession is used in our language. We speak of the succession to the crown or the regal dignity, and the term implies that the successor in all things represents the predecessor. Indeed, the king as a political person, never dies, and upon the natural death of a king the heir immediately succeeds. The English heir-at-law takes the descendible lands of his ancestor as universal successor; and the executor takes the chattels real and other personal property of his testator as universal successor. The general assignee or assignees of a bankrupt or insolvent take by universal succession.

Blackstone says that 'corporations aggregate consist of many persons united together into one society, and are kept up by a perpetual succession of members, so as to continue for ever.' It is true that when members of a corporate body die, others are appointed to fill up their places, but they do not succeed to the others in the Roman sense of succession—they simply become members of the corporation. But it has been established in some cases (2 B. & Ad. 840) that the use of the word 'successors' implies that the legislature meant to establish a corporation; and yet it is certain that a feoffment of land to a corporation aggregate without the word 'successors' is a valid grant. In a feoffment to a corporation sole the word 'successors' is necessary. The succession in the case of a corporation sole follows the nature of the Roman succession. In the case of a corporation aggregate there is no succession, and the rule that a corporation may be established by the use of the word 'successors' in a statute is founded on an erroneous understanding of the term 'successors.'

SUCCESSION, WAR OF, the name usually given to the war occasioned by the accession of the Duke of Anjou, grandson of Louis XIV., to the throne of Spain. Charles II. of Spain, the last male descendant of the Spanish branch of the House of Austria, having no issue nor brothers, the succession to the Spanish monarchy appeared to belong to Maria Theresa, Queen of France, the eldest sister of Charles, and to the children of her marriage with Louis XIV. She had however on her marriage renounced by a solemn covenant her right to the throne of Spain. The second sister of Charles was married to Leopold I., Emperor of Germany, and had not made on marriage a renunciation of her rights of succession; her daughter however, the Electress of Bavaria, had, previous to her marriage, been obliged to renounce her hereditary claims. The Emperor Leopold in consequence claimed the crown of Spain for his second son Charles, on account of Leopold's mother being aunt of Charles II. France and Bavaria, on the other hand, maintained that the renunciations alluded to could not prejudice the children, who held their right not by their mother, but by the fundamental law of Spain. Each of these powers endeavoured to influence Charles II. in their favour, and he was at length induced to name in his will Joseph Ferdinand, Elector of Bavaria, as his successor. The early death of this prince, in 1699, revived the contending claims of the Houses of Bourbon and Austria.

These different claims having excited the apprehensions of a general war, a treaty, called the second treaty of partition [PARTITION TREATY, P. C.], was concluded on 13th March, 1700, between France, England, and Holland, the details of which will be found in another part of this work. By this treaty the Archduke Charles, son of the Emperor Leopold, became the presumptive heir to the Spanish crown, while to the grandson of Louis was awarded the duchy of Lorraine, together with the kingdom of the Two Sicilies and the province of Guipuzcoa in Spain. This treaty however was rejected by the emperor, and the consequences of his rejection proved finally fatal to the cause of his son.

On the death of Charles II. (Nov. 1, 1700) a secret will was discovered which named the Duke of Anjou sole heir to the whole of the Spanish monarchy. Though Charles had been influenced in drawing up this will by the intrigues of Madame de Maintenon, carried on through the Marquis d'Harcourt, the French ambassador at Madrid, Louis, aware that a war, with Austria at least, must be the issue of his acceptance of the Spanish crown for his grandson, hesitated before availing himself of the offer, which was rendered the more pressing by the general feeling of the Spanish nation in favour of the House of Bourbon. A council which he summoned on the occasion gave its unanimous opinion in favour of acceptance, and induced the French king immediately to proclaim the Duke of Anjou as king of Spain and the Indies, under the title of Philip V.: to his assembled court he presented him with these laconic words:—'You see before you the king of Spain. Nature has formed him for it; the deceased king has nominated him, the people desire him, and I consent.' These words became the signal of a war which was one of the longest and most general in Europe. On the side of the emperor were the states of Germany, with the exception of Bavaria and Cologne. Most of the powers of Europe however acknowledged Philip V., who made his entry into Madrid on the 14th of April, 1701; and had Louis, at this time, prudently concerted his measures, he might have secured to his grandson the peaceable possession of the throne, or, at all events, prevented the war from extending beyond the limits of Germany. Peace was moreover of paramount importance to the French monarchy, drained as it was in its resources and weakened in its power by the war which had but lately been terminated by the treaty of Ryswick. [P. C. vol. xxvi. p. 174.] Age and infirmities had diminished the energies and damped the military ardour of Louis, while death had deprived him of many of the great statesmen and generals who have rendered his reign so illustrious in history; Louvois and Colbert had disappeared from the political stage, together with Turenne, Condé, Créqui, and Luxemburg.

England and the States-General, though they had acknowledged Philip V., entertained fears lest the balance of European power should be destroyed by the union of France with Spain. Louis, on the other hand, far from attempting to dispel these fears, with singular impolicy issued letters patent in favour of Philip, to the effect of preserving his rights to the throne of France. Another measure equally impolitic was the encroachments made at that time by the French in the Spanish Netherlands, and their consequent military approximation to the territories of the States-General. This latter measure gave an opportunity to William III. of Orange to excite the Dutch against France; but he found considerable difficulty in bringing over the English parliament to second his views. An event however soon occurred which removed these difficulties; it was the death of the exiled king of England, James II., and the recognition by Louis of his son as king of Great Britain. This was the immediate cause of the treaty drawn up at the Hague on September 7, 1701, and generally known under the name of the Second Grand Alliance. It was signed by the plenipotentiaries of the Emperor of Germany, the States-General, and the King of England. The principal objects of that treaty are detailed in another part of this work. [HAGUE, ALLIANCE OF THE, P. C. S., in which by an oversight the name of Charles III. is put for that of Philip V.] This alliance was afterwards joined by the Kings of Portugal and Prussia and the Duke of Savoy.

On the death of the King of England, his successor, Queen Anne, followed his policy in adhering to the alliance of the Hague [ANNE, P. C.], and three months had not elapsed after her accession before war was declared by the powers united by that treaty against France (4th May, 1702). At the commencement of the war the French for some time maintained the former glory of their arms, and defeated the Imperialists on the Upper Rhine, but the Earl of Marlborough [MARLBOROUGH, P. C.], who had been appointed to the command of the Anglo-Dutch army, made considerable progress in Flanders, while the combined fleets of England and Holland destroyed a French fleet in the Bay of Vigo. The fortress of Landau on the Rhine was also taken by the Imperial General Lewis of Baden. In Italy, Prince Eugene, who had the command of the German army, was unable, through the deficiency of his resources, to attempt any measure of importance. [EUGENE, P. C.]

The following year was spent by Marlborough in reducing the fortified places on the frontiers of the Spanish Netherlands. In Southern Germany the contest was more unfavourable to the allies. The French Marshal Villars [VILLARS, P. C.] had succeeded in crossing the Rhine and in uniting his forces with those of the Elector of Bavaria. In Italy and Alsace the French had likewise the advantage in arms. Their cause however was weakened during that year by the defection of the Duke of Savoy, who joined the allies, as did also the king of Portugal. The campaign of 1704 was more unfavourable to the French arms. Marlborough, having secured the safety of the Netherlands, determined upon marching into Germany to the aid of the emperor, whose capital was menaced on one side by the French and Bavarian armies, and on the other by the Hungarians, who had taken occasion of the war to attempt a revolt. A plan also was resolved upon by the allies to unite the forces under the three Generals—Marlborough, Eugene, and Lewis of Baden, while General Stahrenberg was to remain in Italy. The junction of their armies was effected at Heilbronn on the Neckar; it was agreed among them that Prince Eugene should direct his march along the Rhine, while the two other generals directed their course to the Danube. The passage of the Danube was bravely but unsuccessfully disputed by the Bavarians near Donauwerth. Advantage was taken of their success by the allies to offer peace on favourable terms to the elector, if he would withdraw from the alliance with France. The advance of Marchal Tallard with a French army of 30,000 men determined the elector upon refusing these proposals; at the same time Eugene had joined Marlborough with 20,000 men; the Prince of Baden, whose obstinacy it was feared might derange their plans, was sent to reduce Ingoldstadt. On the 13th August a decisive engagement took place, which terminated in the complete defeat of the French and Bavarians. The details of this important battle will be found in the articles Blenheim and Marlborough, P. C.

This disaster was followed by the loss of Bavaria, which was occupied by the Imperialists, and the elector was compelled to cross the Rhine with the French, and to take up his position at Brussels. In Italy and Spain the French obtained some advantages, which however were counterbalanced by the loss of the important fortress of Gibraltar, which fell into the hands of the English on the 24th July, 1704. [Gibraltar, P. C.]

The next year, 1705, the Emperor Leopold died, and was succeeded by his eldest son Joseph, whose character for energy and determination formed a favourable contrast with that of his father. After some hesitation, he decided upon vigorously pursuing the war in support of the claims of his brother Charles, who the year previous had proceeded to Spain, and had already been acknowledged as king in Aragon, Catalonia, and Valencia. Nothing however of importance occurred during the campaign of that year; the Prince Eugene was sent to Italy to reorganize the army, while Marlborough returned to Flanders to recruit his forces.

In 1706 fresh exertions were made by Louis to maintain an army in Germany, and to take the offensive in Savoy and Flanders. Accordingly he sent into Flanders one of the finest armies that had yet appeared in the war, and placed it under the command of Marshal Villeroi. The imprudent ardour of this general proved disastrous to his projects; he left a strong position which he had taken up at Louvain to give battle to Marlborough on the plains of Ramilies (May 22), which resulted in his complete defeat. [Ramilies, P. C.] The details of this great battle will be found in the article referred to; but the fact that it was fought almost on the site of Waterloo, by which name it has often been designated, may not perhaps be generally known. The victory at Ramilies secured to the allies the greater part of the Spanish Netherlands, while, to increase the misfortunes of Louis, his Marshal, Marsin, lost the battle of Turin against Prince Eugene (September 7); a defeat which was followed by the loss of all territories which had been occupied by the French in Italy. [Eugene, P. C.] In Spain they were also repulsed in an attack upon Barcelona; and the English and Portuguese entered Madrid, which city however they were unable to retain. At this juncture of affairs a suspension of hostilities was offered by Louis to the allies, but they were rejected chiefly through the influence of the pensionary Antony Heinsius.

In 1707 a considerable portion of the Spanish inheritance was in the possession of the Imperialists and their allies, while Lombardy and Flanders had already been secured to them by the battles of Turin and Ramilies. Louis at this time determined upon a diversion in his plan of attack, which was soon followed by important consequences. The large body of troops which had been forced to evacuate Italy he collected together, and, placing them under the command of the Duke of Berwick [Berwick, James Fitz-James, Duke of, P. C.], sent them into Spain to the support of his grandson. On the 26th April a most decisive victory was obtained by him over the English and Portuguese under the Earl of Galway and the Marquis Las Minas at Almanza. In this important battle the allies sustained a loss of 17,000 killed, wounded, and taken prisoners; their two generals were withdrawn from the field severely wounded, and 120 standards fell into the hands of the French. The victory of Almanza proved the prelude of further successes, which, joined to the popularity of his cause, finally ensured the throne of Spain to Philip V. Aragon and Valencia were reduced to his submission by the Duke of Orleans, and in the latter end of the year 1707 the only part of Spain retained by the Archduke Charles was Catalonia. The following year Prince Eugene once more formed a junction of his forces with those of Marlborough, and thus united gave battle to the French army under the command of the Dukes of Burgundy and Vendôme at Oudenarde (July 11, 1708), which terminated in the defeat of the French. [Oudenarde, P. C.] After this victory Eugene besieged and took the strong fortress of Ryssel and recovered Ghent and Bruges. In Spain and Italy the French obtained some success, but the islands of Sardinia and Minorca surrendered to the English fleet under Admiral Leake. A winter of unparalleled severity increased the difficulties under which the French king laboured in pursuing this war, and he once more made overtures of peace to the allies, offering to renounce Spain, India, Milan, and the Netherlands, if they would leave to his grandson Naples and Sicily. Still further concessions, however, were demanded of him, which were granted, and a peace was on the eve of being proclaimed when all hope of it was extinguished by a further proposition from the allies, to which it would have been dishonourable to Louis to have acceded; it was to the effect that, in the event of his grandson Philip refusing to resign the sovereignty of Spain, he should himself assist in expelling him from it by force of arms. This proposal was indignantly refused by the aged king, who once more rallied all the energies of his kingdom to prosecute this war. Thus a peace far more advantageous to the allies than that which was finally sanctioned at Utrecht was prevented by an ill-timed display of overbearing pretensions.

Part of the summer of the year 1709 was passed in these negotiations, and the allied generals hastened to take the utmost advantage of the remaining portion of the season. Their army, about 100,000 strong, was posted near Lille; Marshal Villars, with the French army of nearly equal strength, covered Douay and Arras. Eugene and Marlborough, instead of attacking him, marched against the important fortress of Tournay, of which they took possession. Their next operations were directed against Mons, which place Villars was desirous of protecting, and he accordingly encamped within a league of it in a strong position at Malplaquet. No time was lost by the allies in attacking him in his intrenchments; and, after a contest the most obstinate and sanguinary during the war, victory remained once more on the side of the allies (11 September). [Marlborough, P. C.] The surrender of Mons was the immediate result of this victory. Another campaign had terminated unfavourably to Louis; he again applied for peace, but the same dishonourable terms were proposed to him, and the cruel alternative was again presented to him of continuing a disastrous war or of waging one against his child; as before, he chose the former.

The campaign of 1710 was marked by the reduction of Douay and other strong places on the Netherlands frontier, and in Spain by the successes of Charles at Almenara and Saragossa, which enabled him to enter Madrid. Reverses, however, soon attended his arms; fresh troops arriving from France, the Spaniards cordially co-operated with them, and, under the able command of the Duke of Vendôme, all his possessions were re-conquered, and to Philip V. was secured the quiet enjoyment of his throne.

While, however, fortune favoured the cause of the French in Spain, their own country was reduced to a critical extremity by the victory of Malplaquet and the continued advance of the allies. In this untoward state of things, there happened a series of unexpected events, which so changed the aspect of affairs, that Louis was, from an humble suppliant for peace, soon placed in a condition which enabled him to dictate his own terms to most of the powers allied against him. Not the least important of these events was the death of the Emperor Joseph I. (11 April 1711), who fell a victim to small-pox at the early age of thirty-three. As he died without male issue he was succeeded by his brother Charles, who had for some time assumed the title of Charles III. of Spain. The balance of power, which it had been the object of this war to maintain, would have been destroyed if the new Emperor had added to the hereditary states of the German House of Austria the whole of the Spanish monarchy. Such a predominance appeared dangerous to the other powers, and thus by the accession of Charles VI. to the imperial throne a considerable difficulty in the way of an amicable adjustment with France was removed. [Balance of Power, P. C.]

Another event which tending to the same end was the change of ministry which took place in England. The Whig party, to which Marlborough and his friends belonged, had governed the state since the revolution of 1689. Their influence, in 1710, was somewhat suddenly superseded by that of the Tories. A new parliament was elected, in which the Tory party had a majority, and, as a means of depriving the Duke of Marlborough of his influence, measures of peace were strongly advocated. [ANNE, P. C.] Secret negotiations were set on foot between the Courts of England and France, which ended in a preliminary treaty of peace being signed in London on October 8, 1711. The conferences for a general peace were now opened, and Utrecht was selected as the place where they were to be held.

The conferences which took place at Utrecht in the early part of the year 1712 met with several interruptions, arising from the contending interests of the different powers who composed the grand alliance. The victory obtained by Marshal Villars over the Earl of Albemarle at Denain (24 July, 1712) [VILLARS, P. C.], and the consequent recovery of Douai and other strong places, increased the pretensions of the French, and rendered the allies more tractable. Peace was at length signed at Utrecht in the month of April, 1713, between France and England, the United Provinces, Prussia, Portugal, and Savoy: the Emperor alone refused to take part in it. A full detail of the terms of that treaty will be found in another part of this work [P. C. vol. xxv. p. 174]. The real gainer by it was undoubtedly the French King, who obtained nearly all the advantages which it had been the object of the war to prevent his acquiring; it was also productive of considerable odium against the English ministry. [HARLEY, P. C.]

The Emperor, now deserted by his allies, was compelled to negotiate alone a peace, which became important even for the security of his hereditary states. It was brought about by the moderation of the two great generals Eugene and Villars, who, though among the most distinguished in the war, proved themselves the most desirous of promoting peace. They commenced negotiations at the Castle of Rastadt in November, 1713, and a treaty was there concluded on the 7th March, 1714 [RASTADT, P. C.]; and the terms of it were definitely agreed upon on the 7th September following at Baden in Aarau. [BADEN, TREATY OF, P. C. vol. xxv. p. 174.] The King of Spain acceded to these treaties, and Europe once more enjoyed the privileges of peace.

For a more detailed account of this war, the following works may be referred to: Koch's 'Revolutions of Europe,' translated by Crichton, 3 vols., Edinburgh, 1828, vol. ii. p. 146-157; 'Outlines of History;' Lardner's 'Cabinet Cyclopædia,' p. 384-390; Koherausch's 'History of Germany,' translated by Haas, London, 1844, p. 532-547; Schlosser's 'History of Europe,' vol. iii. p. 17-84, translated by Davison, London, 1844; 'History of Spain,' Library of Useful Knowledge, London, 1833, book iii. chap. 1, 2, 3; Voltaire, 'Essai sur l'Histoire Générale,' &c., chap. 190-196; Lord Mahon, 'History of the War of Succession in Spain.'

SUCHET, LOUIS GABRIEL, Duke of Albuféra and Marshal of France, was a native of Lyon, where his father was a silk manufacturer. The year of his birth is stated by some authorities to have been 1770, by others 1772. On the breaking out of the French Revolution, he entered as a volunteer in the cavalry of the national guard of Lyon; shortly afterwards, he became captain of a volunteer company raised in the department of l'Ardèche, which he commanded during four months, when he was raised to the grade of 'chef de bataillon' in the troops of the above-named department. In this capacity, it is stated, he was compelled to be the active witness of many atrocities, committed in the name of the law by the deputy of the convention, Maignet. He was present at the siege of Toulon in 1793; from thence he was transferred to the army of Italy, and was attached to the brigade under the command of General Laharpe. In this campaign he specially distinguished himself at the combat of Loano (23rd November, 1795), where he captured three Austrian standards. He afterwards served with distinction in the same campaign under the Generals Augereau [AUGEREAU, P. C.] and Masséna [MASSÉNA, P. C. S.], and received several wounds. He was selected by Masséna to present to Bonaparte the standards which had been captured during the year 1797 by the brigade in which was his battalion. It was on the field of battle of Neumark (2nd April, 1797) that he was raised to the rank of 'chef de brigade.' He afterwards joined the army in Switzerland, where he was instrumental to the conclusion of a treaty with the cantons of Berne and Fribourg. This treaty did not prevent the war being soon after rekindled in Switzerland, and in it Suchet displayed considerable skill; it was there that he first gave proof of his talents as a tactician, which afterwards raised him so high in the estimation of Bonaparte. The important part he acted in this campaign was recognised by his chief, who deputed him to Paris to present to the Directory twenty-three standards taken from the enemy.

When the expedition to Egypt was determined upon, it was originally intended that Suchet should be included among the military commanders selected to act under Bonaparte; the disordered state, however, of discipline which prevailed in the army of Italy, and the representations of General Brune, who commanded it, caused him to be retained there with the rank of Major-General of Brigade. In his new command he made many strenuous endeavours to renew the antient discipline and to ameliorate the condition of the soldier; these endeavours were construed by the suspicious government at Paris into an attempt to introduce in the army an aristocratic rule. His recal was decided upon, in opposition to the strong remonstrances made on the subject by General Joubert, who was among the most popular and successful of the republican generals of that period. On his arrival at Paris, he succeeded in clearing himself of the charges which had been brought against him, and he was transferred to a command in the army of the Danube. He there rendered himself conspicuous by the able manner in which he seconded the skilful manœuvres of General Masséna in the Grisons. [MASSÉNA, P. C. S.] The successes which attended the French arms in Switzerland were counterbalanced by the disasters of General Schérer in Italy; these disasters necessitated the appointment of a more daring and vigorous commander, and Joubert was again intrusted with the chief command. On this occasion Suchet was recalled from the army of the Danube, and placed at the head of Joubert's staff. The campaign which ensued added greatly to his military reputation; the careful avoidance of error in his movements and manœuvres, the skilful disposition of his troops, whether acting independently or in conjunction with the main army, as they procured him important successes, soon attracted the notice of Bonaparte when he joined the Italian army, and he was appointed by him second in command to Masséna. In this capacity he particularly distinguished himself in the actions at San Bartolomeo and the bridge of Cezio (7th and 8th May, 1800). With a body of eight thousand men, advantageously posted, he checked the advance of General Mélas, who had five times his numbers, and for a long time harassed his army, whose retreat he had cut off; he thus afforded a powerful co-operation to the main army of the French, which, under the command of Bonaparte, was at that time crossing the Great St. Bernard. [BONAPARTE, P. C.] General Suchet, after these operations, rejoined Masséna on the plains of Alessandria, and was present at the battle of Marengo. When, in consequence of this decisive battle, the city of Genoa again fell into the hands of the French [MASSÉNA, P. C. S.], the government of it was given to Suchet. At the conclusion of the armistice of six months, which had been concluded between the French and Austrians, the command of the centre of the army of Italy was confided to him. In this command he was enabled to extricate General Dupont, so unfortunately known by his subsequent disasters at Baylen, in Spain [BAYLEN, P. C.], from a position of considerable danger, and, in conjunction with him, obtained a signal success over the Austrians, under General Bellegarde, at Pozzolo, in which action four thousand prisoners were made.

During the peace which was concluded in 1801 at Luneville between the Empire and France, General Suchet was employed in inspecting the troops stationed on the south and west frontiers; he was afterwards actively engaged in the superintendance of military works, and finally promoted to the governorship of the castle of Lacken, near Brussels, having been previously named member of the Legion of Honour.

On the opening of the campaign of 1805, Suchet was attached to the division of the army under the command of Marshal Lannes. [LANNES, P. C. S.] At the memorable battle of Austerlitz, he commanded the left wing of that division, and greatly distinguished himself by a manœuvre as daring as it was skilful. The following year, a few days previous to the battle of Jena (14th October, 1806), he obtained, at the head of his division, some important advantages over Prince Frederick Louis of Prussia, who commanded the advanced guard of the main army of the Prussians, at Graffenthal; in this engagement he captured thirty pieces of artillery; among the killed was the young and gallant Prince of Prussia. To this movement of Suchet Napoleon was indebted for the opportunity of attacking, without opposition, the rear of the main army of the Prussians. The following year, he materially contributed to the success obtained by Savary, Duke of Rovigo, over the Russian General Essen, who, with twenty-five thousand men, attacked the French on the banks of the river Narrew (16th February, 1807), and was repelled with considerable loss.

The reputation which Suchet had acquired in these engagements, as a brave soldier and a skilful tactician, induced Napoleon to intrust him with a separate command. An opportunity of doing so was afforded him by the war which broke out in Spain in 1808, and he gave him the command of the fifth division of the army, having previously raised him to the highest grade of the Legion of Honour [Legion of Honour, P. C. S.], with a pension of 20,000 francs, and the title of Count of the Empire. After assisting for a short time at the siege of Saragossa [Saragossa, P. C.; Lannes, P. C. S.], he was appointed to the important command of general-in-chief of the French army in the province of Aragon. This brings us to the most illustrious period of this general's military life; the campaigns which followed under his command, are among the most brilliant recorded in history, and it is to be regretted that sufficient justice has not been rendered to his merit by the English annalists of this war, previous to the time of General Napier. To this distinguished and impartial historian has been reserved the honourable task of raising the character of an enemy to the position he deserves in public estimation. When General Suchet was placed at the head of the forces in Aragon, he found the army so destitute of discipline that it almost amounted to disorganization. In applying the measures to restore this discipline, he evinced considerable discernment, prudence, and energy; no longer thwarted in his efforts by the factious opposition of mere theoretical statesmen, as he had been in the time of the Directory, he speedily effected this important purpose. 'Suchet,' says the historian above referred to, 'was no ordinary man; and with equal vigour and prudence he commenced a system of discipline in his corps, and of order in his government, that afterwards carried him, with scarcely a check, from one success to another, until he obtained the rank of marshal for himself, and the honour for his corps of being the only one in Spain that never suffered any signal reverse.' (Napier, *History of the Peninsular War*, vol. ii. p. 97.) In 1810 General Suchet received orders from Madrid to lay siege to the strong fortress of Lerida, the approaches to which were covered by the Spanish General O'Donnell and a strong body of Catalonian troops. The defeat of this general was followed, after a gallant and obstinate resistance, by the surrender of the fortress which he had protected (14th May, 1810), in which were found five hundred pieces of artillery. The fall of Lerida was followed by that of Mequinanza (8th June, 1810), and Tortosa (2nd January, 1811). These successes were followed by one still more important, the taking of the city of Tarragona (28th June, 1811), which was defended by a garrison of eighteen thousand men; the city fell into the hands of the French after a siege of two months, or rather, as Suchet himself expressed it, after a succession of three sieges and five assaults; they found in it, according to the French accounts, five thousand cannon and abundant munitions. [Tarragona, P. C.] The sanguinary nature of this siege may be judged from the fact that upwards of nine thousand Spaniards of the garrison are said to have perished. The occupation of Mont-Serrat, a place of such great strength that it was deemed impregnable, followed soon after the capture of Tarragona. These brilliant services were justly appreciated by Napoleon, who rewarded them by raising Suchet to the dignity of a Marshal of the Empire. In the latter end of the year 1811 Suchet directed the operations of his army against Murviedro, the antient Saguntum [Hannibal, P. C.], the fortifications of which had latterly been reconstructed at considerable expense; the defeat of General Blake and thirty thousand men under its walls, was followed, after about a month's siege, by the fall of this important fortress. A reinforcement of fresh troops having arrived from Navarre, Suchet next proceeded to invest the city of Valencia, which surrendered to him by capitulation on 10th January, 1812. The fall of this city, and of some fortresses in its neighbourhood, was followed by the occupation of the entire province of which it was the capital. Albuféra, which had been the scene of his last successes, became the title of the dukedom to which he was raised by Napoleon, who added to this title an extensive and valuable domain. But he obtained a higher title to the respect and admiration of posterity by the general expressed feeling of the Spaniards under his rule, that he mitigated the horrors of war by his humanity, and dealt equal justice to the conquerors and to the conquered. 'The mission imposed upon him had been to conquer and to subdue: he was required to provide for the expenses of the war by the successes of war; the mission, however, which he imposed upon himself was to augment his power by his skill, and to diminish opposition by his justice.' (Translated from *Le Journal de la Méditerranée*, du 7 Janvier, 1826.) Marshal Suchet pursued the same system of government in the province of Valencia that had answered so well in that of Aragon; he placed it in the hands of a commission composed of enlightened and respectable men. He called together an assembly of persons of every class of society, and who represented various interests, to vote the expenses of the war and equitably to divide its burdens; and to them he rendered a faithful and detailed account of the manner in which these taxes were employed. He manifested the same spirit of confidence and justice towards the soldiers under his command, and found it productive of the most beneficial results.*

The success which attended the British arms under Lord Wellington, and the decisive victory which he obtained at Vittoria, compelled a large portion of the French army to retreat beyond the Pyrenees, and, in consequence, Suchet found himself under the necessity of abandoning the eastern provinces of Spain, and to fall back upon Catalonia, where he maintained himself for some time. Obliged at length to evacuate this province, and to retreat towards the frontiers of France, he effected this retreat in the attitude of a conqueror, and secured his army from the reverses usually incident upon such an operation. On reaching Narbonne, he signified, on 14th April, 1814, his adhesion to the decrees of the senate directed against Napoleon. Employed to receive Ferdinand VII. [Ferdinand VII., P. C.], who had been released from Valençay, and to present him to the Spanish army, he was publicly thanked by the king for the manner in which he had carried on the war against his subjects. The gratitude of the Spanish nation towards the administration of this marshal was further evinced by the general testimony which was borne to his justice and humanity, when, in 1823, the French again occupied the scene of his exploits. The correct view taken by Suchet, with respect to the release of Ferdinand, will be seen by reference to Montholon, *History of the Captivity of Napoleon*, vol. ii. p. 350.

The speedy adhesion of Suchet to the Bourbons was rewarded by his being created a member of the new peerage, and his appointment to the command of the tenth military division, of which the head-quarters was Strasbourg. On the return of Napoleon from Elba, though he maintained his fidelity to the Bourbons so long as Louis XVIII. remained in France, he renewed his allegiance to his former chief, and accepted the command of the army of the Alps, with which he obtained several important successes over the Piedmontese and the Austrians. His army was composed of only ten thousand men, and on the approach of the main body of the Austrians, nearly one hundred thousand strong, he was compelled to fall back upon Lyon, for which city, by his judicious management, he obtained an honourable capitulation; one of the conditions in it being that all the valuable munitions of war contained in that city should be respected by the enemy.

On the second restoration of the Bourbons, he remained for some time in disgrace, and was deprived of his civil though not of his military honours. He was however restored to his position in the peerage by a royal ordinance, dated the 5th of March, 1819. That he entirely recovered the favour of the king may be presumed from the fact that he was chosen to assist at the birth of the present Duke of Bordeaux. On the French expedition to Spain, in 1823, it was generally expected that Marshal Suchet would have been selected to accompany the Duke of Angoulême, as his principal adviser, but he was already suffering severely from the disease to which he shortly afterwards fell a victim. He died at Marseille on the 7th of January, 1826, leaving behind him a young widow and several children. During the latter years of his life he was occupied in composing a memoir of his campaign in Spain, which has since been published. (*Mémoires de Suchet*, 2 vols., Paris, 1826.)

* 'The corps under the command of Marshal Suchet,' says Napoleon, 'which occupied the kingdom of Valencia, never suffered a want of anything; the country, being well governed by the marshal, supplied all the necessities of the army; the contributions were regularly paid, and war was carried on, as it would have been in Germany, and all this because the marshal set an example of severe probity, and maintained discipline among his troops. Had all the other marshals done the same, the war would have been reduced to the chances of a battle.' (Montholon, *Hist. of the Captivity of Napoleon*, vol. ii. p. 342.)

The reputation of Suchet stands deservedly high amongst the generals of Napoleon. His military career was unstained by any of the excesses which have disgraced so many of his most distinguished colleagues in command. Brought up in the school of Masséna, he rivalled his military skill without imitating his vices. It is true that his entrance by storm into Tarragona was marked by the rapine and inhumanity of his soldiers; but the same excesses were committed by our own army at Badajos and St. Sebastian, and it would be unjust to throw the odium of them on its illustrious commander. The inability of a chief perfectly to restrain the frenzied violence of his soldiers on such terrible occasions is a melancholy fact which the history of all ages has established. We have already dwelt upon his qualities as a military and a civil ruler. The high opinion entertained of Suchet by Napoleon has been recorded by O'Meara and Las Cases. On the question being asked him by the former, who, in his opinion, was the first of his generals? he replied, 'I think that Suchet is probably the first. Masséna was; but you may say that he is dead' (1817), alluding to the complaint under which that marshal was fast sinking. On another occasion, at St. Helena, Napoleon remarked, 'that if he had had two such field-marshals as Suchet in Spain, he should not only have conquered, but kept the Peninsula. His sound judgment, his governing yet conciliating spirit, his military tact, and his bravery had procured him astonishing success.' (*Court and Camp of Bonaparte*, p. 419.)

(Alison, *Hist. of Europe*, vol. viii.; Napier, *Hist. of the Peninsular War; Court and Camp of Bonaparte; Dictionnaire Historique de Batailles*, 4 vols. Paris, 1818; *Biographie Moderne*, 2 vols. Paris, 1815; *Biographie Universelle Classique*, troisième partie; O'Meara, *Napoleon in Exile*, vol. i. p. 492, eighth edit. London, 1834; *Dictionnaire des Girouettes* [see vol. ii. p. 273, of P. C. S.]; *History of the Captivity of the Emperor Napoleon at St. Helena*, by General Count Montholon, 2 vols. London, 1846: Tissot, *Précis de Guerres de la Révolution Française*, 2 vols. Paris, 1821; Southey, *Hist. of the Peninsular War*, vol. iv.)

SUCHOSAURUS, the name given by Owen to a fossil Saurian of the Wealden formation of Tilgate.

SULPHURATION, or SULPHURING, is the process of bleaching employed to give whiteness to silk and woollens by exposing them to the fumes of burning sulphur. For this process a detached chamber, without a chimney, is made use of, but so constructed that, when required, a current of air may be passed through it.

According to Berthollet, 100 pounds of silk, stretched on perches, are placed at a height of nearly seven feet, and about two pounds of sulphur, reduced to coarse powder, are put into an iron pot, containing a small quantity of ashes; the sulphur is fired in several places, and the chamber well closed to prevent the loss of sulphurous fumes: afterwards the windows are opened to let them escape and to dry the silk. In winter, after the smell of the sulphurous vapour has ceased, the windows are shut, and charcoal is burnt in the chamber, in order that the silk may be dried. By this operation the silk becomes perfectly white, and is rendered fit for subsequent operations. Woollen cloths are treated nearly in the same manner.

SUMMARY CONVICTION. [LAW, CRIMINAL, P. C. S.]

SUMMER. [WINTER, SPRING, SUMMER, AND AUTUMN, P. C.]

SUPERCARGO. [SHIPS, P. C.]

SURFACE OF ELECTRICITY. [POLARIZATION OF LIGHT, P. C., p. 330.]

SURGEONS, COLLEGE OF. [SURGEONS, COLLEGE OF, P. C.] A new charter was granted to the College of Surgeons in the 7th year of Victoria, by which it is declared that the name of the college shall henceforth be The Royal College of Surgeons of England; and that a portion of the members of the said college shall be fellows thereof, by the name of The Fellows of the Royal College of Surgeons of England. The charter declares that the present president and two vice-presidents and all other the present members of the council of the said college, and also such other persons, not being less than 250 nor more than 300, and being members of the said college, as the council of the college, at any time before the expiration of three calendar months from the date of the charter, shall elect and declare to be fellows in manner by the charter directed; together with any such other persons as the council of the said college, after the expiration of the said three calendar months and within one year from the date of the charter, shall appoint in manner by the charter authorized, shall be fellows of the said college. But no person, except as hereinbefore named, is to become a fellow unless he shall have attained the age of twenty-five years, and complied with such rules as the council of the college shall think fit and by a by-law or by-laws direct; nor unless he shall have passed a special examination by the examiners of the said college. Every person admitted as a fellow, as last mentioned, is to become a member of the College by such admission, if he is not already a member. Henceforth no member of the College who is not a fellow is to be eligible as a member of the council. There are also (10) some other restrictions as to eligibility. The present members of the council are to continue life members as heretofore; and the number of members of council is to be increased from twenty-one to twenty-four, and all future members are to be elective, and to be elected periodically, in the manner prescribed by the charter (12) when the number of elective members of the council shall be completed and made up to twenty-four. Three members shall go out annually, but they may be re-elected immediately. The members of council are to be elected by the fellows, including the members of the council as such, in the manner prescribed by the charter (15); and the election is to be by ballot (17). There are various special provisions as to the eligibility of fellows, for which we refer to the charter. There are to be ten examiners of surgeons for the college, and the present examiners are to continue for life; and all future examiners are to be elected by the council, either from the members of the council or from the other fellows of the college, or from both of them; and all future examiners of the College shall hold their office during the pleasure of the council. The charter contains other regulations, and confirms the powers of the college and the council, except so far as they are altered by the charter; and it declares that no by-law or ordinance hereafter to be made by the council shall be of any force until the crown shall have signified its approval thereof to the College under the hand of one of the principal secretaries of state, or otherwise as in the charter stated (22). 'The by-Laws and Ordinances of the Royal College of Surgeons of England' contain the regulations as to the candidates for the fellowship (sect. 1), for the examination of candidates for the fellowship (2), admission of fellows (3), election of members of council (5). By section 1 it is required that every candidate for the fellowship, among other certificates, shall produce a certificate, satisfactory to the court of examiners, that he has attained a competent knowledge of the Greek, Latin, and French languages, and of the elements of mathematics. The subjects of examination for the fellowship are Anatomy and Physiology on the first day, and Pathology and Therapeutics and Surgery on the second day. The examination is to be by written answers to written or printed questions; but any candidate may be interrogated by the examiners, on any matter connected with the questions or answers. In the anatomical examination the candidate must also perform dissections and operations on the dead body in the presence of the examiners.

The members of the College are admitted by diploma after examination before the court of examiners, and their diploma confers upon them the right of practising surgery in any part of the British dominions.

The council of the College have at various times required certain qualifications of age, education, &c. from candidates for examination. The regulations last issued are dated October, 1841.

The examinations of members are conducted *vivâ voce*, or, if the candidate desire it, in writing. The questions are almost exclusively anatomical and surgical; and the examination of each candidate occupies about an hour and a half, during which time he is usually questioned by four of the examiners in succession.

According to the financial statement (June, 1843), the receipts of the College for the previous year were as follows:—

	£	s.	d.
Court of examiners; fees for diplomas, at 20 guineas each, exclusive of stamps	14,093	11	0
Rent	12	10	0
Incidental sale of lists, catalogues, &c.	160	6	6
Dividends on investments in government securities, &c.	1,499	0	4
	£15 765	7	10

And the disbursements were as follows:—

	£	s.	d.
College department, including council, court of examiners, auditors, &c.	7,402	19	1
Museum department, including catalogues, specimens, spirits, salaries, &c.	3,653	0	10
Library department, including the purchase and binding of books, salaries, &c.	1,120	12	7
Miscellaneous expenses, taxes, rent, &c.	698	18	1
Repairs and alterations	253	10	6
Hunterian oration, lectures, &c.	264	4	0
	£13,393	5	1

SUSSEX, AUGUSTUS FREDERIC, DUKE OF, a Prince of the United Kingdom, the sixth son of George III., was born on 27th January, 1773. After having been some time under a private tutor, he travelled abroad, and studied at Göttingen. From an incident connected with his early history, a very curious question regarding the law of marriage and legitimation arose. In April, 1793, he was privately married at Rome to the Lady Augusta Murray, daughter of the Earl of Dunmore. Independently of other questions, it was thought that there might be an objection to the validity of this marriage on the ground of its being celebrated by a Protestant clergyman in a place where by the law of the state a marriage by such a person is invalid, and where there was no British representative to make a special domicile. Accordingly the ceremony was repeated in St. George's, Hanover Square, London, on 5th December, 1793. The ground for questioning the validity of their union was the Royal Marriage Act, 12 Geo. III. c. 3, which prohibits every descendant of George III. from contracting matrimony without the consent of the crown, and provides that every marriage contracted without this consent being first obtained, 'shall be null and void to all intents and purposes whatsoever.' There is no doubt that, so far as respected England, the English marriage came under this act. But there were reasons for supposing that the marriage at Rome might be capable of being declared valid in other parts of the kingdom, of which the Duke, as a prince of the blood, was as much a citizen as he was of England. With regard to Scotland, the statute was so much connected with the English Marriage Act, that it is questioned if it extends to that part of the kingdom; and as to Ireland, that country was not united to England when the act passed. It was supposed that the question might come to be considered in relation to the succession of the throne of Hanover, but the birth of a nearer heir has rendered such an event unlikely. His first wife having died in 1834, he married in 1840 the widow of Sir George Buggin, without conforming with the Marriage Act. On 30th November, 1830, he became President, after a pretty warm contest, of the Royal Society, but he resigned this office before his death. He was a great friend of literature and art, and a warm supporter of every liberal measure in politics. His manners were popular, and his disposition kind. He was a great collector of rare books, and left behind him a magnificent library. It consisted in 1827 of 50,000 volumes, 14,000 of which were theological. He died at Kensington Palace on 21st April, 1843, and was buried in Kensall Green Cemetery.

(*Biographical Dictionary of the Society for the Diffusion of Useful Knowledge.*)

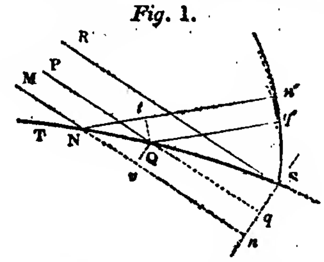
SUSTERMANS, JUSTUS, a distinguished Flemish painter, was born at Antwerp in 1597. He was the pupil of William de Vos. He is little known in Flanders; he lived chiefly in Florence, where he was appointed his court painter by the Grand-Duke Cosmo II. He was favoured also by Ferdinand II., whose portrait he painted, and who ennobled him. His master-piece is a large picture of the Florentine nobility swearing allegiance to Ferdinand upon his succession. He died at Florence in 1681. There are several portraits by him in the Pitti Palace at Florence. Rubens is said to have pronounced Sustermans an honour to his country.

(Descamps, *La Vie de Peintres Flamands*, &c.; Lanzi, *Storia Pittorica*, &c.)

SWIFTEST PROPAGATION, PRINCIPLE OF, in the undulatory theory of light, is the expression of the fact that the front of a wave, after reflexion or refraction, passes through a given space in the least possible time; the velocity after reflexion being the same as before it, and after refraction being that which depends on the medium in which it moves.

In the article UNDULATORY THEORY, P. C., the equality of the angles of incidence and reflexion was proved only for the case in which the reflecting surface is a plane; but it is easy to prove that the equality subsists whatever be the form of the reflecting surface. For let the curve NQS be a section through the axis of a reflecting surface, and, if

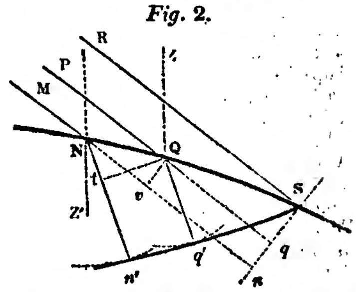
Fig. 1.



the radiant point be infinitely remote, let MN, PQ, RS be rays of right, or lines parallel to the direction of the incident wave; or, if the radiant point be at a finite distance, let those lines diverge from such point so that in either case they may be perpendicular to the general front of the wave: also let that front have the position nqS at a certain time if the reflecting surface be not interposed. Then N, Q, S being the centres of the partial waves produced by reflexion, let the curve at n' be part of the surface of the wave originating at N; its radius Nn' being equal to Nn, since the velocity before and after reflexion is the same: and let the curve at q' be part of the surface of the wave originating at Q, so that $Qq' = Qq$. Imagine partial waves to be formed in like manner from every point in the curve surface NQS; then a curve surface touching all the spheres, as at n' and q', will be the general surface of the reflected wave, at the time that the surface of the direct wave would have been at nqS. Next, imagine Q to be very near N, and let fall Qt, Qv, perpendicular respectively to Nn' and Nn; then Nt may be considered as the difference between Nn' and Qq', and Nv as the difference between Nn and Qq; therefore these differences are equal to one another: hence, NQ being considered as part of a straight line touching the curve NQS at N, the angle QNt is equal to QNv or MNT: consequently the angle of reflexion (the complement of QNt) is equal to the complement of MNT, or the angle of incidence.

Again, in the article UNDULATORY THEORY, P. C., it is proved that, when light is refracted at a plane surface, the sine of the angle of incidence is to the sine of the angle of refraction in a constant ratio, which is that of the velocities of the waves previously and subsequently to the moment of incidence, and the same law may be proved to hold good whatever be the form of the refracting surface. For let

Fig. 2.



NQS represent a section through the axis of a transparent medium bounded by a curve surface, and let MN, PQ, RS be rays or lines perpendicular to the surface of a general wave; also let Sqn represent the position of that surface at a certain time if the refracting medium be not interposed. Next, N, Q, S being the centres of refracted waves, let spherical surfaces at n', q', be the surfaces of such waves at the same time, and imagine partial waves to be formed in like manner from every point in the curve surface NQS: then a curve surface represented by $Sq'n'$ touching all those spherical surfaces will be the general surface of the refracted wave.

Now I and R representing the velocities of the incident and refracted waves respectively, by the principles of the undulatory theory we shall have

$$\mathrm{I} : \mathrm{R} :: Nn : Nn' \left(= \frac{\mathrm{R}}{\mathrm{I}}\, Nn\right)$$

and

$$\mathrm{I} : \mathrm{R} :: Qq : Qq' \left(= \frac{\mathrm{R}}{\mathrm{I}}\, Qq'\right):$$

Next, imagining Q to be very near N, let fall Qv perpendicularly on Nn, and Qt perpendicularly on Nn'; then

$$Nv = Nn - Qq, \text{ and } Nt = Nn' - Qq';$$

or, substituting the values of Nn' and Qq',

$$Nt = \frac{R}{I}(Nn - Qq);$$

therefore $\quad Nv : Nt :: I : R.$

Now NQ being considered as a straight line, it is a common hypotenuse to the right-angled triangles NQv and NQt; hence

$$Nv : Nt :: \sin. NQv : \sin. NQt.$$

But ZQ and NZ′ being perpendiculars to the refracting surface, NQv is the complement of PQN, and is therefore equal to the angle (PQZ) of incidence at Q or N; also NQt is the complement of QNt, and is therefore equal to the angle ($Z'Nt$) of refraction at N:—thus $Nv : Nt ::$ sine of incidence : sine of refraction; and it follows that

sine of incid. : sine of refraction :: I : R;

or since, by the principles of the undulatory theory, the ratio of I to R is constant in the same medium, the sine of incidence bears a constant ratio to the sine of refraction.

It may now be shown that a wave is propagated from the radiant point to any other point in the line of its direction, subsequently to reflexion or refraction, in the least possible time.

Thus, with respect to reflexion, if the waves diverging from N and Q (*Fig.* 1) with velocities equal to that of the incident wave were to take any other directions than those of Nn' and Qq', which are perpendicular to the front $Sq'n'$ of the general wave, it is evident that a curve surface passing through S and touching the surfaces of the several waves would fall between Sn' and SN: such surface would then be the front of the reflected wave; and thus the front would, in a given time, have passed through a less interval from the reflecting surface (or from the radiant point) than it actually passes through in consequence of the partial waves taking the directions Nn' and Qq'. In like manner with respect to refraction: if the waves diverging from N and Q (*Fig.* 2) with velocities which bear to the velocities before refraction the ratio of R to I were to take any other directions than those of Nn' and Qq, it is evident that a curve surface passing through S and touching the surfaces of the several waves would fall between Sn' and SN: such surface would be the front of the refracted wave; and the conclusion corresponds to that which has been stated for a reflected wave. Therefore in both cases the time, reckoning from the moment of setting out from the radiant point, or from the reflecting or refracting surface, during which the general wave arrives in any given position, as $Sq'n'$, will be the least possible.

SWITHIN, ST., seventeenth Bishop of Winchester, was born in the early part of the ninth century, but the exact year is not ascertained. He was ordained priest in 830 by Helmstan, Bishop of Winchester, and was soon after appointed by King Egbert his chaplain, and tutor to his son Ethelwulf. In the reign of the latter he became chancellor, and was intrusted with the education of Alfred, whom he accompanied to Rome. [ALFRED, P. C.] The services rendered by Swithin to Ethelwulf in the direction of the ecclesiastical affairs of his kingdom were rewarded by his elevation in 852 to the see of Winchester, vacant by the death of Helmstan. He is supposed to have been the originator of the payment of 'Peter-pence' to Rome, though there is much reason to believe that this tribute had an earlier origin [PETER-PENCE, P. C.], and also to have procured the first act of the Wittenagemot for enforcing the universal payment of tithes.

William of Malmesbury says of St. Swithin that 'he was a rich treasure of all virtues, and that those in which he took most delight were humility and charity to the poor.' He adds that he built several churches, and devoted himself exclusively to the spiritual administration of his diocese; in his frequent visitations of it, he travelled with his clergy on foot, and for the most part by night, in order to avoid the suspicion of ostentation. He died in the reign of Ethelbert, on the 2nd July, 862. His last request was that he should be buried in the churchyard of Winchester, 'ubi cadaver et pedibus praetereuntium et stillicidiis e coelo rorantibus esset obnoxium.' Within a century afterwards, his name having been admitted into the calendar as that of a canonized saint, it was resolved to transfer his remains to the cathedral, and to place them in a magnificent shrine prepared for the purpose by King Egbert. The translation, which was to have taken place on the 15th of July, was delayed for forty days in consequence of the severe rainy weather which occurred, and hence arose the well-known tradition of which the prevailing notions are thus expressed in a Scotch proverb:—

> 'Saint Swithin's day, gif ye do rain,
> For forty days it will remain;
> Saint Swithin's day, an ye be fair,
> For forty days 'twill rain nae mair.'

In France the day of the festival of St. Gervais (19th June) is marked by a similar superstition:—

> 'S'il pleut le jour de Saint Gervais,
> Il pleut quarante jours après.'

These superstitions are not however altogether unfounded on facts, experience having shown that whenever a wet season sets in about the end of June to the middle of July, it generally continues for a considerable period, and that, in a majority of our summers, a rainy season of about forty days comes on nearly at the time indicated by the tradition of Saint Swithin. (See an interesting paper on the subject in the *Penny Magazine* for 1832, p. 149.)

The festival of St. Swithin in the Roman Martyrology is the 2nd of July, the day of his death, but in England it was celebrated on the 15th of July, the day appointed for the translation of his relics to the Cathedral of Winchester. [WINCHESTER, P. C.]

(Alban Butler, *Lives of the Saints*; Fleury, *Histoire Ecclesiastique*. b. xlix. c. 29; Lord Campbell's *Lives of the Lord Chancellors and Keepers of the Great Seal of England*, first series, 3 vols. 8vo., London, 1845.)

SYCO'CRINUS, a genus of fossil Crinoidea from the mountain limestone of Yorkshire. (Austin.)

SYDENHAM, CHARLES EDWARD POULETT THOMSON, LORD, was the son of John Poulett Thomson, Esq., of Waverley Abbey and Roehampton in Surrey, the head of the mercantile firm of J. Thomson, T. Bonar, and Co., which had been long one of the most eminent houses engaged in the Russian trade. Mr. John Thomson, who assumed the name of Poulett by sign-manual, in 1820, in memory of his mother, married, in 1781, Charlotte, daughter of Dr. Jacob of Salisbury, and by her he had a family of nine children, of whom the subject of the present notice, born at Waverley on the 13th of September, 1799, was the youngest. There were two elder sons, Andrew and George, of whom the latter, now George Poulett Scrope, Esq., is the present member for Stroud, and the author of 'Principles of Political Economy,' 12mo., 1833, and of 'The Life of Lord Sydenham,' 8vo., 1843.

Charles is stated by his brother to have been remarkable in his infancy for his grace and beauty; but the story which he tells of the child, who had attracted the notice of George III. at Weymouth, in the summer of 1803, having been placed by his majesty in the arms of Mr. Pitt, cannot be correct in all respects; for Mr. Pitt was not then prime minister, as is assumed, and could not have been in attendance upon the king in that capacity. It seems unlikely indeed that he should have been with his majesty at all in that year.

Lord Sydenham was never at any public school or university; and he left his native country at the age of sixteen, to be placed in his father's house of business at St. Petersburg, then under the chief direction of his eldest brother He returned to England in ill-health in 1817; then made a tour to the south of France, Switzerland, and Italy; after which he took his place in his father's counting-house in London, in the summer of 1819. In the spring of 1821 he was again sent out to St. Petersburg, this time as a partner in the firm; and here he remained for two years. The greater part of the winter and spring of 1823-4 he spent in Vienna; whence returning by Paris to England, he assumed, in conjunction with his brother Andrew, the chief conduct of the business in London.

Sanguine, ambitious, and self-confident, he involved himself to some extent in the American mining speculations of 1825. Meanwhile he had become intimate with the late Mr. Bentham and Mr. James Mill, with Mr. Warburton, Mr. Hume, Dr. Bowring, and Mr. M'Culloch, and had set his heart upon entering public life. He obtained a seat in parliament for Dover, after an expensive contest, at the general election in the summer of 1826. His rise from this date was very rapid. Voting steadily with the extreme section of the Opposition, he spoke but seldom, and almost exclusively upon commercial questions. On the first occasion however on which he delivered himself at any length, in a debate on the state of the shipping interest, on the 7th of May, 1827, he made a very favourable impression on the House, and had the gratification of being warmly complimented by Mr. Huskisson. After this, whenever he rose he was listened to with attention. He was again returned for Dover in 1830; and when the Whigs came into power, in November of that year, he was appointed to the offices of Vice-President of the Board of Trade and Treasurer of the Navy. He was returned again for Dover after his acceptance of office, and also to the succeeding parliament, which met in June, 1831. At the general election in December, 1832, he was returned both for Dover and for Manchester; he elected to sit for the latter place; and continued to represent Manchester as long as he remained in the House of Commons. Meanwhile on the reconstruction of the ministry in June, 1834, occasioned by the secession of Lord Stanley and Sir James Graham, Mr. Poulett Thomson was made President of the Board of Trade, in the room of Lord Auckland, who was removed to the Admiralty; and on the recovery of power by his party in April, 1835, after Sir Robert Peel's short administration, he resumed that office with a seat in the cabinet. So early as in the beginning of the year 1836, if there be no misprint of the date in Mr. P. Scrope's narrative, it had been in contemplation to remove him to the House of Lords, in order to relieve him from the fatigues of the long night sittings in the Commons, under which his health was already beginning to break down; but circumstances, it is added, for a time put a stop to this plan. At last, towards the close of the session of 1839, on the elevation of Mr. Spring Rice to the peerage, he was offered his choice between the chancellorship of the exchequer and the government of Canada; and accepted the latter. He was sworn into his new office before the Privy Council on the 29th of August; he left England on the 13th of September, and landed at Quebec on the 19th of October. Of his administration in Canada, which was highly successful, Mr. Scrope has published a very full narrative, which was drawn up by Mr. Murdoch, the civil secretary. In August, 1840, the governor-general was raised to the peerage by the title of Baron Sydenham, of Sydenham, in Kent, and Toronto, in Canada. But on the 4th of September, 1841, while in a weak state of health, he had the misfortune to be thrown from his horse, which stumbled and fell upon him, and to sustain a fracture of the principal bone of his right leg, besides other serious injuries; and his death followed on Sunday the 19th of the same month. The most remarkable quality that Lord Sydenham possessed was great decision of character, arising from clear-headedness and self-reliance. His activity, zeal, and extensive information also made him an excellent man of business, and his very attractive manners added to his value as a partisan.

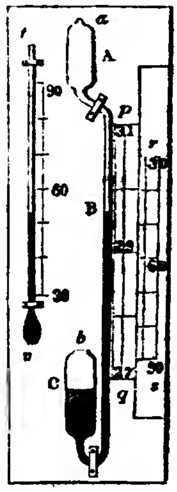
(*Memoir*, by G. Poulett Scrope, Esq., M.P.)

SYE'NE. [EGYPT, P. C.]

SYLVESTER, JOSHUA, was born in 1563. He appears to have engaged in mercantile pursuits, and was a member of the company of merchant-adventurers at Stade, for whose secretaryship he was a candidate in 1597, recommended by the Earl of Essex. He seems to have always remained a poor man, and to have been of a roving disposition. In the latter part of his life he emigrated to Holland, and died at Middelburg in 1618. Both in his opinions and in his choice of friends he was strongly puritanical; and those numerous versified works, chiefly translations from the French, to which he owed his literary reputation, show a warmly devotional and serious tone of feeling. He was not however remiss in courting the patronage of the great. To King James VI. he addressed many adulatory dedications; and it was probably in compliment to him that he selected the topic of one of his original poems, which is thus entitled: 'Tobacco battered, and the Pipes shattered (about their Ears that idly idolize so base and barbarous a Weed, or at leastwise over-love so loathsome a Vanitie), by a Volley of holy Shot thundered from Mount Helicon.' He is chiefly known now on account of the obligations said to have been incurred by Milton to his principal translation, that of the 'Divine Weeks and Works' of Du Bartas. [BARTAS, DU, P. C.] There are two collected editions of Sylvester's works, both in folio, and commencing with the translation of Du Bartas. Their dates are 1633 and 1641. The second of them contains a supplement of posthumous poems; among which is that tasteless alteration of the 'Soul's Errand,' which caused this fine poem to be erroneously attributed to Sylvester.

SYMPIESO'METER (from συμπιεσις, *compression*, and μέτρον, *measure*), is an instrument which was invented by Adie, of Edinburgh, in 1819, to serve as a barometer, for the purpose of measuring the pressure of the atmosphere, or of exhibiting the variations of its density near the earth. An account of its construction is contained in the first volume of the 'Edinburgh Journal of Science.'

It consists of a glass tube B about eighteen inches long and seven-hundredths of an inch in diameter internally: at the upper extremity is a cylindrical vessel A half an inch in diameter internally and two or three inches long; and the lower extremity, being turned upwards, terminates also in a vessel C of an oval form horizontally. The vessel A and the upper part of the tube B are filled with an elastic fluid, as hydrogen gas, while the vessel C and the lower part of the tube contain almond-oil tinctured with some colouring matter, as anchusa root.



In order to introduce the gas and oil, the extremities a and b of the vessels A and C being open, and the former extremity being drawn in the form of a slender tube, the instrument is quite filled with mercury; when, being held in a horizontal position with the orifice b covered by the finger, that the mercury may not run out, the slender pipe at a is put in communication with the gasometer. The hydrogen gas entering at a, and the instrument being now brought to a vertical position, on removing the finger from b the mercury will flow out till its upper surface is at the same level in the tube B and the vessel C, the gas occupying its place in the former. The extremity a is then hermetically sealed, and, the instrument being inverted, the mercury in C runs out, while that which remains in the tube B prevents the gas from escaping. The instrument being afterwards returned to its former position, the vessel A uppermost, the oil is poured into the vessel C: then, the gas being heated, by its expansion it drives the mercury in B into the vessel C; and, the instrument being now held in an inclined position, the oil is by the pressure of the atmosphere forced into the tube B in proportion as the gas by cooling becomes contracted in volume. The remaining mercury is lastly poured out of the vessel C; and the end b being left open, the pressure of the atmosphere on the oil is, the instrument being again put in a vertical position, a counterbalance to the weight of the column of oil in B and to the expansive force of the compressed gas which is in the upper part of the tube and in the vessel A.

In order to form a scale for the sympiesometer, the instrument, together with a good barometer and a thermometer, must be placed in a glass receiver in which, by proper syringes, the air may be rarefied or condensed at pleasure: then, on bringing the air in the receiver successively to such states, with respect to density, that the top of the column of mercury in the barometer may stand at 27, 28, 29 and 30 inches, and marking the points on the tube or frame of the sympiesometer at which the top of the column of oil stood when the air was in those states, the distance between every two of these points being divided into one hundred equal parts, the scale $p\,q$ of the instrument is constructed. The particular graduation at which, on the scale, the top of the column of oil stands at any time should indicate the number of inches and hundredths of an inch at which the top of the column of mercury in a barometer would stand at the same time in the same place.

But the volume of the hydrogen gas changes in consequence of variations in the temperature of the atmosphere; and therefore a correction, depending on the amount of the variation in the volume of gas for given increments of heat, should be applied to the number of the graduation on the scale of the sympiesometer in order to obtain the true height of the mercurial column in a barometer.

But, to avoid the trouble of computing and applying this correction, the scale $p\,q$ of the sympiesometer is made to slide on one side of a scale $r\,s$ which is graduated like that of a thermometer, by communicating different degrees of heat to the vessel A while the pressure of the atmosphere on the upper surface of the oil in C remains the same (suppose that which corresponds to 29½ inches on the scale of a barometer) and observing the points at which the top of the column in B stands: these points on the scale $r\,s$ are numbered so as to express, in degrees, the temperature of the gas; and the scale $p\,q$ being moved till its index (at 29½ inches) coincides with the degree of the scale $r\,s$ corresponding to the temperature of the atmosphere, expressed by the degree of a thermometer $t\,v$ attached to the instrument, the graduation on $p\,q$ corresponding to the top of the column of oil in B expresses the height of a column of mercury in a barometer.

Dr. Robert Gordon, the writer of the article Meteorology in the 'Edinburgh Encyclopædia,' having made a series of observations for the purpose of comparing the indications of the sympiesometer with those of a barometer, found that the former stood higher than the latter by quantities varying between 0.03 inch and 0.017 inch, the temperature varying between 42°.3 and 62°.6 (Fahr.): he found at the same time that, in general, the difference between the indications of the two instruments increased as the temperature and pressure diminished. The excess of the indications given by one instrument over those given by the other may be conceived to have arisen from some inaccuracy in the construction of the sympiesometer: but the variation of the excess is not so easily accounted for; it may, however, be supposed to be caused in part by the expansions of the gas not being exactly proportional to the increments of heat, a circumstance which is assumed in the subdivisions of the scale *r s*, between each of the complete inches, being made equal to one another, and in part from some absorption between the oil and the gas. It is inferred, therefore, that the indications of the sympiesometer cannot always be relied on as accurate measures of the density of the atmosphere; but, since it has been observed that the instrument is frequently affected by changes in that density, which are too small to be perceived on the scale of a barometer; and since it is well known to be less deranged than the latter instrument by the motion of a ship at sea, it follows that, in these respects, it possesses great advantages as a marine barometer in indicating the approach of gales of wind.

SYMPLOCARPUS, a genus of plants belonging to the natural order Araceæ. It has a cucullate spathe, a short spadix covered with tetrandrous floscules. The ovaries are one-celled, with one ovule in each and a minute stigma. The berries are consolidated, the seeds without albumen.

S. fœtidus, Skunk-weed or Skunk-cabbage, has a large abrupt tuber with numerous crowded fleshy fibres. The spathe is præcocious, ovate, turgid, various in width, spotted, and sometimes covered with dull brownish purple. The spadix is oval, on a short peduncle covered with perfect tetrandrous flowers, and of the same colour as the spathe. It has 4 fleshy wedge-shaped sepals, truncate at the top, and edges inflated; the 4 stamens are opposite the sepals with subulate filaments equal in length to the calyx. When the spathe decays, the spadix continues to grow, and every part of the plant, excepting the anthers. Within the spadix at the base of each style is a round fleshy seed as large as a pea, white, tinged with green and purple, and invested with a separate membranous coat, and with a prominent embryo situated in a depression at the top. The leaves spring up some time after the flowers; they are numerous, large, crowded, oblong, heart-shaped, and on long channelled petioles. The plant emits an offensive odour; its tubers are acrid, but when dried and powdered, are antispasmodic.

It is considered an excellent remedy in asthma, catarrh, and chronic coughs, and has also been employed in dropsy, rheumatism, and epilepsy.

(Lindley, *Flora Medica.*)

SYNBATHO'CRINUS, a genus of fossil Crinoidea from the mountain limestone of Bolland forest. (Phillips.)

SY'NOCHUS and **SY'NOCHA**, forms of fever recognised by most of the older and many recent writers on the practice of medicine. Sauvages defined Synochus to be a fever which lasted more than a fortnight without materially weakening the pulse; whilst Cullen used this term to express a fever which combined the two forms of inflammatory and putrid fever, that is, a fever which at its commencement was inflammatory and at its close putrid. The inflammatory form of fever which was characterised by running its course rapidly, and marked by high excitement of the heart and arteries, was called Synocha by Cullen. A putrid and low form of fever was called Typhus. The latter term is now however applied to all continued contagious fevers, and the former terms are not often used at all.

INDEX TO THE LETTER S.

VOLUME II.

T.

TABLE. Since the article TABLE, P. C., appeared (in 1842) we have kept an eye upon it, with a view to its correction and amplification in this supplement. We were obliged to take much of our article from the description of other writers: though we had ourselves seen a majority of the books we cited. We have since seen many more, and have found several errors in our sources of information; but not more than, in the general laxity of bibliographical description, we were prepared to expect. We shall take the subjects in the same order as in the article above referred to; and when a table is merely mentioned by the author's name in the present article, it will be found in the former one with fuller description.

The restoration of the old numerical type, namely, that in which all the figures except 0, 1, 2, have a head or a tail, and in which the thickness does not vary sensibly from one part to another, was adopted and recommended by the Astronomical Society at the end of 1842; but it had previously been used by Mr. Baily in his detail of the Cavendish experiment, which forms one volume of the Memoirs of that Society. The writer of this article, who first suggested the revival of the old figure (and caused it to be employed in Taylor and Walton's five-figure logarithms, in their reprint of Barlow's tables, and in his own work on Arithmetic, before any one else had used it) is decidedly of opinion that one more change is yet wanting, the substitution of dull and rather dark paper for the bright and shining material now in general use, which dazzles the eye too much. Tables should not be hot-pressed, and not even pressed at all. The mischiefs of pressure are two-fold; first, the smooth surface thereby created makes the page a kind of mirror, which has a bright image in one place, whereas rough paper dissipates the light equally in all directions; secondly, the other side of the leaf shows through much more after pressure than before. It is also a mistake to suppose that great blackness in the ink, combined with great whiteness in the paper, is favourable to the reader. Every increase of the contrast, over and above what is necessary to perfect legibility, is injurious to it: jet upon snow would in time destroy the strongest eyes. Of all the things which are meant to be read, a black monumental inscription on white marble in a bright light is about the most difficult: one would suppose, to look at our specimens of expensive printing, that such an inscription was the model which it was intended to imitate, and if possible to surpass. We are satisfied, after many trials and comparisons, that a dull paper, of a whitish brown character, too thick to be seen through, and an ink which is of a dull-brown black, as it were the very deepest shade of the colour of the paper itself, are the things which are permanently agreeable to most eyes. Those who try it should remember that the first page read is not so good a test as the hundredth.

One of the most legible books we know of is the trade edition of Gibbon's 'Decline and Fall,' &c., in twelve volumes octavo, London, 1820. It is considered by the booksellers themselves to be very badly executed. But printers and publishers are too much in the habit of forgetting that a book is a book and not a line engraving. They look at the page as a whole, and if the individual lines stand out and make their separate existences too perceptible, they pronounce it ugly. Accordingly, the uglier they hold it to be the more legible the reader will pronounce it.

We regret to see that, just as we are beginning to abandon the use of the thick even-sized figures, the Germans are taking strongly to them. Most of the modern German tables have these illegible characteristics.

§ 1. *Tables of Multiplication.*—We were wrong in calling the anonymous table, London, 1775, by the name of Riley. This table, which goes up to 10,000 × 10, is 'Tables of Products . . . London, printed for J. Plummer.' But Riley's table, published in the same year, under exactly the same form, is 'Riley's Arithmetical Tables . . . . London, printed for G. Riley.' It is imperfect in all the copies we have seen, ending abruptly at the multiplicand 5280. The numerals are of the same form and size as in Plummer, but the headings and lines are different. We suspect that some writer of more than usual research on the quarrels of authors, or some hunter of old injunction cases, might find something about the history of these two books.

Cadet's 'Table,' Paris, 1797, goes to 10,000 × 100; misprinted 1000 × 100 in our article.

Bretschneider, 'Producten-Tafel,' Hamburg and Gotha, 1841, goes up to 100,000 × 10.

There is a compression of this kind: in finding, for example, the multiples of 62873, the reader must look into the page headed 2800, and there, in one part of the page, opposite to (6) 28, he finds the first three figures, and in another part, opposite to 73, the last three figures. The first part belonging to 628 is repeated twice, once for the cases in which the following numbers are less than 50, and once for those in which they are above it; and an asterisk in the last part of the table occurs when it is necessary to add a unit to the preceding figures. This arrangement brings the table into ninety-nine pages octavo, and is very ingenious: but there is more risk of error in using it than we like. Again, multiplying five figures by one is not so difficult an operation that it need be avoided by using a table which requires us to look attentively at three distinct things. Lambert's table (1770), presently mentioned, contains the nine multiples of sin x for every degree, to six figures; and multiples of primes to those of 313.

The Munich table, mentioned in our last article, is 1610, J. G. Herwart, 'Tabulæ Arithmeticæ Προσθαφαιρέσεως* Universales,' a folio containing all products up to a thousand thousand.

In the Royal Society's Library is a table by J. J. Centnerschwer, 'Neu-erfundene Multiplikations- und quadrat-Tafeln,' Berlin, 1825. The earliest table we have seen mentioned (by Lipenius) is—Thomas Finck, 'Tabulæ Multiplicationis ac Divisionis,' Copenhagen, 1604 (oblong form). There is also, by the same author, 'Tabulæ quotidiano numerandi usui accommodatæ,' Copenhagen, 1615, 16mo.

As Finck is an author of some interest in the history of tables (as will presently appear), we have made some inquiry about these works,† and we find that they are not in the library at Copenhagen; but that Mollerus (*Cimbria Litterata*, vol. iii. p. 254) gives them as follows. It seems they were not intended for scientific purposes.—

'Tabulæ Multiplicationis et Divisionis, seorsim etiam Monetæ Danicæ accomodatæ,' Hafniæ, 1604; fol. obl.

'Tre Tabeller, indrettet til daglig fornöden Regning;' Copenhagen, 1615, 16mo.

Under this head we ought to mention John Bernoulli (the younger), 'Sexcentenary Table,' London, 1779, and Michael Taylor's 'Sexagesimal Table,' London, 1780, intended to save the use of logistic logarithms; the former having 10′ for the first term, and the latter 1°. Both were published by the Admiralty.

§ 2. *Tables of division and of prime numbers.*—Chernac's table gives not merely the lowest divisor as stated, but every divisor, for all the numbers under 1020000 which are not divisible by 2, 3, or 5. It is accordingly a larger (and we think a more useful) work than that of Burkhardt.

Branker's translation of Rhonius, mentioned in our preceding article, is of London, 1668, 'much altered and augmented by D. P.': this D. P. is Dr. Pell. The table of primes, &c. to 100000 is computed under Pell's advice and direction. But there is preserved in several places the title of a work of Pell which we have never seen, and which we take from Lipenius: 'Tabula decem millium difficilium Numerorum, eorum nempe omnium qui ab 0 ad centum Milliones [mille?] habent difficultates,' English, London, folio, 1666. This looks like a table of prime numbers, and the number of primes under a hundred thousand is about ten thousand. But we must leave it to those who can see the work, if it still exist. Branker's table was reprinted in the

* Prosthaphæresis is a word compounded of prosthesis and aphæresis, and means addition or subtraction. Astronomical corrections, sometimes additive and sometimes subtractive, were called prosthaphæreses. The constant necessity for multiplication, in forming proportional parts for the corrections, gave rise to this table, which therefore had the name of its application in the title-page.

† From Professor Werlauff, Royal librarian at Copenhagen, through the kindness of Professor Schumacher.

second volume of Harris's 'Lexicon Technicum,' London, 1710.

Murhard mentions the *first part* of a table (by A. Felkel) of the factors of all numbers not divisible by 2, 3, or 5, from 1 to *a hundred million*, Vienna, 1776. We presume if this work had got as far as either Burkhardt or Chernac, we should have heard of it.

§ 3. *Tables of squares, cubes, square roots, cube roots, and powers in general.*—Perhaps the oldest printed table of squares is that in p. 30 of Pacioli's *Summa*, &c. [VIETA, P. C., p. 318], printed in 1494 and again in 1523, which however goes only to 100^2. Cosmo Bartoli, 'Del Modo di misurare le Distantie,' &c., Venice, 1564, has squares up to 661^2. Maginus's 'Tabula Tetragonica,' Venice, 1592, is not a separate work, but a chapter in his work on triangles, presently mentioned: it gives squares up to 10100^2, but not cubes. It was however published separately, at the same time with the work on triangles, as well as in it: the only difference being that the separate publication has its headings and explanations Italian instead of Latin. The number of so-called books, which are only chapters of other books, is large enough to make a big catalogue.

Lipenius mentions 'Tabulæ numerorum quadratorum decies millium,' Londini, 1672, which is Pell's table, though it has not his name. It has also an English title, contains the first ten thousand squares, and also the number of pairs, triads, and quaternions (1044 in number) of figures with which a square can end. Henischius, 'Arithmetica perfecta,' Augsburg, 1609, begins with squares and cubes of all numbers up to 360. Heilbronner (p. 627) mentions a *tabula Calviana* which gives squares up to 1000^2. Detached tables of powers are given in various works. John Hill's Arithmetic, of which the seventh edition bears London, 1745, has all the powers of 2, up to the 144th, for the purpose of solving questions about chessboards and horseshoe-nails. We have also the title G. C. Sartorins, 'Cubische tabellen,' Eisenach, 1827.

Maseres, at the end of the tracts on Combinations, London, 1795, has reprinted Hutton's square roots 0(1)1000 to ten decimals, and reciprocals to seven. We believo that Hutton first gave them in his 'Miscellanea Mathematica,' 4 vols. 12mo. 1775. In Jonas Moore's Arithmetic, 1650, there are the squares and cubes of all numbers up to 1000, the fourth powers up to 300, and the fifth and sixth up to 200. These were reprinted in the edition of 1660.

Rogg mentions 'Art gantz nen-entdeckte,' &c. Dessau, 1755, 8vo., containing the cubes of all numbers up to 100,000, or at least professing in the title-page to give the cube root of every number under a thousand millions of millions: perhaps the cubes went to that of 10,000, with a rule for the fifth figure. And here we may mention that we have been several times deceived by a title-page stating, not the extent of the table, as it ought to do, but the extent to which operations of interpolation will be effective.

§ 4. *Pure Decimal Operations.*—An anonymous work, 'Tafeln zur Verwandlung aller Brüche, &c.' Oldenburg, 1842, gives every fraction less than unity whose denominator does not exceed three figures, nor its numerator two, to seven places of decimals. This is a useful table. We may also mention (but not as having seen it) W. F. Wucherer, 'Beyträge zum allgemeinen Gebrauch der Decimalbrüche, &c.' Karlsruhe, 1795, 8vo.

Tho oldest table we have found printed in English is in 'This boke showeth the maner of measurynge of all maner of lande, as well of woodlande, as of lande in the felde, and comptynge the true nombre of acres of the same. Newlye invented and compyled by Syr Rycharde Benese Chanon of Marton Abbay besyde London. Prynted in Southwarke in Saynt Thomas his hospitall by me James Nicolson.' There is no date, but Nicolson's dated works run from 1536 to 1538. There is another edition (which omits the tables) printed by Thomas Colwell, who printed from 1558 to 1575. They aro double-entry tables of the rudest character, for finding the number of acres in a given length and breadth, and for casting up payment at per perch, per acre, &c.

§ 5. *Pure Trigonometrical Tables.*—The bibliographical history of the early part of this subject is so incorrectly given, as well as ambiguously, even by the best authorities, that it will be worth while to collect the several heads, distinguishing between what we know from the books themselves and what we are obliged to take from other sources, by putting the name of an authority (of which we have usually two or three) to the latter. Much confusion has arisen from the double meaning of the word *publication* in the century following the invention of printing, when it was applied equally to the issue of a printed book and of a manuscript. We are here only concerned with the former; and it is sometimes difficult to distinguish between the two.

That ALBATEGNIUS [P. C. S.] had substituted sines for Ptolemy's chords,—that he had also used versed sines and tangents—that Purbach and Regiomontanus had constructed and issued (in manuscript at least) tables of sines to two separate radii, 6,000,000 and 10,000,000—are historical facts of notoriety. Our question is, what tables were first *printed?* On the books which Regiomontanus actually printed, out of the long lists of those which he published and intended to publish (as set forth in his own 'Index Operum, &c.' printed at Nürnberg by himself), his historians, Doppelmayer, De Murr, Weidler, &c., are either not very clear, or somewhat at varianco. In the vague manner in which books and their contents are frequently described by professedly mathematical writers, a good resource is often found in the catalogues of general bibliographers.

The 'Tabulae Directionum Profectionumque' of Regiomontanus were published by himself at Nürnberg (without date, probably about 1475), and were reprinted at Venice in 1485. But we cannot ascertain that either of these contained tables of sines. But Hain (*Repert. Bibliogr.*), who gives their titles, gives that of the next edition (Augsburg, Ehr. Ratdolt, 1490, 4to.) in a fuller manner: from which it appears that there is appended to it a table of sines to minutes, in words which would imply that Regiomontanus had not given such a table in the former edition: they are, 'Tabella Sinns recti: per gradus et singula minuta divisa. Ad Tabulas Directionum Mag. Joh. de Regiomonte necessarias.' But from the description it is clear that this table does not belong to the work, since it follows even the printer's insignia. And Hain also met with it as a separate work; being, as appears from his description of the lineation, pages, &c. absolutely the same as that which was appended to the Tabulæ Profectionum. Accordingly, until something earlier or more definite is produced, we must say that the first known printed table of sines is an anonymous table, to minutes, in quarto, without date, but before 1500, stated (with *necessarias* when it ought to be *necessaria*) to be necessary to the tables of Regiomontanus, and implying that sines had not then been printed with those tables. From the next-mentioned edition of the Tabulæ Directionum (this we have seen) we should suppose that these tables were to a radius of 600,000, as in that edition, which is of Venice, 1504, 4to. In it we find a minute-table of sines, beaded 'Incipit tabella sinus recti,' and with a column containing differences for ten seconds. Delambre and others mention Regiomontanus as having given the first tables of tangents in this work under the name of *tabula fæcunda*. It is in the edition of 1504, and was reprinted by Gemma Frisius in his book 'De Radio Astronomico,' Antwerp, 1545. It is to degrees only, and to a radius 100,000; and is a table of cotangents, not of tangents. Delambre mentions an edition of the work, edited by Gauricus, in 1524, as containing a table of sines to every ten minutes: of this we can find nothing. As yet we have no sines calculated to the now ordinary radius of 10,000 &c. Of these the earliest that we have seen (and we find no earlier ones mentioned) are those of Peter Apian in the 'Introductio Geographica, &c.' Ingoldstadt, 1533, folio. They are minute-tables to a radius of 100,000, and were reprinted the next year in the same author's 'Instrumentum primi Mobilis,' Nürnberg, 1534, folio. Apian states that they are of his own calculation, and this is to us a strong presumption that no such tables had been previously printed; for Apian was a great reprinter of the writings of others at his own press, and very unlikely to have recalculated any table which he knew to exist already. The statement that the work of Regiomontanus on triangles (Nürnberg, 1533, folio) contains tables of sines, is incorrect: we know it from examination of two perfect copies. As we are now contradicting our own previous assertion [TABLES, P. C.], we will point out how we were misled. Lalande (*Bibl. Astron.*) says that the first edition of the work, Basle, 1536, has in the title-page 'una cum tabulis sinuum.' Now the fact is that Lalande, who had only seen the second edition (*Basle*, no date, known to be of 1561), which *does* contain tables of sines, took the liberty of presuming that the first edition was the same in contents, title, and place; in all of which he was wrong, and in the date also.

In 1542, Rheticus, the most laborious of all the table computers, made his first appearance as the editor of a work of Copernicus: 'De Lateribus et Angulis Triangulorum,' &c., Wittemberg, 4to. (Weidler and Kastner). This contains a minute-table of sines to a radius of ten millions, being the first-published seven-figure table. The table which appeared in the following year, in the great work of Copernicus [Copernicus, P.C.], is an abridgment of the preceding; going only to every ten minutes, and to a radius of 100,000.

In 1541 appeared one of the tables which have obtained most celebrity: being the 'Tractatus Geo. Purbachii super propositiones Ptolemæi de Sinubus et Chordis, item compositio Tabularum Sinuum per Joannem de Regiomonte. Adjectæ sunt Tabulæ Sinuum duplices per eundem Regiomontanum,' Nürnberg, 1541, folio (Kastner, &c.). The two tables of sines are both minute-tables, with radii of 6 millions and of 10 millions. The table of tangents to every degree is repeated again under the name of *tabula fœcunda*.

Rheticus, in the meanwhile, was pursuing the route of analogy, which suggested to him the formation of a table giving *all* the ratios which exist between the sides of a right-angled triangle: by which he was led to the invention of what were afterwards called secants, to the completion of the trigonometrical canon, and to its arrangement in the form which it has ever since preserved. His rights in this matter have long been forgotten; and it is only very recently indeed that the work which established them has received any notice in modern times. (See the *Notices of the Astron. Soc.*, vol. vi. p. 213, and *Phil. Mag.*, June, 1845.) In 1551, the year following that in which he was placed in the *Index* as a forbidden author, he published his 'Canon Doctrinæ Triangulorum,' Leipzig, 4to. This is a complete canon to every ten minutes, and to a radius of 10 millions (or, as we should now say, to seven decimals) with differences, so arranged that the matters connected with each angle also belong to its supplement, in the manner so familiar to those who can use any modern table. This arrangement may be called *semi-quadrantal*, as opposed to the older *quadrantal* arrangement in which the sines are carried direct from 0 to 90°. Accordingly the page of Rheticus has both a head and foot description, as in modern tables. So completely is he bent on the idea of a register of the proportions of right-angled triangles, that he rejects the use of the word sine. In the place of the sine and cosine, he has the perpendicular and base to an hypothenuse of ten millions; in that of the tangent and secant he has the perpendicular and hypothenuse to a base of ten millions; in that of the cotangent and cosecant, he has the base and hypothenuse to a perpendicular of ten millions. The same description is adopted in his larger work, of which we shall presently speak.

In 1554 Erasmus Reinhold (who had been the colleague of Rheticus* in teaching mathematics at Wittemberg) published the 'Liber Tabularum Directionum,' Tübingen, 4to. In this work, for the first time, occurs a *canon fœcundus* (not yet called a table of tangents) carried to every minute. Both sines and tangents were computed to a radius of 10 millions. This work of Reinhold, though founded upon Regiomontanus, must not be confounded with his professed edition of the 'Tabulæ Directionum' of Regiomontanus himself, which had tangents only to every degree, and was printed several times, the last edition being in 1606. (We have not thought it worth while to catalogue reprints.)

In 1558 (Delambre) Maurolycus published his edition of Theodosius, Menelaus, &c. (Messana, 4to.), containing the three tables, that of sines, the tabula fœcunda, and the *tabula benefica* (as he called the present table of secants). This table goes only to degrees (except that tangents and secants are given for 15, 30, 45, 55, and 59 minutes of the last degree of the quadrant) and is to a radius of 100,000. Delambre, &c. suppose that these are the first tables of secants which were published, and they accordingly attribute the invention to Maurolycus. But we have seen that it is due to Rheticus: and Finck (presently mentioned), who lived close to these times, states expressly that Maurolycus borrowed this table from Rheticus.

In 1562 a pupil of Rheticus published a table of sines to every minute, and to a radius of ten millions. This was Samuel Eisenmenger (or Siderocrates, as he wrote himself), in his 'Libellus Geographicus,' Tübingen, 4to. And there was, as we find stated in various quarters, a table of sines in the work on dialling of Hermann Witekind, 'Conformatio Horologiorum,' of which the first edition is said to be of Heidelberg, 1576, 4to.

The first complete canon *to every minute* (that of Rheticus in 1551 being to every ten minutes) was Vieta's 'Canon Mathematicus, seu ad Triangula, cum Adpendicibus,' Paris, 1579, folio. We have described this work in Vieta, P. C., p. 316, and shall here only make a few additions. Besides the three title-pages there mentioned, there must have been a fourth; for in the title of that which Delambre examined was the motto *Dura et quiesce*, which certainly was not in either of the three seen by us. The work has well obeyed the direction given: it has lasted in silence, having never been described in catalogues or histories till modern times. Copies seem to have been rare in Germany; neither Weidler, Heilbronner, nor Kastner mentions it. Hutton never saw but his own copy; Montucla (in France!) never saw more than two, one in the royal library, and one sold at the Soubise sale (but it is not in the catalogue of that sale), which the historian would fain have bought, had not a *curieux* bid too high. And this was only by the time Montucla's second edition was written, for by the mention of it made in the first edition it is clear that the author had never seen it. We have examined in London at least eight copies. We have mentioned [Vieta, P. C.] the complaints which the author had to make against the printers: Montucla states that he bought in as many as he could.. There are several signs of something odd having taken place in the printing: and the following is worth mention:—To one of the copies we have seen (as well as to one of those in the Museum) is appended one folio sheet, in correction of a mass of errors in one sheet of the collection of formulæ: this sheet is a separate publication, with the date (1579) and printer's name on it.

Vieta imitates Rheticus in his method of heading the tables, but in addition uses the word sine, and calls the table of tangents *fœcunda*, and that of secants *fœcundissima*. He complains that elegant names have not been found, and states that he gets his denominations from certain *Raphsodi* (as he calls them; it is not often that mathematical tabulators are called rhapsodists) whom he does not name. In a later work, the *Responsa*, &c. [Vieta, P. C., p. 315], published in 1593, he names and objects to the words tangent and secant, which by that time he had seen. And he proposes to call the tangents *prosines* or *amsines*, and the secants *transsinuous* lines.

As to the matter of Vieta's tables, it is worth notice that they must have been made by independent calculation. They do not exhibit the errors in the last tangents and secants which appear in all writings prior to the more correct publication of Rheticus by Pitiscus. On the additions made by Vieta to the theory of trigonometry we have not here to speak: but we may simply say that they made the computation of a trigonometrical canon a much easier thing than it had theretofore been. Delambre is quite right when he observes that the 'Trigonometria *Britannica*' of Briggs is altogether French in all that relates to the non-logarithmic part of it. Had he known a little more of Vieta, he could have reinforced his assertion. For the method of solving equations which he describes (evidently not understanding it) as an obscure mixture of division and extraction of roots, was the slightly amended form of Vieta's numerical exegesis, to which we have referred in Involution and Evolution, P. C. S., p. 104. And as, by Gellibrand's account, we trace the commencement of Briggs's labours to shortly after the time when Vieta first published this exegesis, it is by no means an unlikely conclusion that the power of trisection and quinquisection given by this mode of solving equations, first put it into his head to construct the table.

Purbach and Regiomontanus had seen the advantage of adopting decimal tables, though their use of the radius 600, &c. was a remnant of sexagesimalism. It was reserved for Maurice Bressius to show himself a century behind his time, by publishing in his 'Metrices Astronomicæ Libri Quatuor,' Paris, 1581, folio, sexagesimal tables to every minute of sines, tangents, and secants, or as he calls them, *sines*, *adscripts*, and *hypothenuses*. Thus, the radius being 60°, the sine of 57° 20′ is given as 50° 30′ 34″; and the adscript and hypothenuse as 1 sex. 33° 34′ 46″, and 1 sex. 51° 9′ 44″; 1 sex. meaning 60°. Accustomed as we are to look upon sexagesimal division as sacred to angular and horary measure, we are apt to forget that the time was when other subdivisions were rarely used in Europe.

* Reinhold taught the higher branches, and Rheticus the lower. It is very illustrative of the neglect into which the prohibition (with other circumstances afterwards noted) caused the writings of Rheticus to fall, that Weidler, himself of the university of Wittenberg, writing and printing his History of Astronomy there, giving minutely the dates of Rheticus's degrees from the register, and stating that from the time when he and Reinhold were colleagues it had always been customary to have two teachers of mathematics—is as ill-informed as any one about the writings of Rheticus, and in particular knows nothing of the publication of 1551, of which we may therefore be pretty sure there was not a copy in the library.

As yet we do not find the modern names of *tangent* and *secant*. These were introduced in 1583 by a young man of twenty-two years, Thomas Finck, of Flensborg in Denmark, in his 'Geometriæ Rotundi Liber XIV,' Basle, 4to. His part in the matter was quite forgotten, and has been recently revived (see *Phil. Mag.*, May, 1845). He introduces the words with expressions which cannot be interpreted otherwise than as a proposal of his own, to which it must be added that no earlier use of these words has ever been brought forward. The tables of sines, tangents, and secants, so called, which Finck has introduced in his work, are to every minute, and to a radius of 10 millions. Finck deserves a much higher name than he has got, for the contents of this work alone: there are other writings of his, which we have not seen. He calculated his own secants by a theorem which answers to the formula

$$\text{Sec }\theta = \tan\theta + \tan\left(45^\circ - \frac{\theta}{2}\right).$$

In 1585-6 Clavius published at Rome, in quarto, his edition of Theodosius, to which is appended a treatise on triangles, and a table of sines, tangents, and secants, under those names. They were reprinted in the folio collection of his works, Mayence, 1611. It is clear, on inspection, that these tables are, as far as tangents and secants are concerned, a reprint of those of Finck, in their preliminary theorems, in their arrangement, in their omissions, and in their errors, as well as in the new terms with which they are headed. The name of Finck is suppressed as well as that of Rheticus; both of them were Protestants, and Clavius was a Jesuit, high in favour at Rome. Delambre expresses his astonishment that Clavius, in recapitulating the names of celebrated writers on dialling, should have omitted Sebastian Munster. The fact was, that Munster followed Luther. We are not quite certain that a greater than Clavius was altogether exempt from this laughable weakness. When Vieta suppresses the names of his authorities, as above noted, calling them merely *rhapsodists*, we may almost suspect that he wanted to avoid speaking of Rheticus and Reinhold; for he was very intolerant.

In 1591, Philip Lansberg published 'Triangulorum Geometriæ Libri Quatuor,' Leyden, 4to.: and in 1592 Magini published 'De Planis Triangulis Liber Unicus,' Venice, 4to. Both these are copied from Clavius: but Magini at least, who goes beyond Clavius in historical reference, wilfully suppresses the name of Finck.

We at first thought ourselves unable to give a date to the tables of Stevinus, except within a few years, and conjecturally. That he published his Arithmetic in 1585, and that Snell* collected his works in Latin in 1605-8, are the facts which are supposed to mark out the known limits of his career. The tables must have been published after 1593, since Vieta's names for the tangent and secant are mentioned; probably long after, for Vieta's works were of very slow travel. We ourselves believe fully that the Cosmographia, which contains the tables, was never published until it appeared in what is called Snell's collection (in 1608). These tables are to every minute, to a radius of 10 millions, and they are copies of Finck, Clavius, &c. We are informed that recent researches in Belgium have made it appear that Stevinus was born in 1548, and died in 1620, which puts our opinion beyond dispute. The mistake about Snell seems to have originated with Gerard Vossius.

In 1588, Nic. Raymar, Ursus Dithmarsus, published 'Fundamentum Astronomicum, id est nova Doctrina Sinuum,' &c., Strasburg. We cannot make out from the descriptions, whether this work contains tables or not: probably it did.

Who published the first English trigonometrical table is a point which we have never seen examined: and we must investigate it in the best way we can from rather scanty materials. We cannot find the word *sine* mentioned in the works of Recorde, nor in the English works of either Digges, father or son, nor in those of John Dee; nor indeed in any work written in English before Blundeville, except that of Burroughs presently cited. In the 'Alæ, seu Scalæ Mathematicæ' of Thomas Digges, London, 1573, 4to., trigonometrical processes are required for which allusion is made to Copernicus and Regiomontanus, and the tables of Rheticus are often cited (the ten-minute canon, of 1551). In John Dee's 'Parallacticæ Commentationis Praxeosque Nucleus quidam,' London, 1573, 4to., there are also solutions of triangles, and the tables referred to are those of Regiomontanus with the radius 60,000, before mentioned. But neither of these writers makes the smallest allusion to any tables published in England. We have examined the libraries of more than one diligent collector of English works of the sixteenth century, without finding anything which at all controverts our decided impression that Blundeville* was the real introducer of a complete canon of sines, tangents, and secants.

Blundeville's 'Exercises,' London, 1594, 4to. (it is said sometimes that 1597 is the date of the first edition, but incorrectly), were commenced, as he informs us, about seven years before. He alludes to Regiomontanus, Copernicus, and Clavius, from whom he took his tables. And he informs us that Regiomontanus is in folio, and that Clavius is in quarto, and published in 1586, at Rome. We rely much on this in our conclusion that his were the first tables: for to mention the form of a book, or the date of publication, is very rare with the writers of his time; and it is most likely that so precise a person would have noticed any previous work of the same kind in his own country. The tables, being copies of Clavius, have already been described. These 'Exercises' went through seven editions at least: the seventh, now before us, has the tables corrected from Pitiscus, by Robert Hartwell, the editor; it is London, 1636, 4to.

It must be noticed however, that though Blundeville gave the first English canon complete, a table of sines *only* had been printed four years before. It is at the end of the 'Horologiographia, the art of Dialling,' by Thomas Fale, London, 1593, 4to. (reprinted in 1652). The sines are to minutes, with a radius of 100,000. This then is the earliest table, but it is of sines only. We have seen that Digges used sines, but he is a Latin writer, and refers to a foreign table. Perhaps the first writer who *used* them in English (but still with foreign tables) is the well-known W. Burroughs, in his 'Discourse on the Variations of the Compasse,' published in 1581. In the preface he apologises for introducing rules 'wrought by the doctrine of signes and triangles, which may seem strange in our English-Tongue,' and all he gives on tables is in the following passage:—'In these examples I have used the abridged table of 100,000 the whole sine, which though it give some ease in the working, yet it is not so exact as that of 10,000,000 of *Erasmus Reinholdus*. Unto the which, with his *Canon fœcundus*, answerable to the same, if the third *Canon* of the *Hypothenusæs* were annexed, wee should have an entire Table for the Doctrine of Triangles, that might worthily bee called *The Table of Tables*. Which thing, though *Georgius Joachimus Rheticus* have well begunne, and framed it orderly, from ten Minutes to ten: yet is it left very rawly, for such as desire the exacte truth of things. I have therefore for mine owne ease and use, Calculated the complement of this Table, and almoste ended it, for the whole Quadrant, from minute to minute: which if in the mean time before I have finished, I shall not finde it extant by any other, I will publish it for the commoditie of all such as shall have occasion to use the same for navigation and cosmographie.' But this table was never published, and accordingly the editor of the edition of 1614 refers the reader to Ralph Handson's tranlation of Pitiscus, and the very tables of that work are annexed to the end of the edition of 1614. They are tables to every minute, and to a radius of 100,000. We cannot describe the first edition of Handson's work, having only seen the second, which is London, 1630, quarto. (Wilson, in the preface to his Navigation, says it was in 1614.) In 1609, John Speidel, afterwards well known in the history of logarithms, began his career by publishing, in quarto, 'Certaine verie necessarie and profitable Tables: *viz.* A Table of Sines, Tangents, and Secants, &c.' This tract of sixteen pages contains a canon to every ten minutes, and to a radius 1000, with some tables subsidiary to astronomy.

In 1610, Arthur Hopton published 'Baculum Geodæticum sive Viaticum, or the Geodæticall Staffe,' London, 4to. The seventh book of this is called 'Trigonometria, containing Longimetria, and Altimetria, performed by Synnicall supputation, with a Canon for the Dimension of tryangles.' The canon (from Pitiscus) is complete for every five minutes and

* It can be made very obvious that Stevinus *was alive* throughout the whole of the printing of these two volumes (or five volumes bound in two). In the very *last page* of the *last volume* (Index excepted), the author excuses himself for not fulfilling certain announcements, because he had not made up his mind about the subjects of them; and the printer could not wait. And this after referring to the places of the several matters in the very volumes which are supposed to be the collection of the editor. Besides, Snell, the reputed editor, was only seventeen years old when the work was published.

* This is the same as the Blundeville who wrote on Horsemanship. A few months ago (it is now October, 1846) a patent for a horseshoe was upset in Chancery, upon proof that Blundeville had described it before 1600.

to a radius of 100,000. Peculiar to this table is a heading by which the sine, tangent, secant of the complement, or defect from 90°, are also made to belong to the excess above 90°; thus at 10° tho sine, tangent, and secant of 80° are made to be those of 100°.

The history of the rest of the works of Rheticus was, till lately, very inaccurately told, and there is still some confusion about it. After Rheticus had published his ten-minute canon, already noticed, in 1551, he was occupied till his death in 1576, in what is, beyond a doubt, the most laborious work of calculation that any one man ever undertook: a complete trigonometrical canon to every ten seconds, and to ten places of decimals, sines to every ten seconds, and to fifteen decimals, with the first and last degree to every second, and tangents and secants to every minute, and to fifteen decimals. It is to be remembered that he wanted the abbreviations which might have been introduced, if he had known what Vieta had done. At his death, he had finished this work, within a mere trifle: what little remained to do, was done by his pupil Valentine Otho, and part of it was published at Neustadt* in the Palatinate, 1596, in folio (sometimes bound in two volumes, from its thickness). The title of the book, which was published at the expense of the Emperor Maximilian, is 'Opus Palatinum de Triangulis a Georgio Joachimo Rhetico cœptum: L. Valentinus Otho Principis Palatini Frederici IV. Electoris Mathematicus consummavit.' The contents are (after prefaces) three books *de Fabrica Canonis*, on the construction of the Canon, by Rheticus; one book on plane triangles, and four books on *right-angled* spherical triangles, by the same; five books on oblique-angled spherical triangles by the editor, Otho; three subsidiary astronomical tables called *meteoroscopia;* the great table, in 540 folio pages, giving, under the titles already alluded to, the sines, tangents, and secants, for every ten seconds, with a radius of 10000 millions, or, as we should now say, to ten places of decimals; a list of errata; and lastly, a second table of cotangents and cosecants for the first half of the quadrant, to every ten seconds as before, and to a radius of 10 millions. The appearance of the last table is merely the editor's want of judgment; it is clearly nothing but a previous attempt, made before the larger plan was resolved on, and is much less accurate than the great table to ten places.

Within a short time after the *Opus Palatinum* was published, it was found (by whom or how we are not told) that the tangents and secants towards the end of the quadrant became more and more erroneous, and at the extreme end were very erroneous indeed. All persons who know anything of trigonometry are aware that, to calculate the tangent or secant of an angle near to 90° true to any number of decimal places, requires that the cosine should be calculated to a greater number of places. Rheticus seems to have foreseen this, and to have provided sines true to a larger number of places than those which were published. When the defect was discovered, the advisers of the Elector Palatine, Frederick IV., to whom the work was dedicated by Otho, caused him to intrust the superintendence of the corrections to Bartholomew Pitiscus of Grünenberg, in Silesia, who had been his own teacher, and who was still in his service as chaplain: we suppose this means that Pitiscus himself was the adviser. Pitiscus applied to Otho, then an old man, for the larger tables of sines which Rheticus was known to have calculated: Otho was never able to find them; but at his death they were found among his papers. Pitiscus accordingly made *two* publications; but so confused are the statements respecting them, that some of our readers may almost doubt the fact. These two publications were as follows: 1,—He corrected all that part of the great table of the *Opus Palatinum* in which the tangents and secants are sensibly erroneous, being the first 86 pages. These be reprinted, and joined his reprint to the 540—86, or 454 remaining pages of the great table. He then cut away all the *Fabrica Canonis*, the books on triangles, the *Meteoroscopia*, and the small table of cotangents, &c., and added to his own 86 pages and Otho's 454 a short description, or *commonefactio*, as be calls it. This of course gives a thin folio. But we collect from Delambre's account of Prony's copy, tbat besides this, there were such things as complete copies of the *Opus Palatimum*, with tbe 86 correct pages substituted for the incorrect ones. And we presume that to these the separate title of tbe *commonefactio* was not appended, being printed only for the separated table. For Prony, Delambre, and all the rest of the French savans (to whom the subject was particularly interesting, on account of its connection with the *Tables du Cadastre*, then preparing) missed the date of the correction, which nevertheless appears on the separate title-page of the *commonefactio*. The person who is used to accurate descriptions of books might possibly, without this warning, throw away the thin folio we are speaking of, under the idea that it could not be in any sense an edition of the Opus Palatinum: which in fact it is not, though it is an edition of all that was corrected. The 86 pages of reprint are easily distinguishable by the inferiority of paper and type.* The title-page of the thin book is a sort of fly-title, without date &c., on the first page, as follows:—'Georgii Joachimi Rhetici magnus canon doctrinæ triangulorum ad decades secundorum scrupulorum, et ad partes 1 00000 00000. Recens emendatus a Bartholomæo Pitisco Silesio. . . . Addita est brevis commonefactio de fabrica et usu hujus Canonis . . . . . Canon hic, una cum brevi commonefactione . . . . . etiam separatim ab opere Palatino venditur. In bibliopoleio Harnischiano.' And the *commonefactio* has a title-page of its own, as follows: 'Bartholomæi Pitisci Grünbergensis Silesii Brevis et Perspicua commonefactio de fabrica et usu magni canonis doctrinæ triangulorum Georgii Joachimi Rhetici. Neostadii Typis Nicolai Schrammii MDCVII.' It thus appears that the date is 1607, which no one has yet noted, except Kastner, copying an older description, apparently without any distinct separate knowledge of what he was describing. 2, Pitiscus published, Frankfort, 1613 (misprinted on two of the titles 1513, by omission of a C) folio, the tables of Rheticus by which himself was enabled to make the preceding corrections, under a long descriptive title beginning with *Thesaurus*† *Mathematicus*. The contents, described in modern language, are:—sines to every ten seconds and to fifteen decimals, with first, second, third, and sometimes more differences; those of the first and last degrees, also to fifteen places, and to every second; the fundamental sines, from which the rest were calculated, to twenty places: the sines of every 10th, 30th, and 50th second in the first 35 minutes to 22 places (this last table was done by Pitiscus himself). Pitiscus died in July, 1613, very shortly after the publication of the *Thesaurus*.

When we come to reflect, we find that the tables of Rheticus did not make such an epoch in the history of these things as might have been expected. The ten-minute canon (1551) which we have described, and of which the memory was almost lost, introduced the secants, completed the system, and suggested to Vieta both the extension and its form. Had Rheticus published his own large table before his death, in 1576, it might have been otherwise: but deferred as this publication was, partly till 1596, seventeen years after Vieta's Canon had appeared, and partly till 1613, the year before the publication of logarithms, it turned out that the impulse had already been given from other quarters. The next great tables of sines which were produced were the work of Briggs, who was, as we have seen, exclusively the follower of Vieta in this part of the matter. The labours of Rheticus became little more than a tradition, though Vlacq used the last half of his quadrant in the construction of logarithmic sines. Vossius (1650) knew nothing definite of the tables except the Thesaurus, and that only in time to insert it in the additions to his work. Sherburne (1675) has not a word of tables. Briggs hardly mentions Rheticus; his biographers not at all. The Jesuit Blancanus omits him as a condemned writer; and it is to be noticed that he was, as to this matter, worse off than Copèrnicus himself; and the absolute prohibition against all his writings must have tended to the oblivion into which his name fell. Weidler (1741), writing in the University of Wittemberg, in which Rheticus taught, had not seen the Opus Palatinum, and knew nothing of what Pitiscus had

* Weidler, copied by Montucla, gives Heidelberg, 1594; and Lalande reconciles them by taking *Neostadium* to be Latin for Heidelberg! The Neustadt here mentioned is now part of Bavaria, lat. 49° +, long. 11° –.

* The corrected copies of the work, thick or thin, may be distinguished from the uncorrected ones in a moment, as follows:—Look at the bottom of page 7, at the running titles of the columns. The uncorrected copy will have, as it ought to have,

Basis Differentia Hypothenusa.

But the *corrected* copy (*quis custodict ipsos custodes?*) will have, as it ought not to have,

Hypothenusa Differentia Basis.

† The copies of the two works, the *Opus Palatinum*, and the *Thesaurus*, which belonged to Delambre, were bought at the sale of his books by Mr. Babbage. The copy of the *Thesaurus* is curious: it once belonged to De Thou, and was bequeathed to Delambre by Lalande. It sold at the sale for eleven pounds sterling. Mr. Babbage has also a copy of the corrected table (the thin volume). He informs us that, in 1828, Reuss, the librarian at Göttingen, and the indefatigable editor of the *Repertorium Commentationum*, &c., the most complete digest of scientific transactions which exists, was altogether ignorant of the existence of any corrections of the Opus Palatinum. This is a truly singular instance of the slowness with which bibliographical information spreads.

done. In the Berlin Memoirs for 1786, John Bernoulli (the younger) revived the knowledge of the *Opus Palatinum* and the *Thesaurus*; and Lalande had previously come at some statement to the effect that Pitiscus had once received instructions to correct the former. But Bernoulli knew nothing of these corrections, and nothing was known until chance threw a copy of the corrected Opus Palatinum into the hands of Prony, who described it in a paper printed in the fifth volume of the Memoirs of the Institute (1804). Delambre gave an accurate account at the beginning of the second volume of the 'Histoire de l'Astronomie Moderne.' Montucla had given nothing but mistakes. Hutton knew as much as Bernoulli. Kastner (1796, who would have got much more credit if he had given a proper name to his work of bibliography, instead of calling it a history of mathematics) has a detailed account of all the matter, except the corrections of the Opus Palatinum, on which he could only quote from a periodical of 1789.

In 1599 Pitiscus published his own work on Trigonometry, with tables, generally to seven places, and having intervals which may be described in the notation of our former paper as 0 (1″) 1′ (2″) 10′ (10″) 1° (1′) 45°. The edition of 1608, now before us, has of course the corrected tangents and secants. It was reprinted again in 1612, and Dechales mentions a reprint, by Henrion, in 1623.

Pitiscus will always be remarkable as the priest who wished that all his brethren were mathematicians,* to make them manageable and benevolent.

Among the non-logarithmic tables, which were published after the invention of Napier turned all the calculators another way, we have mentioned in our former article Schooten's Table, Amsterdam, 1627. Lipenius says this was reprinted in 1638 (?) and we know there is an edition of 1672 at Rouen, and of 1683 at Brussels. Editions are mentioned of 1640 and 1664, and also a Spanish edition, Brussels, 1683. Joh. Meyer's tables, Strasburg, 1619, contain sines, tangents and secants, squares, and cubes. Those of Adrian Metius, 1633, give a complete canon, to minutes, to seven decimals. In 1627 Snell published his 'Doctrina triangulorum canonica,' Leyden, containing a complete canon to every minute, and to seven places. Cruger's 'Synopsis Trigonometriæ,' Danzig, 1612, gave a five-decimal canon, to minutes. Albert Girard's 'Tables des sinus,' &c., Hague, 1626, are to five decimals; there was a Dutch reprint in 1629. Adrian Romanus gave tables (Delambre, *Astr. Mod.*, vol. ii. p. 35) in 1609; they were taken from Clavius. The contents of this paragraph are taken from different sources, and not from the books themselves. We might mention some anonymous tables from various catalogues, but anonymous works of this kind are so rare that we always suspect them.

Alsted's Encyclopædia (1649), the earliest work which has bulk enough to be compared with modern works of the same name, gives nothing more than a canon to degrees and seven decimals, with another to ten minutes and five decimals. The name only of logarithms is mentioned, and an insufficient definition given.

§ 6. We shall now add something to our account of logarithmic tables, including a fuller description of a few of those mentioned in our former article. The date and name, when unaccompanied by a title, will serve as a reference to that article.

1614. Napier. It must be specially noted that the logarithms which Napier himself published are not precisely those which are now called Naperian; that is, they are not the simple logarithms to the base $\epsilon=2{\cdot}7182818\ldots$ As the sines increase, his logarithms decrease. As he uses no decimal point, both his sines and logarithms are integers, the former to a radius of 10 millions. And if N be a sine and L the logarithm of it, as they stand in Napier, the equation connecting them is

$$N = 10{,}000{,}000 \;\; \epsilon^{-\frac{L}{10{,}000{,}000}}$$

Delambre proposes to call them *Naperian* logarithms, and to restrict tho term *hyperbolic* to the *modern Naperian* or ϵ logarithms.

1618. Benjamin Ursinus. The *Magnus Canon*, besides going to every ten seconds, has one place more than in Napier. It was partially reprinted by Schulze, as presently mentioned.

1619. John Speidell. These 'New Logarithmes' are the first *modern Naperian*, or *hyperbolic* logarithms. The second edition was in 1620, not 1627, as we stated (from others) before we had seen it. The reason of the mistake is that the 'Briefe Treatise of Sphæricall Triangles,' which is frequently prefixed, has 1627 on its title-page.

Taking decimals it stands thus:—If $m:n$ be the sine of an angle, and if λ represent the logarithm to the base ϵ, the *figures* of the Naperian logarithm are found in

$$\lambda n - \lambda m.$$

Thus, the sine of 19° 38′ is ·336, very nearly. And we have

$$\begin{aligned}\lambda\ 1000 &= 6{\cdot}9077552\ldots\\ \lambda\ \ 336 &= 5{\cdot}8171111\ldots\\ \hline &\ \ 1{\cdot}0906441\end{aligned}\qquad \text{Napier has } 10906448.$$

The figures of Speidell's logarithmic sine are found in

$$10 + \lambda m - \lambda n$$

thus for 19° 38′ he has 890936. But he leaves the 10 out of all the secants and the last half of the tangents. His logarithms of numbers, 0 (1) 1000, are modern hyperbolic to six decimals, as we should now say, but without the decimal point; thus at 770 he has 6646388 not 6·646388. To each logarithm he gives its difference, its arithmetical complement, and the halves of all three. Also an additional column which shows that he means to use his table in calculation by feet, inches, and quarters. Thus the number 775 has 16.1.3 opposite to it, there being 775 quarter inches in 16 feet 1 inch 3 quarters. At the bottom of each page he puts the logarithm of 100 and of 1000, for help in decimal fractions.

Speidell, as we have seen, first published in 1619; Baron Maseres reprinted from the 'tenth impression,' dated 1628; Hutton mentions the seventh, dated 1624; the Royal Society has one of 1623; Murhard gives the third impression of 1621, and we have the second, dated 1620. And it appears that Speidell was not the only person who reprinted it. In his 'briefe treatise' above mentioned, Speidell mentions, and naturally complains of, those * who had printed his work without an atom of alteration, and yet dispraised or undervalued it in their prefaces for want of alterations which themselves either could not or would not make. This he attributes to his not having been at Oxford † or Cambridge. These ten editions give a very large idea of the progress which the use of logarithms had made: but (whether for his own reason or not) Speidell's name was very ‡ little known. The Continental writers rarely mention him; Wallis knew nothing of him; and even his own son, Euclid Speidell, when he published his 'Logarithmotechnia,' in 1688, has no accurate information on his father's writings; for he says, 'I do find my father printed several sorts of logarithms, but at last concluded that the decimal or Briggs's logarithms were the best sort for a standard logarithm, and did also print the same several ways.' This must have been merely a mistaken tradition, arising from Speidell's not having printed the same logarithms as Napier: we may safely say he did not print any decimal logarithms. In addition to this testimony as to the rapid spread of logarithms in England which Speidell gives, we may state that their advantages were immediately seen by the practical mathematicians. Aaron Rathborne, in his 'Surveyor,' London, 1616, recommends the use of the 'tables and more than admirable invention of logarithmes by that divine and noble writer the Lord Marchiston, whose name and honour will never out.'

1643. F. B. Cavalieri, 'Trigonometria plana et sphærica,' Bologna. Seven-decimal Briggs's logarithms 0 (1) 1000, with interscript differences; also sines, tangents, secants, and their logarithms, 0 (10″) 1° (1′) 45°. But the decimal point is not used.

1620. J. B. [Justus Byrgius], 'Arithmetische und Geometrische progresse Tabulen,' Prague. This is the title given

* In his preface he says, 'Mansuetudo autem, bone Deus, quantum et quam rarum est Theologorum ornamentum! Et quam optandum esset hoc seculo, omnes Theologos esse mathematicos, hoc est, homines tractabiles et mansuetos.' Perhaps the union of the characters of divine and mathematician gives a peculiar right to speak well of the latter; for Barrow says, 'Tenerrimæ frontis et stomachi robustissimi, aut si mavis, pudentissimum undique patientissimum genus hominum sunt mathematici.' We accept the *si mavis*, for there is no saying how the moderns might translate the first epithets.

* To them he speaks as follows, in the introduction:—

'To the M. C. Z.
If that thou canst amend it,
So shall the Arte increase:
If thou canst not: commend it,
Else, preethee hould thy peace.'

† 'Yet to satisfie in part the learned, that I can giue a reason for what I doe, I will set downe the making of there 2. last Theorems, whereby they may (if so they please) suppose I can doe as much for the rest, and whether some of them doe or no, I passe not greatly, for that they are sorry I can doe so well, not hauing seene one of the Vniuersities' (p. 27).

‡ There is not now a copy of any edition in the British Museum. Hutton happens to say that there is in the seventh impression (being the one he had before him) a table of logarithms of numbers. Hence in the *Encycl. Brit.* this is translated into an assertion that the table was not added until the seventh impression.

by Montucla, and the history of the book is as follows:—Kepler had stated that Byrge had invented the very same logarithms as Napier many years before the latter published anything on the subject. And Bramer, author of a German work on perspective (Cassel, 1630), says that his brother-in-law and teacher, Justus Byrgius, had, twenty years before that time, made a table of progressions with differences of 10, calculated to nine figures, which he had published without text at Prague in 1620. This announcement obtained no notice, until Kästner informed Montucla (how, Montucla does not state; probably by private communication, or perhaps Montucla ought to have cited the 'Forsetzung der Rechenkunst,' 1783) that this passage of Bramer had led him to look at some old tables which he had bought, and which had lain by neglected. And in these old tables he says he found the above work of Byrgius. This occurs in the second edition of Montucla's History, vol. ii. p. 10; see also Kästner's History, vol. ii. p. 375, and vol. iii. p. 14; and Delambre, Hist. de l'Ast. Mod., vol. i. pp. 560-566. It will be noticed that Byrgius did not publish till six years after Napier; so that in all probability Napier is first in point of invention as well as publication. His system begins with 0 as a logarithm and 10^9 as a number; for every increase of the logarithm by 10, the number is multiplied by 1·0001; so that $10m$ has for its number $10^9\,(1{\cdot}0001)^{m-1}$. This is undoubtedly a rude table of logarithms, or rather of numbers to logarithms: and since Byrgius carried it up to 230270, the number to which is 999999999, he certainly secured the main advantages of logarithmic calculation.

1624. John Kepler, 'Chilias Logaritbmorum,' Marpurg, and 1625, 'Supplementum . . . continens Præcepta de eorum Usu.' These were reprinted by Maseres, in vol. i. of the *Scriptores Logarithmici*. See a very full account of them also in the first volume of Delambre's History of Modern Astronomy. The logarithms are strictly *Naperian*, 0(1)1000, but four ciphers are put to the end of each number, to make the radius ten millions. There are five columns, of which this is a specimen—

44° 30′ 26″ | 7010000 | 16^h 49^m 26^s | 3552474 | 42° 4′

The number here is 701, and the sine being 7010000 the angle is 44° 30′ 26″. The logarithm is 3552474. And if 1000 represent 24h, then 701 represents 16^h 49^m 26^s: while if 1000 represent 60°, 701 represents 42° 4′. We were wrong in saying that it was this set of logarithms that was republished in 1700, as will presently appear.

1626. Wingate. 'Arithmétique Logarithmique.' Under this head, in our last article, we mentioned the difficulty about the date of the book by which Wingate introduced Briggs's logarithms into France. We have since found a copy dated 1625, and we are satisfied, from the date of the 'privilège' and other things, that this was the first edition. That date is November 4, 1624, and the printing is stated as having been finished April 4, 1625. This edition and that of 1626 are from the same types, except in their title-pages, and a page or two of the postfixed explanations. The latter has also a further appendix on some points of explanation. It has also additional (perhaps, for the same thing may have been torn out of our copy of 1625) a folding sheet of mean proportionals between 10 and 1. The contents are,—seven-decimal logarithms of numbers 0(1)1000 with interscript differences; and 0(1′)45° logarithms of sines and tangents. This is the introduction of Briggs's logarithms into France; that of Napier's was made, as noted, by B. Vincent. But the dates should have been 1619 for the *Descriptio*, and 1620 for the *Constructio*.

1626. Henrion. In our former article we left this work in doubt. All we can learn is from Dechales, who states that Henrion wrote on the proportional compasses in 1623 (reprinted in 1681) and on the rule of proportion (which we take to be Gunter's scale) in 1626; and that this last work contains logarithms of numbers up to 2000.

1626. 'Tables des Logarithmes pour les nombres d'un à 10000, composées par Henry Brigge. A Goude. Par Pierre Rammaseyn.' The negligence of a bookbinder enables us here to take up a thread or two from our former article, in rather a singular manner. It will be seen that we have (p. 498) noted Sherwin as stating that he examined his table by one of Vlacq's, in large octavo, printed at Gouda in 1626, of which table we find no other mention. The table before us corresponds in every respect, except that there is no author's name: but no one except Vlacq can be mentioned, who was in the least likely to have printed logarithms at *Gouda* in or about 1626. And this we have no doubt is the real first edition of the series of small logarithms called Vlacq's, which will occur several times in our list. Again (p. 498) in speaking of Gellibrand's 'Institution Trigonometricall,' we have noted the table at the end of Well's 'Sciagraphia,' which we had seen, and which seemed to resemble the description of Gellibrand's tables, which we had not. Now this table, Gouda, 1626, having the title above described (and which we have also seen with a Dutch title and preface), *is* the table which is always bound up at the end of 'Sciographia, or art of Shadowes . . . . by T. W., Esq.,' London, 1635, large octavo. That the book was intended to have these logarithms bound at the end is evident from every page of it. Now the fact stands as follows:—A sufficient number of copies of the logarithms having been procured from abroad, the binder was directed to cancel the title-page of the logarithms, and to append them to the work. Accordingly, most copies have no title to the logarithms, which look quite like part of the work. But in some copies the binder has not cancelled as required; we have obtained two (since our first article was written) and there is another in the library of the Royal Society. But in all three copies the title of the logarithms is cut half way up with knife or scissors, as a direction to the binder to cancel it. One of our copies has this Dutch title-page to the tables 'Henrici Briggii Tafel van Logaritbmi voor de Ghetallen van een tot 10000. Ter Goude . . . 1626.' And the work (though the same impression as before) has a different title-page and date, namely, 'The Compleat Art of Dyalling . . ., by T. Wells of Deptfort, Esq.,' London, 1637.

This first edition of Vlacq (1626), as we will call it (being certainly the first *small* table published under Vlacq's name), contains logarithms of numbers 0 (1) 10,000, to ten decimals, and a complete canon (of logarithms only) to every minute and to seven decimals. But the terms cosine, cotangent, cosecant, are not yet introduced.

The 'Institution Trigonometricall' of Henry Gellibrand, London, 1635, contains logarithms, sines and tangents (not secants), from 1 to 10,000, a minute-canon of logarithms, and a complete minute-canon of sines, &c. all to seven decimals: but without differences. It has also some subsidiary tables for astronomy and navigation: and it has the name of Briggs prefixed to the logarithms of numbers only. All this, the subsidiary tables excepted, is most literally the description of the celebrated small work of Vlacq, of which we shall mention five editions, one of which is called the twentieth. Now it is stated in VLACQ, P. C., that his first edition of the small table which goes by his name was published in 1636; which is confirmed by Dechales, who describes the book in a manner which completely identifies it. If this be correct, of which we can be by no means certain, for early * editions are often nearly lost to history, then the celebrated tables of Vlacq (in their later and usual form) are certainly Gellibrand's, in every point which distinguishes them from preceding tables. But in all probability Gellibrand took his plan from the Vlacq of 1626, or at least the idea of publishing small tables: and it is most likely that neither of these two men, the undoubted successors of Napier and Briggs, would have thought there was much, either to claim or to take, in the way of scientific merit, from the smaller publications with which they indulged those who were unwilling to face their folios.

1630. Bartschius. The tables which Bartschius published independently of his father-in-law (Kepler) had fallen into oblivion, when Eisenschmidt found a copy and republished them with Kepler's *last* tables under the title of 'Joh. Kepleri et Jacobi Bartschii Tabulæ manuales logarithmicæ,' Strasburg, 1700, 12mo. What the titles and dates of the original works were, we can find only from Lipenius, who gives them as follows:—

> Jac. Bartschii 'Tabulæ Novæ Logarithmico-logisticæ,' Leipzig, folio, 1635; and 'Trichil. Hexacosias Logarithmi.' Sagan, 8vo., 1630.

Whether the first was an original edition we do not know: if so, it was posthumous. The reprint by Eisenschmidt contains, according to Delambre (*Astr. Mod.* i. 530), *Naperian* logarithms of sines and tangents to ten seconds, but only to five decimals. The *Trichil-Hexacosias* is in fact a table of what we *now* call logistic logarithms for every second of the first degree, 1° being the first term of the proportion. It is to six figures.

1630. J. Faulhaber, 'Ingenieurs-schul, Erster Theyl, Frankfort. This work contains logarithms, according to Scheibel, who does not give a description.

* Witness the first edition of Smart's tables, hereinafter mentioned, which seems to be wholly unknown to all the modern writers on interest.

1633. J. B. Morin, 'Trigonometriæ Canonicæ Libri Tres,' Paris. Seven-decimal Logarithms; of Numbers 0 (1) 1000, with interscript differences; of Sines and Tangents 0 (1′) 45°. The decimal point is not used.

1634. Cruger. Kästner gives Dantzig as the place. The logarithms are Naperian, according to him.

1651. Vincent Wing, 'Harmonicon Coeleste,' London. The logarithms have separate title-pages, and might, if torn out, pass for separate works. They have the decimal point and are to six decimal places. Sines and tangents 0 (1′) 45°; numbers, in decads, 0 (1) 1010, without characteristics. Wing was a much more learned man than his reputation (which is that of an almanac-maker) would imply.

1668. John Newton, 'The Scale of Interest, or the use of Decimal Fractions.' Here is a table of logarithms to six decimals 0 (1) 10000 arranged in lines of decads, with a separate table of proportional parts.

1681. Vlacq, 'Tabulæ' Sinuum, &c., Amsterdam: also 1683. Vlacq, 'Tables de Sinus,' &c., Amsterdam; and 1689, Vlacq, 'Tabellen der Sinuum, &c.,' Amsterdam. A great many small tables of logarithms bear the name of Adrian Vlacq. Those before us, which have the same introduction, one in Latin, the other in French, the third in German, have sines, tangents, secants, and logarithms of sines and tangents, to every minute and to seven decimals. Also, seven-decimal logarithms from 1 to 10,000, headed 'H. Briggii Tabula Logarithmorum.' See above, at the year 1626.

1685. Ozanam, 'Tables des Sinus,' &c., Paris. This is really Vlacq in every particular as to the tables, though his name is not mentioned.

1690. Dechales, 'Cursus seu Mundus Mathematicus.' The first volume has seven-decimal tables; logarithms of numbers 0(1)10000; of sines and tangents 0(1′)45°, and the sines and tangents also.

1690. Wm. Leybourn, 'Cursus Mathematicus.' This book has internal evidence of having been written before 1660. Seven-decimal logarithms of numbers 0(1)10000; six-figure logistic logarithms 0(1″)1° and 1°(1′)1°12′; *signs*, tangents, and secants, &c., 0(1′)45°; the names cosine and secant not used.

1699. John Wing (nephew of Vincent), 'A compleat Body of Surveying, formerly publish'd by Vincent Wing,' London. Five-decimal logarithms of sines and tangents, 0(10′)45°; of numbers, 0(1)1000.

1704. J. H[arris], Table of Logarithms, quarto, mentioned in Hutton's sale catalogue.

1705. (Second edition.) Anonymous, 'A Table of Logarithms for Numbers increasing in their natural order, &c.,' London. Six-decimal logarithms of numbers 0(1)10000. The trigonometrical part has a separate title, 1704, 'A Triangular Canon Logarithmical,' London. Six-decimal logarithms of sines, tangents, and secants 0(1′)45°. As far as appears, this table was got up by J. Seller and C. Price, mathematical-instrument makers, who seem to have desired to sell their own table of logarithms as well as their own quadrants.

1710. John Harris, 'Lexicon Technicum,' vol. ii. This volume contains seven-decimal tables of logarithms 0(1)10,000, and a complete canon (including versed sines), 0(1′)45°, both natural and logarithmic. There is also a table of proportional parts for every integer from 44 to 4320. These tables, except the last, seem to be taken from Sherwin.

1721. In this year was printed at Pekin, by command of the Emperor Kang-Hi, in Chinese type and in three folio volumes, Vlacq's logarithmic tables of sines, &c., to ten seconds, and of numbers to 100,000. (Brunet, from Vega, who had seen it at Vienna.)

1741. Deparcieux, 'Nouveaux Traités de Trigonométrie Rectiligne et Sphérique,' Paris. Deparcieux is so much better known by his tables of annuities, that his other writings * are neglected. The tables are all to seven decimals (though the decimal point is not used). There are logarithms of numbers 0(1)20000; sines, tangents, and secants, &c., 0(10″)5°(1′)45°, and logarithms of sines and tangents. This is the earliest table we remember to have seen in which the argument of degrees, minutes, and seconds accompanies the logarithms of numbers. The book is also distinguished by its gnomonical tables, and by the excellence of its solid diagrams.

* When a person is distinguished by one particular work, his other, and particularly his previous, writings, even on the same subject, go out of notice. How many persons, for instance, know that Laplace published (separately from the Memoirs of the Academy) a small work on the elliptic motion and on the figures of the planets, in 1784? (See Lalande, Bibl. Astron. ann. 1784.) And how many biographical accounts of Laplace mention it?

1742. J. F. Gleditschen, 'Des vollständigen Mathematischen Lexici zweyter Theil,' Leipzig. Here we have squares and cubes 0(1)10,000; seven-decimal logarithms of sines, tangents, and secants 0(1′)45°; logarithms of numbers 0(1)20000; sines, tangents, and secants 0(1′)45° to seven decimals; factors of odd numbers not ending with 5, to 10,000.

1743. Rivard, 'Tables des Sinus, &c.,' Paris, with the official 'approbation' of Clairaut. Seven-decimal logarithms of sines, tangents, and secants 0(1′)45°; sines and tangents to five decimals; secants in a separate table; logarithms of numbers 0(1)20000: all with characteristics and no decimal points.

1770. J. H. Lambert, 'Zusätze zu den Logarithmischen Tabellen,' Berlin. This is a miscellaneous collection of tables and formulæ, containing—Primes, and least divisors of all odd numbers which do not divide by 3 or 5, up to 102,000; first ten multiples of all prime numbers up to 313; primes alone up to 102,000; powers of 2 as far as the 70th, and of 3 and 5 as far as the 50th; hyperbolic logarithms, seven decimals, 0(1)100, and 1(·01)10; numbers which divide by 2, 3, 5, or 7 only (except those which divide by 2 or 3 only), up to 10,000; 27-decimal arcs 0(1°)100°(20°)120°(30°)360°, and for minutes and seconds; five-decimal sines and nine multiples 0(1°)90°; seven-decimal sines, tangents, and secants, and logarithms of sines and tangents 0(1°)90°; tables for facilitating cubic equations; sines and cosines of *hyperbolic trigonometry*, the only table of the kind we have met with; squares and cubes 0(1)1000; figurate numbers to the 12th order, 30 of each; eight decimal powers of fractions 0(·01)1 to the 11th power; seven-decimal square roots 0(1)100. There is another edition of this useful miscellany, Lisbon, 1798.

1775. Douwes 'Tafellen bebelzende de Sinussen.... als mede de Logarithmen,' &c., Amsterdam. A complete minute-canon to seven decimal places; followed by logarithms to seven places; versed sines and logarithms on the same scale to 90 degrees; logarithms of numbers from 1 to 101000; and traverse tables.

1778. J. C. Schulze, 'Neue und erweiterte Sammlung logarithmischer . . . Tafeln,' Berlin. Also 'Recueil de tables logarithmiques . . . .' The titles and preliminary explanations are both in French and German. This is a valuable and original collection. It contains the usual seven-figure tables 0 (1) 101000; a page of multiples of ·434 . . . and its reciprocal to 48 places, and powers of 2·718 . . . to 28 figures; *Wolfram's** hyperbolic logarithms of all numbers from one to 2200, and from thence to 10,000 for all numbers not divisible by any single digit, all to *forty-eight decimal places;* common logarithms to seven decimals of sines and tangents 0 (1″) 2°; logistic logarithms 0 (1″) 1°; a complete canon 0 (10″) 3° (1′) 45° containing sines, tangents, and secants to seven decimals, common logarithms of sines and tangents to seven decimals, *Naperian* logarithms of sines and tangents to eight decimals; first nine multiples of sines of every degree to five decimals; lengths of arcs 0 (1°) 360° to twenty-seven decimals; ditto 0 (1′) 1° and 0 (1″) 1′; powers of fractions 0 (·01) 1 as far as the eleventh, to eight decimals; squares and cubes 0 (1) 1000; square and cube roots 0 (1) 1000 to seven decimals; factorials 0 (·01) 1 to six factors; a table for the fall of bodies, of rational right-angled triangles, and small tables of specific gravities and of weights and measures. Half-a-dozen of Wolfram's logarithms which were accidentally missing in consequence of an illness, are supplied in the Berlin Ephemeris for 1783, p. 191. The *Naperian* logarithms of sines and tangents are an abbreviation of Ursinus, who carried them to ten seconds all the way through the quadrant.

1783. Vega 'Logarithmische Trigonometrische und andere . . Tafeln und Formeln,' Vienna. This was Vega's first work, and we have never met with it. (Octavo.)

1783. Callet, 'Tables Portatives de Logarithmes, publiées à Londres par Gardiner,' &c., Paris. This first edition of Callet, as it is called, and which we have said was substantially that of Gardiner, was actually and formally so 'aug-

* This table was the work of Lieut. Wolfram, of the Dutch artillery, and took six years of hard labour. It is one of the most striking additions to the *fundamenta* of the subject which has been made in modern times. Delambre (*Hist. Astr. Mod*, v. i. p. 501, &c.) introduces his comparisons of Napier and Wolfram so abruptly, and so many pages elapse before the reader can find out who the latter was, that most probably many have inferred that the two were contemporaries. But this is Delambre's way, and is often liable to confuse a reader who has no warning on the subject. With a work before him from which he is drawing his materials, he perhaps never mentions it till the end of his remarks, or perhaps casually in the middle, though until such mention is made, all he says is very liable to be misunderstood.

mentées et perfectionnées dans leur disposition par M. Callet.' Callet added as much of each kind of table as would leave no white in his last page, and, from Mouton, completed the single-second table of sines and tangents up to 2°. Here also first occurs the broken line at the change of tho third figure. On this edition Hutton says 'it is but justice to remark the extraordinary spirit and elegance with which the learned men and the artisans of the French nation undertake and execute works of merit:' and the compliment is well deserved by the beauty of the type and the general accuracy of the work.

1784. M. Robert, curate of 'St. Geneviève à Toul,' sent Lalande (*Ency. Meth.* 'Tables,') a manuscript volume containing sines to every second, to how many places he does not say; shortly afterwards he sent the tangents. Lalande gives a hint that the approaching publication of Taylor's logarithms prevented any steps being taken to print these. He also states that there was in the library of the Academy of Sciences a manuscript of Mouton, giving the logarithmic sines and tangents of 0 (1″) 4° to eleven figures; we suppose he means to ten places of decimals. M. Robert's manuscript came into Delambre's possession, and was bought at the sale of his books by Mr. Babbage, in whose possession it now is. It is in two large folio volumes, the figures (to seven decimals) being written in printed skeleton columns. Some corrections of Callet, discovered by means of this manuscript, were printed in one of the Nautical Almanacs.

1794. George Vega, 'Thesaurus Logarithmorum completus,' Leipzig, folio. There is also a German title-page, and the explanations are both in German and Latin. This is, no doubt, up to this time, *the* table of logarithms; the one of all others to which ultimate reference should be made in questions of accuracy. Its contents are,—a *ten*-decimal table of common logarithms 1 (1) 101000, distributed in the common manner, a decad in each line, with the differences arranged in the same way, and tables of proportional parts for the first three figures of the differences. Logarithmic sines and tangents to 10 decimals, 0 (1″) 2° (10″) 45°. Sines 0 (1″) 12′ to ten decimals. Lengths of arcs to 11 decimals. Wolfram's *hyperbolic* logarithms above described, reprinted from Schulze.

1794. J. J. Girtanner, 'Logarithmische Tafeln zur Abkurzung kaufmannischer Rechnungen,' Commercial logarithms. The plan is to have logarithmic tables for integers and different sorts of fractions, among which eighths, tenths, sixteenths, and sixtieths are conspicuous. But it will not do: Mohammed must go to the mountain. When coinage, weights, and measures, are decimalized, the use of logarithms will follow as a matter of course. It is useless trying to bring logarithms to ordinary fractions.

1799. J. P. Hobert and L. Ideler, 'Nouvelles Tables Trigonométriques calculées pour la Division décimale du Quart de Cercle,' Berlin. Delambre speaks highly of this table; but he is wrong in saying it subdivides the quadrant as minutely as those which himself and Borda published. Meaning by 1° the hundredth of the right angle, and 1′ being 0°·01, and so on, Hobert and Ideler's division of the quadrant is 0 (10″) 3° (1′) 50°; but Delambre and Borda's, which is not given correctly in our last article, is 0 (10″) 5′ (1″) 3° (10″) 40° (1′) 50°. The Berlin table gives sines and tangents and their logarithms, through the quadrant; the Paris table gives logarithms only. The former has no logarithms of numbers except 0 (1) 1100 and 999980 (1) 1000021, all to 36 decimals.

1802. J. R. Teschemacher. 'Tables calculated for the Arbitration of Exchanges, both Simple and Compound,' London. This is a book of commercial *logarithms*, though the author wisely avoided frightening the merchant by mentioning the word in any part of his book. There is one table of logarithms for the exchange between London and each other place: the tables average about a page each. With this limited range, the logarithms are really effectively applied to commercial purposes, and operations are very much simplified. We are fully of opinion that such a work might be very useful.

1806. Thomas Whiting. 'Portable Mathematical Tables,' London. Six-figure logarithms. This book is a striking proof that in the old figure, the reduction of the thickness of the type very much increases the legibility. This is a very easy book to read, and would exactly suit those who want a large type in a small book.

1808. Ebert. 'Adriani Vlacq Tabulæ Sinuum,' &c. Leipzig. The contents are as before described. This is a new (and apparently the last) edition of Ebert's, whose preface is dated 1790. Besides the contents above described there are squares and cubes of all integers up to 1000.

1809. George Douglas. 'Mathematical Tables,' Edinburgh. A long preface; followed by seven-decimal logarithms from 1 to 10,000, ten in a line, in the usual way, without differences. Two supplemental tables, with the same from 10,000 to 11,000, and from 100,000 to 101,000. A complete logarithmic canon for minutes, to seven decimals. A corresponding canon of natural sines, &c. Natural and logarithmic versed sines, the latter continued to 180°. A table to convert sexagesimals into decimals; and logarithms from 1 to 180, to 15 decimals. A different arrangement from the usual one in several respects.

1812. In Zach's *Monathliche Correspondenz*, vol. xxvi. page 498, Gauss proposed his logarithms for the finding of log $(a \pm b)$ from log a and log b [LOGARITHMS, GAUSS'S, P. C. S.], with a specimen. He stated that he had been in the habit of using five-figure tables of his own construction. Gauss has given a short review of Pasquich's tables (next mentioned) in the 'Gottinger gelehrte Anzeigen,' 1817, No. 158.

1817. J. Pasquich, 'Tabulæ Logarithmico-Trigonometricæ contractæ,' Leipzig. Title and explanations in both Latin and German. Five-decimal logarithms of numbers 0 (1) 10,000; logarithms of sines and tangents 0 (10″) 56 (20″) 1°; five-decimal logarithms of sines and tangents, with a table of the *squares* of sines and tangents 0 (1′) 45°; *Gauss's logarithms.* [LOGARITHMS, GAUSS'S, P. C. S.] A ranging as follows, 0 (·001) 2 (·01) 3·40 (·1) 5. This trigonometrical canon of squares is, we suppose, almost unique.

1817. E. A Matthiesson, 'Tabula ad expeditiorem Calculum Logarithmi Summæ vel Differentiæ duarum Quantitatum,' Altona. This is hitherto the most extensive set of tables of Gauss's logarithms in existence. It is to seven decimals, and A proceeds as follows: 0 (·0001) 2 (·001) 3 (·01) 4 (·1) 5 (1) 7.

1821. Nordmann, 'Adriani Vlacq Tabulæ,' &c. The explanations are given in Latin and German. To the contents of Ebert's edition are added square and cube roots to seven decimals for all integers up to 1000. This is called the *twentieth edition*, which very likely it is; but it was the editor's duty to have stated what the other nineteen editions were.

1821. Westphal's tables, Leipzig, contain Gauss's tables, to five decimals, with proportional parts.

1823. Matthiessen, 'Gemeine Logarithmen,' &c., Altona. *Stereotyped.* This tablo has five-figure logarithms from 1 to 10,000, with a supplemental table of proportional parts, arranged on the two sides of a folding sheet, on canvas.

1828. 'Encke's four-figure Tables of Logarithms,' &c., Berlin, contain Gauss's tables. See '1842, Warnstorff,' &c. below.

1832. J. P. Gruson, 'Bequeme Logarithmische .. Tafeln,' Berlin. A school-book. Seven-decimal logarithms 0 (1) 10,000; squares and cubes, square and cube roots 0 (1) 1000; arcs of the circle; logarithmic sines and tangents 0 (1′) 5° (10′) 45°

1832. H. G. Köhler, 'Tables de Logarithmes,' &c. An edition of Lalande which gives Gauss's logarithms.

No date, (stereotyped,) Moritz von Prasse, 'Logarithmische Tafeln,' edited by Mollweide, and then by Jahn, Leipzig. Five-decimal logarithms of numbers 0 (1) 10,000; of sines and tangents 0 (1′) 45° put together in a new way, so as to separate the common figures, as in the logarithms of numbers, and to get five degrees into a double page, sacrificing the differences; Gauss's tables, A having 0 (·001) 2 (·01) 3·40 (·1) 5; and a modification of Gauss's table, in which log x is the argument, and log $\left(\frac{x-1}{x+1}\right)$ the tabular result, x going through ·382 (·001) 2 (·01) 3·6 (·1) 5·5. An edition of Von Prasse was published by Halma, at Paris, in 1814; and the last-mentioned table was published separately by Weidenbach, Copenhagen, 1829.

1838. G. B. Airy, 'Appendix to the Greenwich Observations, 1837,' London. A table of sines and cosines, with the arguments given *in time*, 0 (10^s) 24^h and the signs marked. There is a separate table both of sines and of cosines, each of which is therefore a transformation of the other. And each again is the table from 0 to 6^h repeated, with transformation, four times; so that the pair of tables is an eight-fold repetition of one table. It is to five decimals, without differences

1839. Anonymous (Useful Knowledge Society). After the first *tirage*, the following addition was made:—One page, for example, begins and ends with the numbers 5220 and 5310, and with the logarithms ·71767 and ·72509. According, at the corner of the page, so as to catch the eye on opening the book, is

5220	·71767
5310	·72509

in full. This plan ought to be adopted in all tables, instead of the abbreviations which are frequently employed as headings.

1840. (Second edition.) Moritz Rühlmann, 'Logarithmisch-Trigonometrische . . . Tafeln,' Dresden and Leipzig. Six-decimal logarithms of numbers 0 (1) 10080; logarithmic sines and tangents 0 (1′) 45°; sines and tangents 0 (10′) 45°; arcs of circles.

1840. Hülse's edition of Vega, Leipzig, stereotyped. This contains Gauss's tables to five decimals with proportional parts, in six columns, the additional three (which contains a peculiar mode of treating the proportional parts) having been also suggested by Gauss. The most recent tirage of this excellent work (1846) contains seven-decimal logarithms of numbers 0 (1) 108000; logarithmic sines and tangents 0 (0″·1) 1′ (1″) 1° 32′ and 0 (10″) 6° (1′) 45°; angles to eleven decimals; five-decimal Gauss's tables A being 0 (·001) 2 (·01) 3·4 (·1) 5, with the proportional parts above alluded to.

1845. Warnstorff's edition of Schumacher's 'Sammlung von Hülfstafeln' (first published in 1822), Altona. This is a well-known and valuable astronomical collection. What we have here to do with is the republication of Encke's four-figure logarithms, 0 (1) 1000, and 0 (4′) 10° (10′) 45°, and Gauss's logarithms 0 (·01) 1·80 (·1) 4.

1846. R. Sheepshanks, 'Tables for facilitating Astronomical Reductions,' London (also issued two years before, without title, preface, or author's name). This is the most complete *four-figure* table we know of, and will do for the purpose oftener than our orthodox septenarians are aware of. Logarithms 0 (1) 1000, with proportional parts, in decads; logarithms of sines and cosines, *the angle being in time*, 0 (1^m) 24^h, with proportional parts for 10^s, and 0 (10^s) 1^s; table for converting sidereal into mean solar time; logarithmic sines, tangents, and secants 0 (1′) 6° (10′) 45°; constants for precession; tangents and secants 0 (10′) 80° (1′) 86°, with a rule for the rest; Bessel's refractions; Gauss's tables, thus arranged, log x as an argument gives log $\left(1+\frac{1}{x}\right)$ as a tabular result, and log $\left(1-\frac{1}{x}\right)$ as another, log x being 0 (·001) ·909 (·01) 2 (·1) 4 in the first table, and 0 (·001) 1 (·01) 3 (·1) 4 in the second; log. $\sin^2 \frac{1}{2}$ hour angle, in time 1^h (1^m) 9^h; numbers to logarithms 0 (·001) 1.

1844. Captain Robert Shortrede's 'Logarithmic Tables to seven places of decimals, containing logarithms of numbers from 1 to 120,000, numbers to logarithms from 0 to 1·00000, logarithmic sines and tangents to *every second* of *the circle*, with arguments in *space and time*, and new astronomical and geodesical tables,' Edinburgh, stereotyped. We do not yet know enough of this table to form an opinion. It is printed at the whole expense of the framer, an enterprising officer attached to the Indian survey. The types were cast for the work, and being of the old figure, we wish of course that they had not been so; but we must say that they look better than any existing figure of the old form could have done in so heavy a page, and also that the uniformity of the type used in logarithms of numbers with that of the trigonometrical ones is a great advantage. It is a most public-spirited undertaking.

Among the titles of tables which we might have said something on if we had seen them, collected from different sources, are those of—John Lauremberg, Leyden, 1628, 8vo.; Lubert Middendorff, Cologne, 1648, 12mo.; Henry Phillips, London, 166?, 8vo.; Institutio Mathematica, London, 166?, 12mo.; Strauchius, Witteberg, 1662, 12mo., and Amsterdam, 1700, 8vo.; D. R. Van Merop, Harlingen, 1671; Chr. Grüneberg, *Tabulæ Mathem.*, Berlin and Frankfort, 1690 (oblong form); Chr. Grüneberg, *Pandora Mathem.*, Berlin and Frankfort, 1700, 8vo.; Chr. Wolff, Magdeburg, 1711, 8vo.; J. G. Leibknecht, Giesa, 1726, 8vo.; Raph. Levi, Hanover, 1747, 4to., and supplement in 1748; J. C. Nelkenbrechers, Leipzig, 1752, 4to; J. Melitaó da Mata, Lisbon, 1790, 8vo.

To our old tables of interest we have to add the following. Stevinus, in the 'Practique d'Arithmetique,' appended to his Arithmetic, Leyden, 1585, reprinted by Albert Girard in Stevinus's collected works, 1626, gave the first tables of compound interest and annuities. They precede the famous tract *La Disme*, in which decimal fractions were first proposed. And as this *Practique* should rather have been at the beginning than at the end, if rational arrangement had been studied; and as the *Disme* again should have preceded it, on the same supposition; we must infer it to be most likely that the tracts were placed in the order in which they were written. If this be the case, then it is pretty certain that these tables of compound interest *suggested decimal fractions*, the account of which speedily follows them. They are constructed as follows:—Ten millions being taken as the base (or *root*, as Stevinus calls it), and a rate, say five per cent., being chosen, the present value of ten millions due at the end of 1, 2, &c., up to 30 years, are put in a column, to the nearest integer. By their sides are the sums of their values, which give the present values of the several annuities of ten million, as follows:—

Table d'Interest de 5 pour 100.

1	9523810	9523810
2	9070295	18594105
3	8638376	27232481
4	8227025	35459506
. . .	. . .	. . .
. . .	. . .	. . .
30	2313774	153924494

The rates are from 1 to 16 per cent., and also for 1 in 15, 1 in 16, &c., to 1 in 22; or, as the French say, denier quinze, denier seize, &c. At the end is a direction to dispense, when convenient, with some of the last figures.

There is thus a virtual use of decimal fractions preceding the formal one. The same thing happens in the tables of Richard Witt, mentioned in our former article, which we believe to be the first English tables of compound interest, and the first English work (except a translation of the *Disme* of Stevinus) in which decimals were used; the use* of them being something more than the virtual use by Stevinus in the *Practique*. The next English writer who gave tables of compound interest, Robert Butler, in his 'Scale of Interest,' London, 1633, makes a rather more decided use of these fractions than Witt, and uses the phrase *decimal fractions*, which had then hardly found its way into books. It should be noted that both Witt and Butler give real half-yearly and quarterly tables, as well as yearly ones.

Mr. Pocock, in his Bibliography of Annuities, &c. (Familiar Explanation . . . . of Assurances upon Lives, London, 1842), gives the following works, which we do not remember to have seen:—'Tables of Leases and Interest . . . ,' London, 1628, 12mo; and William Purser, 'Compound Interest and Annuities, containing the Art of Decimal Arithmetic,' London, 1634, 8vo.

In Newton's 'Scale of Interest,' mentioned in the list of logarithms, is a set of tables for six per cent., then the maximum legal rate. There is here what we never met with elsewhere—a common almanac, with months, dominical letters, and fixed saints' days; having, in lieu of astronomical information, simple and compound interest and discount tables, telling for each day the amount of one pound from the beginning of the year, or the present value for the end.

The first edition of Smart's tables, the original of all our large tables of compound interest, is 'Tables of Simple Interest and Discount at 3, 4, 5, 6, 7, 8, 9, and 10*l.* per cent. per Ann.; also tables of compound interest at the same rates, whereby,' &c. By John Smart, at the Town Clerk's Office, London: London, 1707, 4to. (duodecimo size). The second edition, of 1726, is as large, compared with the first, as it is possible its author 'John Smart of Guildhall, Gent.' may have become, compared with the subordinate at the town clerk's office. The first edition (which we did not know of when we wrote our last article, and we find all† modern writers knew as little), besides a smaller range of rates, has not the half-years, and has only six decimal places. The tables of simple interest are also of very little extent. This set of tables was incorporated (with acknowledgment) in the article *Interest* in the second volume of Harris's 'Lexicon Technicum,' London, 1710. There was an abridged edition, with some of the rates and of the half-years left out,

* See the Bibliography of Arithmetical works, by the author of this article, intended for the 'Companion to the Almanac' for 1848.

† Since this was written we find that Mr. Farr (*Reg. Gen. Rep.* 1844, p. 559) mentions the edition of 1726 as the second edition.

but still to eight figures, 'Tables of Interest, &c., abridged for the use of Schools, in order to instruct young gentlemen in the use of Decimal Fractions,' by John Smart, &c. London, 1736, quarto (octavo size).

Commercial tables of any real power are rendered impossible in practice by the use of shillings, pence, and farthings, except by an extent of matter which makes them very expensive. If, indeed, the rule for decimalizing the parts of a pound [COMPUTATION, P. C. S.] were well learned and properly used, some of the older tables, which have fallen entirely into oblivion, would certainly be revived with effect. Two of those mentioned in our former article will certainly be reprinted when the time comes; Brown's 'Arithmetica Infinita,' and Webb's 'Tables for buying and selling Stocks.' The main part of the former is the first nine multiples of the decimal, which expresses any number of farthings in a pound. Thus, under 7*s.* 8¾*d.* are ·3854166... and its multiples up to nine times. The latter has the multiples necessary to find the quantity of stock which answers to any sum of money, and *vice versâ*, at different prices. These are both pocket tables, and their places are supplied at present by works of much greater bulk and less extensive use.

We go a littlo out of our way to mention Mr. Edward Sang's 'Assurance and Annuity Tables,' Edinburgh, 1841, folio, a most extraordinary work. The author learnt to print that he might set it up with his own hands, and caused the distribution of the types before printing to be done with the care used in composition. It contains for a single life, and for the Carlisle tables at 3 per cent., *every thing.* All annuities and assurances, temporary or deferred, or for the whole life; all values of policies, whenever made, for every subsequent period; all the yearly risks of such policies; assurances at increasing or decreasing premiums; five-figure logarithms and antilogarithms, &c., &c., &c. And every result has its logarithm set down by its side ready for use. Why it is so coldly looked at hy the assurance offices, those who study the human mind will be at no loss to decide. The typography is so beautiful, the paper and type so luxurious, that a century hence a copy will he an object of competition to the Hebers and Spencers of that day. We believe it to be a work of great accuracy.

In the preceding articles [TABLES, P. C. and the present one] we have described, we believe, all the tables of note, whether in history or practice, as far as general tables of pure mathematics are concerned. We have omitted those which relate only to astronomy, life contingencies, or any other special application of mathematics. Altogether, we have hrought forward about 318 tables, of which 221 have been taken from actual inspection, and the remainder from various authorities, very few indeed from one only. In Lalande's *Bibliographie Astronomique* there are 208 tables mentioned, *including astronomical ones.* In the Royal Society's Library the entries under tables, of every sort, mathematics, astronomy, navigation, geography, meteorology, &c. are 536 in number, including from the merest tide-table for one year up to the largest body of logarithms. And upon looking at the appearances which the different catalogues present, we do not find one in which 200, or even 100, tables of pure mathematics are mentioned as having undergone the actual inspection of the compiler. It would not, then, we suspect, he a very extensive undertaking to make as complete a list of tables of all kinds as can now be recovered; and the undertaker of it might expect to be able to verify about two out of three from inspection.

TACK is the technical term in Scotland for a lease, whether of lands or edifices; the rent is called the tack-duty, and the tenant tho tacksman. The Scottish system of leases having lately attracted some attention, and being intrinsically important, a separate sketch of its more prominent peculiarities seems to be requisite. The Scottish lease, however long its duration, is purely a contract, and does not partake—at least in questions betweon landlord and tenant—of the peculiarities of the feudal system. In early times it is possible to trace something like an inferior system of vassalage in the nature of the agriculturist's tenure. He held not as party to a contract, but by a unilateral conveyance from the landlord, called assedation. In Scotland, however, there was no permanent interruption of the legitimate system of subfeuing; and thus all descriptions of permanent estates could bo constituted in the land by the pure adaptation of the feudal usages. There was no temptation to convert the contract for the limited occupation and use of the land into a means of constituting a semi-proprietary right in it—of supplying with a lessee the place of a sub-vassal; and the system of leases, as one of mere letting and hiring, took its principles from the Roman contract of *locatio conductio.* The right of the lessee or tacksman was so purely personal that it was ineffectual against a party acquiring the lands by purchase from the lessor; and so early as 1449 a statute was passed, preserving the rights of 'the puir people that labouris the ground' against new owners. Leasehold rights, however, in questions of succession, and in the form of attachment, employable by creditors, have by usage come into the position of real or heritable property. In the times of rapid agricultural improvement, when farms were frequently taken on leases of fifty-seven years at a low rent, a virtual estate was created, the succession to which might for the time be more important than that of the ownership of tho land. Unless there be any specification to the contrary in the lease, such successions follow the rules applicable to landed property. It has been matter of much regret, that the system by which feudal rights in land may be subjected to real burdens, has not been extended to this species of property, so as to enable valuable leases to be burdened with a security for borrowed money, or a guarantee fund for provisions for children. The system of granting and recording public feudal titles not being available for this species of property, all attempt to accomplish this object, by the tenant assigning the lease and retaining possession as the assignee's sub-tenant, have been ineffectual against the rights of creditors. It has been frequently proposed to pass an act creating a system of registration of leases, and of burdens affecting them.

It is unnecessary to state very minutely the title which a person must have to enable him to grant a lease, the parties who may hold leases, or the nature of the titles which constitute an ordinary lease, as these hear a generic resemblance to the corresponding features of English law. Long leases however being the prominent feature of the Scottish system, those cases in which there is a restriction on granting them may be noticed. A person who has a life-rent interest is, in the general case, not entitled to grant a lease to last beyond his own life. Persons having the absolute administration of property, as trustees, corporations, &c., are entitled and bound to grant leases for such a period as is deemed necessary to good husbandry; and this period has, by usage, in the ordinary case, been fixed at nineteen years. There have been many questions as to the extent to which persons holding under entails may grant leases, because in many instances attempts have been made in this form to alienate a considerable estato in tho property, which have been challenged by successors. In the celebrated Queensberry case, leases granted for ninety-seven years, on a grassum (that is, a sum of money paid by the tenant on entering, like a fine in England), were found to be struck at by the entail as an attempt to alienate part of the property (2 Dow, 90). In later cases, leases of forty and thirty-one years have been found ineffectual. A lease of twenty-one years is the longest that has heen sanctioned by the courts where an heir of entail has shown that he has an interest to impugn the contract.

Writing is necessary to constitute a lease, although possession during the part that may remain over of a year begun, may ho held as a right from sufferance and acquiescence in its commencement. The proper form of the written agricultural lease has been an object of much attention by conveyancers, and there is a considerable degree of uniformity in the practice throughout the country. There are usually nineteen clauses, as follow:—1. *The Description of Parties.* 2. *The Destination,* in which the extent to which assigning or subletting is permitted or prohibited is set forth, and provision is made for the arrangements in case of the tenant's decease. 3. *Clause of Possession,* describing the subject let. 4. *Duration.* 5. *Reservation,* if there be any rights such as that to minerals or game reserved by the landlord. 6. *Landlord's Meliorations,* containing such obligations to improve the subject as the landlord undertakes. 7. *Warrandice,* or guaranteo of the title given to the tenant. 8. *Rent clause.* 9. *Tenant's Meliorations,* setting forth such improvements as the tenant undertakes. 10. *Preservation,* containing the tenant's obligation to keep the building, fences, &c. in repair. 11. *Insurance,* in which the tenant becomes bound to insure the buildings, crops, &c. against fire. 12. *Thirlage.* This clause, a remnant of feudal usages, is now comparatively rare—it binds the tenant to grind his corn at the mill of the over-lord. 13. *Management.* 14. *Bankruptcy,* providing in general for the landlord's resumption of the lease if the tenant becouo bankrupt. 15. *Removal,* by which the tenant engages to evacuate the premises at the prescribed term. 16. *Reference*, providing for arbitration of disputes. 17. *Mutual Performance*, indicating penalties to be paid by the party failing. 18. *Registration* for execution. [REGISTRATION, P. C. S.] 19. *Testing clause*, containing the formalities of the execution of the contract. Of these, the clause of management is the most important. It is now much doubted how far it is good policy to bind the tenant to the observance of a particular course of agriculture. In the highly improved districts, where very scientific farming is expected, the tenant is generally more capable than the landlord of estimating the value of improved systems. Agricultural chemistry, and other means of increasing the produce of the soil, are at present the object of much attention among farmers, and where tenants cannot alter a fixed routine without the risk of a law-suit, an embargo is laid on the practical application of improvements. The landlord's chief interest in any routine being followed, is simply the preservation of the land from deterioration towards the conclusion of the lease. On the subject of the usual provisions for management, Mr. Hunter says, 'In those districts where agriculture is best understood, the following are the ordinary rules of management during the currency of the lease:—1. White corn crops ripening their seeds shall never be taken from the same land in immediate succession. 2. A certain proportion shall be under turnips or plain fallow every year, and be sown to grass with the first corn crop after turnips or fallow. 3. No farm-yard dung or putrescent manure made from the produce of the farm, nor straw nor hay made from the natural herbage, shall ever be carried off the farm. It is sometimes added, that no turnips or rape or hay of any kind shall ever be removed or sold. And upon weak soils, it is sometimes required that no less than half of the turnips shall be eaten by sheep on the ground where they grow. 4. If the soil is not such as to admit of being ploughed and cropped every year, it is stipulated that a certain part or proportion shall be always in grass, and that land laid down to grass shall be, before being broken up again, two or more years in pasture. 5. During the first five or six years of a lease, the conditions are sometimes more special, obliging the tenant to have so much more in fallow or turnips every year, and so much more in grass, and also to leave the farm in a particular shape, so as to admit of the incoming tenant pursuing a correct rotation of cropping from his very entry. Or, 6. What is approved of by some agriculturists, it may be agreed that the lessee shall cultivate the lands according to the rules of husbandry, but with the addition of specific regulations applicable to the four or five last years of the lease. 7. Adherence to the course prescribed may be enforced by conditioning for payment of additional rent in the event of contravention, besides damages, and with a power to prevent further contravention, for which purpose power to make a summary judicial application is occasionally taken. Or, 8. Liberty may be given to the lessee to deviate from the prescribed course upon payment of an additional rent specified, which may be declared to be pactional and not penal, and not liable to judicial modification. 9. In some districts, though seldom in the most improved, there is occasionally a stipulation that the lessee shall himself reside upon and manage the farm.' (i. 369-370.)

(*A Treatise on the Law of Landlord and Tenant, with an Appendix containing Forms of Leases*, by Robert Hunter, Esq., Advocate, 2 vols. 8vo. 1845.)

TÆNIOI'DES, a family of Acanthopterygious fishes nearly allied to the Mackerels. The species comprising it are all long flattened fishes, with very small scales. The following are among the principal genera.

Lepidopus, tænioid fishes with elongated snouts, a wide gape, projecting under jaw, and strong sharp cutting teeth. The ventral fins are reduced to small scaly plates. The tail is well formed. The *Lepidopus argyreus* or scabbard-fish is an example. It is of a bright silver colour, and attains a length of six feet. It is one of the rarest of British fishes.

Trichiurus resembles the last genus in the character of the head, but has neither ventral nor caudal fins, the tail being represented by a long slender compressed filament. The *Trichiurus lepturus* of Linnæus, an inhabitant of the Atlantic, attains a length of more than 12 feet and resembles a beautiful silver riband.

Gymnetrus, the Deal fish, has a very small protractile mouth with small teeth. It has no anal fin, and the caudal is composed of few rays. The *Gymnetrus arcticus* is between four and six feet in length, but does not exceed a table-knife in thickness. An original description of it may be found in Dr. Fleming's 'British Animals.'

Cepola, the Ribbon or Band-fish, is a well known Mediterranean genus. The snout is short, the gape oblique, and the teeth well developed. The dorsal and anal fins are both long, and reach to the base of the caudal. The ventrals are moderately developed. The *Cepola rubescens*, a beautiful little fish about a foot long, and of a subpellucid carmine hue, is occasionally found on the southern coasts of Britain.

The genus *Lophotes* of Giorna has a short head with a bony crest bearing a long and stout spine. The caudal fin is distinct, but very small. The *Stylephorus* of Shaw is allied to *Gymnetrus*, but has the tail prolonged into a slender filament, exceeding the length of the body.

TÆNIO'PTERIS, a group of fossil ferns with broad ribband-like leaves. In the Oolitic series of Yorkshire and Scania. (Brongniart.)

TAGORE, DWARKANATH. [RAMMOHUN ROY, P. C. S.]

TAILZIE, in the law of Scotland, is the technical term corresponding with the English word Entail, which now generally supersedes it in colloquial use, even in Scotland. The early history of Entail law in Scotland in some respects resembles that of England, but in later times they diverged from each other. In Scotland there was no early effort, such as the statute of Westminster the Second (13 Edw. I.) favouring deeds appointing a fixed series of heirs, nor does there appear to have been on the part of the judges that inclination to permit perpetuities to be defeated by fictions which was shown in England. Devices however of a very similar character to those of the English statute were adopted to defeat attempts by holders under entail to use their lands as if they were absolute proprietors. The first and simplest restriction laid on the destined heirs of an entail was in the form of a mere prohibition, against contracting debt which might occasion the attachment of the estate by creditors, selling the property, altering the order of succession, and the like. A provision of this character, called the 'Prohibitive clause,' was however quite insufficient to accomplish the end; because if a creditor had really attached the estate for debt, or a person had bonâ fide purchased it, it was no ground for wresting the title out of his hands, that the proprietor was under a prohibition against permitting such occurrences. A second provision was added, called an Irritant clause, by which any right acquired contrary to the provisions of the entail was declared to be null. Still this did not effectually intimidate the holder under the entail from making efforts to break it, and did not give the next in succession a sufficient title to interfere. A third provision was added called the 'Resolutive clause,' by which the right of the person who contravenes the prohibition 'resolves' or becomes forfeited. It was provided by statute (1685, c. 22) that all entails should be effective which contain Irritant and Resolutive clauses, are duly recorded by warrant of the court of session in Registers of Entails, and are followed by recorded saisins containing the Prohibitory, Irritant, and Resolutive clauses. No attempts were made to counteract the Entail system by fictions of law, which are not in accordance with the genius of the law of Scotland, and it became a permanent feature in the institutions of the country. A sort of judicial war has however been carried on against Entails individually, which has been productive of a vast amount of litigation and strife, has occupied much judicial time, and has tended to place the titles of property in a precarious and doubtful position. An Entail is excluded from the favourable interpretation of the law. The interpretation of its clauses is to be what is termed *strictissimi juris*. The intention of the framer is never to be contemplated: every blunder is to be given effect to, and nothing is to be explained by reference to the context, if its own meaning as a sentence is doubtful. Thus, in a late case, those who held under an Entail were prohibited among other things from contracting debt to the effect of the estate being attached. The Irritant clause proceeded to say, 'if the heirs shall contravene the premises, by breaking the Tailzie, contracting of debts,' &c. (enumerating other contraventions), it was provided that 'then and in any of these cases, the said venditions, alienations, dispositions, infeftments, alterations, infringements, bonds, tacks, obligements, made to the contrair' should be null. It was found that proceedings by creditors to attach the estate for debt were good, because they were not by name enumerated among the things that should be null, though they were prohibited, and mentioned among the things which, if coming to pass, should cause a nullity. (*Duffus's Trustees* v. *Dunbar*, 28*th January*, 1842, 4 *D. B. M.* 523.) Some statutory enlargements have been made on the powers of persons holding under entail to provide for widows and younger children: but the system is still productive of great domestic inequality, and it is to be hoped that in no long time it will be swept away as an impediment to the improvement of the country and an injustice to the mercantile classes.

TAJURRAH is a sea-port in Africa, situated at the most western corner of the Gulf of Aden, in 11° 47′ N. lat. and 43° E. long. It is built on the northern shore of a bay, which extends several miles farther west, and is called the Bay of Tajurrah. The anchorage is of moderate extent, and large vessels must remain at some distance from the shore. It is secure, except during the north-western monsoon. The town lies at the base of a group of hills of moderate elevation, which run north and south, and are furrowed by narrow glens, which during the rainy season bring down a great volume of water. It contains about 300 houses and a population of 1200 or 1500 inhabitants. The houses are built of wooden framework, covered with matting. There are only a few stone houses in the town, and two mosques. As no cultivation is carried on in the vicinity of the town, the inhabitants are principally engaged in the trade in slaves and salt. The salt is obtained from the lake of Assal [ADAL, P. C. S., v. i. p. 34], and the slaves are brought to the place by the Dankali, or tribes that inhabit the country between the sea-port and Shoa. [ABYSSINIA, P. C. S., p. 20.] These articles go chiefly to Mocha and Hodeida; to Aden wool, sheep, goats, and butter are sent. There is no bazar in Tajurrah, but the common necessaries of life may be obtained in exchange for beads, buttons, fish-hooks, and tobacco. Water is plentiful, but grass is scarce, and fodder for horses is obtained with difficulty. The climate is very hot; during the last days of May the thermometer at noon ranges between 96° and 98°, but the heat is rendered less oppressive by the sea-breeze, which generally sets in about eleven o'clock of the morning. Almost all the inhabitants belong to the Dankali, and the governor of the town, who is styled sultan, is considered the chief of the whole nation. None of the Dankali tribes pay obedience to his orders, but they send him annually a present of two hundred head of cattle and camels. As this town is the nearest port to Shoa, and the British have entered into a closer connexion with the sovereign of that country since their occupation of Aden, it is hoped that Tajurrah will soon rise to greater importance. The British have also made a treaty with the Dankali and Somauli, and have acquired two larger islands, situated near the entrance of the Bay of Tajurrah, and a smaller one which lies farther within the bay; but we do not know if they are actually taken possession of and settled.

(Isenberg and Krapf's *Journals, detailing their proceedings in the Kingdom of Shoa*, &c.; Kirk's *Report on the Route from Tajurrah to Ankóbar; The Friend of Africa*, 1841.)

TALBOTYPE. [PHOTOGRAPHY, P. C. S.]

TALLOW (French, *suif;* German, *talg;* Italian, *sevo, sego;* Russian, *salo, toplenoe;* Spanish, *sebo*) is animal fat [FAT, P. C., p. 204] melted and separated from the fibrous or membranous matter which is naturally mixed with it. When pure, tallow is white, and nearly tasteless; but the tallow of commerce usually has a yellow tinge. It is divided, according to its qualities, into various kinds, of which the best are used for the manufacture of candles, and the inferior for making soap, greasing machinery, and some other purposes. Much tallow is used in the dressing of leather.

A very large proportion of the tallow used for making candles in this country is of home production, and, according to a paper on 'Artificial Light from Solid Substances, and the Manufacture of Candles,' published by Arthur Aikin, Esq., in the fifty-second volume of the 'Transactions' of the Society of Arts (part ii. pp. 123-127), is fitted for use by the *renderer*, who chops into pieces the fat and suet received from the butchers, and boils it in water, by which operation the greater part of the fat is melted out from the membranes, and floats to the top, whence it is removed by skimming. The remaining fat is subseqnently squeezed from the membranes by a powerful press, leaving the membranous matter in the form of a cake or block, of a dark colour, which is called *graves*, and which, when macerated in warm water, softens and swells, and becomes a wholesome and palatable article of food for poultry, dogs, and other domestic animals. It is said to be extensively used in fattening poultry for the market. Dr. Ure, in noticing this subject in his 'Dictionary of Arts,' &c., art. 'Candle,' styles the refuse membranous matter *cracklings;* states that the operation of rendering should he performed as speedily as possible after the removal of the fat from the carcass, because the fibrous and fleshy matter mixed with it tend to promote putrefaction; and directs that the liquid tallow be strained through a sieve into a second copper, and there treated with water at a boiling temperature to wash it.

Almost all our imported tallow is brought from Russia, where this article is produced in enormous quantities. Kohl, in his work on that empire, gives a graphic account of this great branch of industry, from which (using the abridged translation, published in Chapman and Hall's 'Foreign Library,' 1842, pp. 501-503), we condense the following particulars: — The exports of St. Petersburg, he states, are estimated to amount to about 120,000,000 of rubles (the ruble being, according to MONEY, P. C., p. 325, worth 3*s.* 1*d.*) annually, of which one-third consists of tallow; while the value of the exports of this article from other Russian ports is probably about 30,000,000 more. For these 70,000,000 of rubles about 250,000,000 of lbs. of tallow are furnished to the rest of the world, providing the chief supply of soap and candles to England, France, Germany, Scandinavia, Italy, and the other countries of Europe; and this is all in addition to the large quantity consumed by the Russians themselves. Nearly the whole of this enormous quantity is furnished hy the Pontine steppes, in the southern part of European Russia. 'At present,' observes Kohl, 'the large tallow-manufactories, or *Salgans*, as they are called, are exclusively in the hands of the natives of Great Russia, who have their establishments in all parts of the steppe.' They huy the cattle by hundreds and thousands, and after fattening them for a season, drive them to the salgans to be slaughtered; and Kohl states, that if the season proves tolerably moist, so that the cattle may fatten well, the speculation is productive, but that a long-continued drought is ruinous in its consequences, the tallow-boilers remaining empty, and the meagre oxen having nothing but their skins wherewith to remunerate the speculators. 'After such a season,' he adds, 'the owners of the salgans usually close their books, and declare themselves insolvent, for they are seldom possessed of much capital, and generally carry on their operations with the money advanced by the merchants of the sea-port towns.'

The salgans, to which the tallow-boilers usually begin to drive their oxen in small numbers towards the close of summer, generally consist of a spacious court-yard surrounded by the buildings necessary for the manufacture, embracing shambles for slaughtering the oxen, houses containing enormous boilers to boil down the flesh, places for salting the hides, and counting-houses and dwellings for the workmen. In the summer these establishments are untenanted, excepting by dogs and birds of prey, which hover about all the year round, attracted by the nauseous smell, which, however alluring to them, is described as being infinitely disgusting to a visitor, and evidently distressing to the oxen. They seem, according to our informant, as if conscious of their approaching fate, and become so restless as they approach the salgan, that it is often necessary to drag them to it by main force, notwithstanding the device of mixing with the herd, as decoys, a few tame oxen accustomed to the place, and trained to the service. About a hundred oxen are driven into the court-yard at once, and of these twenty or thirty are conducted immediately to the slaughterhouse, where six or eight hutchers are kept constantly at work, in the midst of stench and filth which Kohl describes as exceeding anything that the mind can imagine. The business is generally carried on during the rainy season; and, owing to the utter absence of provision for cleanliness, 'the whole salgan is soon converted into a swamp of blood and mud,' the smell of which is never removed by the rigours of the winter or the storms of the spring. It appears also that the actual slaughtering is performed in so rude and unartificial a manner as to occasion much needless suffering to the beasts.

After the carcasses are skinned, three or four poods of flesh are cut off from the loins and back, for sale in the bazaar as meat, there being little fat in those parts of the body; but owing to the barbarous method of slaughtering, this meat is so much injured that none but the poor will buy it. The remainder of the carcass is cut up, and everything, excepting the intestines, which are given to the pigs (of which a considerable number are always kept at the salgan to fatten during the season), is thrown into the boilers, of which there are from four to six in every salgan, each large enough to contain the flesh of ten or fifteen oxen. A little water is put into the boiler, to prevent the 'soup,' as its contents are termed, from burning. The fat, as it collects at the top, is skimmed off with large ladles; and before it is quite cold it is poured into the casks in which it is afterwards shipped. The first fat which comes off is the best, and is quite white, while that which follows has a yellowish tinge. When there are not sufficient casks at hand, the hides of the slaughtered oxen are sewn up, and the tallow is poured into them, 'till,' our author observes, 'the whole assumes again a form something like that the animal wore when living. Of these tallow-stuffed oxen,' he adds, 'a large number are usually seen standing about the salgans.'

A further supply of fat, but of very inferior quality, is subsequently obtained by subjecting the mash of bones and flesh to huge presses. This tallow, which is rarely exported, is of a dark brown colour, and is used for greasing wheels and for other coarse purposes.

An ox in good condition, it is stated, will yield from seven to eight poods (250 to 290 lbs.) of tallow, which is generally worth from eleven to fifteen rubles a pood. The article is always so greatly in demand, that the merchants often pay part of the price for it while the oxen are yet grazing on the steppes; and the singular appearance of the salgans is heightened by the number of merchants and their clerks in attendance upon them; while the steward of the estate on which the oxen have fattened comes to receive his rent; the workmen for their wages; cattle-dealers to contract for further supplies of oxen, while perhaps some merchant is standing by, eager to secure and advance money for the tallow to be produced by them; and 'a colonist comes in to bargain for the fattening of some 200 hogs, which he afterwards receives back walking masses of hog's-lard, too yellow and coarse however for the market, till the grunters have been a little refined by sundry good feeds of corn.' Sometimes a wealthy nobleman, possessing oxen, but no tallow-making establishment of his own, makes his appearance to farm a salgan for a few weeks, while other persons visit the place to buy the refuse-meat for feeding pigs on the steppe, or to bargain for the horns and hides. 'The Turkish captains come eagerly to obtain the tallow in its greatest purity at the fountain-head, for tallow is too much esteemed by the gourmands of Constantinople to be idly wasted in enlightening their darkness; in short, however busily death may be at work, there is, meanwhile, no want either of life or bustle in the salgan.'

Notwithstanding the nature of the employment, there are always plenty of hands found to seek engagements in the salgans, the wages being high. The workmen usually earn about 70 or 80 rubles per month during the season, which lasts about twelve or thirteen weeks. In the neighbourhood of Odessa, Kohl states, there are seven salgans, in which probably 25,000 oxen are killed every year, besides countless numbers of sheep. In the vicinity of Kherson, Taganrog, Nikolayeff, Saratoff, Kisheneff, and other places, he adds, they will be found on an equally large scale.

From details quoted in M'Culloch's 'Dictionary of Commerce,' from a work by Borrisow on the commerce of St. Petersburg, it appears that the merchants of that city divide the tallow which they receive from the interior into white and yellow candle-tallow, and common and Siberian soap-tallow; the latter, which is considered the best tallow for soap-making, being brought by several rivers from Siberia to the lake Ladoga, and thence to the Neva by the canal of Schlusselburg. An *ambare*, or warehouse, is appropriated to the reception of the tallow on its arrival, in which it is selected and assorted (or *bracked*) according to quality, after which the casks are marked with the quality, the date of the selection, and the name of the *bracker* or selector. The white tallow is usually brought in conical casks, 2½ feet in diameter at the largest and 1½ at the smallest end; but the yellow tallow is commonly in casks of the more usual shape. 'Yellow candle-tallow, when good,' according to this authority, 'should be clean, dry, hard when broken, and of a fine yellow colour throughout. The white candle-tallow, when good, is white, brittle, hard, dry, and clean. The best white tallow is brought from Woronesch.' Soap-tallow however is said to be better the more greasy and yellow it is. M'Culloch states that 120 poods of tallow, gross weight (of which the cask is usually about 10 per cent.), make a Petersburg last, and 63 poods an English ton.

In his account of the candle-manufacture, referred to at the commencement of this article, Mr. Aikin refers to the practice of mixing different kinds of tallow together according to the quality of candles required, but does not give any directions for the mixture; but it is stated in the article 'Candle,' in the 'Encyclopædia Britannica,' that one-half of sheep's and one-half of bullock's tallow should be used, and that hog's tallow should be avoided, because it would make the candles gutter, give an offensive smell, and produce a thick black smoke; and Dr. Ure states that 'mutton-suet, with a proportion of ox-tallow, is selected for mould candles, because it gives them gloss and consistence. When weighed in due proportions, and cut up into small pieces that it may melt the more readily, the tallow is, according to Aikin's account, put into a boiler with some water, which tends to prevent its becoming over heated, and melted at a temperature of about 90°. Some water is then sprinkled upon it, which has the effect of causing such dregs and impurities as may have escaped the skimmer to sink to the bottom, after which the clear tallow is let out by a cock into suitable vessels, and when sufficiently cooled, but while yet retaining its perfect transparent fluidity, it is fit for use. Different kinds of tallow melt and retain their fluidity at very different degrees of temperature; the fat which is deposited about the kidneys being, in all animals, harder than that found in the cells of the bones, and especially than the half-oily fat found in the muscles and other soft parts; while the fat of some animals is harder than that of others—that of the sheep and deer, for example, congealing much sooner than that of the ox or horse. According therefore to the different kinds of fat which may enter into its composition, tallow will be found to vary considerably in fusibility; but 92° is the heat generally given as its melting-point, though Aikin states that he had seen a boiler-full of tallow perfectly fluid at 72°, and even then not sufficiently cooled to be made into candles; nor was this case, he observes, considered remarkable; 'whence we may conclude that tallow, made into candles and exposed to the air, loses much of its fusibility.' The author of the article above referred to in the 'Encyclopædia Britannica,' observes that no water should be mixed with the tallow for the first three dips, lest the candle-wicks, being quite dry, should imbibe it, and thus cause the candles to sputter in burning. He adds that in removing the melted tallow from the boiler to the tub or vessel in which the candles are dipped, it may be passed through a coarse horse-hair sieve, to purify it the more perfectly; and that it may be used after standing three hours, and will continue fit for use about twenty-four hours in summer and fifteen hours in winter.

The mode of manufacturing both dip and mould candles being described under CANDLE, P. C., p. 236, we need only, upon this subject, refer to a fuller account of the process, illustrated with engravings of some of the machinery employed in an extensive candle-factory, including one by which the operation of dipping is so facilitated as to enable a man and a boy to make nearly 26,000 candles, of twelve to a pound, between six o'clock in the morning and four in the afternoon, in the 'Penny Magazine,' No. 631, description of 'A Day at a Soap and Candle Factory.'

'A recently made candle of good quality,' observes Aikin, 'is of a yellow colour, is soft, and will be found to spit or sputter when set fire to, and to give a comparatively feeble light, the two latter qualities showing that it contains a little water.' 'If kept three or four months,' he proceeds, 'in a box placed in a cellar (for the presence of the sun's light is by no means necessary), the candle will be found bleached both inside and outside, will be harder than at first, and will now burn with a clear flame undisturbed by any sputtering. It is evident therefore that the water has been evaporated, and it is also extremely probable that the water, or the air which the water holds in solution, has acted chemically on the tallow, bleaching and at the same time hardening it.' 'This bleaching process,' he adds, 'goes on slowly in a cold and damp atmosphere; it being found that autumn-made candles hardly ever bleach to a good colour, although in three or four months they are fit for use. Candles made in March bleach the best of any, for the three or four months during which they are kept in the manufacturer's store are usually dry and warm.'

Tallow-lamps, as well as some recent improvements in candles and candle-lamps, are treated of under LIGHTS, ARTIFICIAL, P. C. S., p. 203.

TANACE'TUM, a genus of plants belonging to the natural order Compositae and the sub order Corymbiferae. The florets of the disk hermaphrodite, the involucre hemispherical imbricated, the receptacle naked, the fruit oblong and angular, with a large epigynous disk crowned with a slight membranous border.

T. vulgare, Tansy, has pinnatifid leaves and serrated leaflets. The heads in a terminal corymb. The florets of a bright yellow. The fruit with an entire crown. The stem is from 1½ to 3 feet high, erect, and rather angular. The root moderately creeping. Every part of the plant is bitter, and emits a strong but not unpleasant scent. It is considered tonic and cordial, and has been administered as a medicine in cases of worms and hysteria. It is also said to be of use in gout. It does not however suit every stomach. Withering says if meat be rubbed with tansy leaves the flesh-fly will not touch it. This plant is found by roadsides all over Europe and the Crimea.

(Lindley, *Flora Medica;* Babington, *Man. Brit. Botany.*)

TARA'NTULA, the *Aranea tarantula* of Linnæus, a species of spider of the genus *Lycosa* of Latreille. It is one of the largest of European spiders, and is found in the countries bordering the Mediterranean, where its bite is dreaded, and believed to be curable only through the effects of music. In reality, however, its venomous powers have been greatly exaggerated. According to Walckenaer, several distinct species have been confounded under the name of *Tarantula*.

TARIFF, a table of duties payable on goods imported into or exported from a country. The principle of a tariff depends upon the commercial policy of the state by which it is framed, and the details are constantly fluctuating with the change of interests and the wants of the community, or in pursuance of commercial treaties with other states. The British tariff underwent six important alterations from 1772 to 1842; namely, in 1787, in 1809, 1819, 1825, 1833, and 1842. The act embodying the tariff of 1833 is the 3 & 4 Wm. IV. c. 56. Its character has been described in the Report of a Committee of the House of Commons in 1840, on the Import Duties, as presenting 'neither congruity nor unity of purpose. No general principles seem to have been applied. The tariff often aims at incompatible ends: the duties are sometimes meant to be both productive of revenue and for protective objects, which are frequently inconsistent with each other. Hence they sometimes operate to the complete exclusion of foreign produce, and in so far no revenue can of course be received; and sometimes, when the duty is inordinately high, the amount of revenue becomes in consequence trifling. An attempt is made to protect a great variety of particular interests at the expense of the revenue and of the commercial intercourse with other countries.' The schedules to the act 3 & 4 Wm. IV. c. 56, contain a list of 1150 articles, to each of which a specific duty is affixed. The unenumerated articles are admitted at an *ad valorem* duty of 5 and of 20 per cent., the rate having previously been 20 and 50 per cent. In 1838-9, seventeen articles produced 94½ per cent. of the total customs' duties, and the remainder only 5½ per cent., including twenty-nine, which produced 3$\frac{9}{10}$ per cent. The following table of the tariff of 1833, showing the duties received in 1838-9, is an analysis of one prepared by the inspector-general of imports for the parliamentary committee to which allusion has been made:—

	No. of Articles.	£
1. Articles producing on an average less than 24*l*.	349	8,050
2. Ditto less than 240*l*.	132	31,629
3. Ditto less than 713*l*.	45	32,056
4. Ditto less than 2,290*l*.	107	244,933
5. Ditto less than 22,180*l*.	63	1,397,324
6. Ditto less than 183,864*l*.	10	1,838,630
7. Ditto less than 2,063,885*l*.	9	18,575,071
		Excess of drawback
8. Articles on which no duty has been received	147	5,398
	862	22,122,095

In 1840 Mr. Porter, of the Board of Trade, in his evidence before the Parliamentary committee on import duties, showed that out of a total amount of 22,962,610*l*. of Customs-duties received in 1839,

17 articles produced 94½ per cent. or	£21,700,630
29 articles produced 3$\frac{9}{10}$ per cent. or	898,661
46 articles produced 98⅖ per cent. or	£22,599,291

In 1842 Sir Robert Peel effected some improvements in this system, which were carried into effect by 5 & 6 Vict. c. 47. This act reduced the duty on about 750 different articles on which the receipts had amounted to about 270,000*l*. The general principle of the measure was to reduce the duty on raw materials to about 5 per cent., to limit the highest duty on partially manufactured materials to 12 per cent., and on complete manufactures to about 20 per cent. The number of articles in the tariff was now reduced to 813. Foreign horned cattle, sheep, goats, swine, salmon, soles, and other fish, and fresh beef and pork, which had been prohibited formerly, were admitted on paying a duty under the tariff of 1842. In 1844 the duty on foreign wool was abolished. In 1845 Sir Robert Peel effected further improvements in the tariff by abolishing the duty on cotton wool (about 680,000*l*.), and on 430 other articles, on which the duty amounted to 320,000*l*. By this plan expenses of warehousing are saved [WAREHOUSING SYSTEM, P. C.], and a number of troublesome accounts and impediments to business are got rid of; but for statistical purposes the customs department retains the power of examining articles which do not pay duty. The paramount object of the tariff reform of 1845 was to encourage the abundance and cheapness of raw materials of manufacture. In the same year, by an act (8 Vict. c. 7) 'to repeal the Duties of Customs due upon the Exportation of certain Goods from the United Kingdom,' the duties on the exportation of coals, culm, &c. are wholly repealed.

Caps. 84 to 94 of the 8 & 9 Vict. are all acts relating to Customs, Trade, and Navigation, and they all came into operation on the 4th of August, 1845. Cap. 84 is 'An Act to repeal the several Laws relating to Customs,' by which 26 acts were repealed. Cap. 85 is 'An Act for the Management of Customs,' and regulates the appointment and duties of officers, the taking of land for warehouses, &c. Cap. 86 is 'An Act for the general Regulation of Customs,' and relates to landing, warehousing, and custom-house entries. Cap. 87 is 'An Act for the Prevention of Smuggling,' and specifies the acts which constitute smuggling, and the penalties. Cap. 88 is 'An Act for the Encouragement of British Shipping and Navigation,' giving, with exceptions which are specified, certain privileges to British ships over foreign ships. Cap. 89 is 'An Act for the Registering of British Vessels.' Cap. 90 is 'An Act for granting Duties of Customs,' and imposes duties upon certain articles. (These duties are referred to in the preamble of the Tariff Act (9 & 10 Vict. c. 23) hereafter mentioned.). Cap. 91 is 'An Act for the Warehousing of Goods.' Cap. 22 is 'An Act to grant certain Bounties and Allowances of Customs,' which is confined however to refined sugar. Cap. 93 is 'An Act to regulate the Trade of British Possessions abroad.' Cap. 94 is 'An Act for the Regulation of the Trade of the Isle of Man.'

On the 26th of June, 1846, the royal assent was given to Sir Robert Peel's last tariff, which carries out still farther the principles of free trade by a total repeal of several important duties, and by a great reduction of numerous others. It is entitled 'An Act to alter certain Duties of Customs' (9 & 10 Vict. c. 23).

On the same day (June 26, 1846) the royal assent was given to the act for repealing the duties on the importation of foreign corn. It is entitled 'An Act to amend the laws relating to the Importation of Corn' (9 & 10 Vict. c. 22). By this act certain reduced 'sliding scale' duties are substituted for those of 1842, and they are to continue till Feb. 1, 1849, when all duties on the importation and entry for home consumption of corn, grain, meal, and flour, in the United Kingdom and in the Isle of Man, are repealed, with the exception of 1*s*. per quarter on all wheat, barley, bear or bigg, oats, rye, peas, and beans, merely for the purpose of registration of the quantities imported. The duties on all wheat-meal and flour, barley-meal, oat-meal, rye-meal and flour, pea-meal, and bean-meal are to be 4½*d*. for every hundred-weight.

The sliding-scale duties of 1842 (5 & 6 Vict. c. 14) are given under WHEAT, P. C., p. 305. The duties of 9 & 10 Vict. c. 22 are as follows:—

	s.	*d.*
Wheat, per quarter, under 48*s*	10	0
48*s*. and under 49*s*.	9	0
49*s*. and under 50*s*	8	0
50*s*. and under 51*s*.	7	0
51*s*. and under 52*s*.	6	0
52*s*. and under 53*s*.	5	0
53*s*. and upwards	4	0
Barley, bear, or bigg, per quarter, under 26*s*.	5	0

	s.	d.
Barley, 26s. and under 27s.	4	6
27s. and under 28s.	4	0
28s. and under 29s.	3	6
29s. and under 30s.	3	0
30s. and under 31s.	2	6
31s. and upwards	2	0
Oats, per quarter, under 18s.	4	0
18s. and under 19s.	3	6
19s. and under 20s.	3	0
20s. and under 21s.	2	6
21s. and under 22s.	2	0
22s. and upwards	1	6

On rye, peas, and beans the duty is equal in amount to the duty payable on barley. But there appears to be some blunder here, for the duty on rye, peas, and beans being regulated by the duty on barley, is regulated by the price of barley, and not by the price of rye, peas, and beans. The consequence of this is that when barley is under 26s. the quarter, and is paying 5s. duty, rye, peas, and beans will pay 5s. dnty, whatever their respective prices may be; and they will only pay the lowest duty of 2s. per quarter when barley is 31s. and upwards the quarter. (See 'Economist' Newspaper, Juno 4th and 11th, 1846.) The duties payable on all flour and meal, as above enumerated, until the 1st February, 1849, are enumerated in the schedule to the act. The average price, both weekly and aggregate, of all British corn is to continue to be made up according to 5 & 6 Vict. c. 14.

Of the exemptions from duty and reductions of duty made by the last tariff act (9 & 10 Vict. c. 23), it will suffice to mention a few of the most important.

No duties are chargeable on the following living animals:—oxen and bulls, cows, calves, horses, mares, geldings, colts, foals, mules, asses, sheep, lambs, swine and hogs, sucking-pigs, goats, kids.

No duties are chargeable on bacon, beef fresh or slightly salted, beef salted, not being corned beef, meat fresh or salted, not otherwise described, pork fresh or salted (not hams), potatoes, all vegetables not otherwise enumerated or described, hay, hides, and some other articles slightly wrought, and a few wholly manufactured.

Of the reduced duties the following are the most important: —ale and beer of all sorts, 1*l.* the barrel; arrow-root, 2*s.* 6*d.* the cwt., and if from a British possession 6*d.* the cwt.; pearled barley, 1*s.* the cwt., and if from a British possession, 6*d.* the cwt.; buckwheat, 1*s.* the quarter; butter, 10*s.* the cwt., and if from a British possession 2*s.* 6*d.* the cwt.; tallow-candles, 5*s.* the cwt.; cheese, 5*s.* the cwt., and if from a British possession 2*s.* the cwt.; cured fish, 1*s.* the cwt.; hams of all kinds, 7*s.* the cwt., and if from a British possession 1*s.* 6*d.* the cwt.; men's hats, 2*s.* each; men's boots, 14*s.* the dozen pairs; men's shoes, 7*s.* the dozen pairs; women's boots and shoes, from 4*s.* 6*d.* to 7*s.* 6*d.* the dozen pairs, according to kinds, as described; maize or Indian corn, 1*s.* the quarter; potato flour, 1*s.* the cwt.; rice, 1*s.* the cwt., and if from a British possession 6*d.* the cwt.; sago, 1*s.* the cwt.; tallow, 1*s.* 6*d.* the cwt.

The duties on manufactured goods of brass, bronze, china-ware, copper, iron, and steel, lead, pewter, tin, woollen, and cotton, are 10*l.* for every 100*l.* value. On silk manufactures the duties are about one-third higher, or 5*s.*, 6*s.*, and 9*s.* the lb., according to kinds, as described, or 15*l.* on every 100*l.* value.

The duty on foreign spirits of proof strength is 15*s.* the gallon.

The duty on foreign solid timber, from and after April 5, 1847, is 1*l.* the load of 50 cubic feet; from and after April 5, 1848, the duty is 15*s.* the load. On deals or boards, the duty, from and after April 5, 1847, is 1*l.* 6*s.* the load; from and after April 5, 1848, it is 1*l.* the load. Tho Tariff of 1842 is not altered with respect to timber imported from a British possession, which is still 1*s.* the load of solid timber, and 2*s.* the load of sawn timber.

The dnties on coffee and tea are not altered by the tariff.

Sugar Duties.—On the 18th of August, 1846, the royal assent was given to an Act (9 & 10 Vict. c. 63) 'for granting certain Duties on Sugar and Molasses.' By this Act the previous distinctions between free-labour and slave-labour are abolished, the former duties on sugar and molasses are repealed, and the following duties levied:—

From and after the passing of the Act,—

On sugar or molasses the growth and prodnce of any British possession in America, or of any British possession within the limits of the East India Company's Charter, into which the importation of foreign sugar is prohibited, and imported from thence, the duties following:—

	£.	s.	d.
Candy, brown or white, double refined sugar, or sugar equal in quality to double refined, per cwt.	1	1	0
Other refined sugar, or sugar rendered by any process equal in quality thereto, per cwt. . .	0	18	8
White clayed sugar, or sugar rendered by any process equal in quality to white clayed, not being refined, per cwt.	0	16	4
Brown sugar, being Muscovado or clayed, or any other sugar, not being equal in quality to white clayed, per cwt.	0	14	0
Molasses, per cwt.	0	5	3

And from and after the respective days next hereinafter mentioned,—

On Sugar or Molasses the Growth and Produce of any other British Possession within the Limits of the East India Company's Charter:—

—	From passing of Act to 5 Joly, 1847.	5 July, 1847, to 5 July, 1848.	5 July, 1848, to 5 July, 1849.	5 July, 1849, to 5 Jaly, 1850.	5 July, 1850, to 5 July, 1851.	From and after 5 July, 1851.
	£. s. d.	£. s. d.	£. s. d.	£. s. d.	£. s. d.	
Candy, brown or white, double refined sugar, &c., per cwt.	1 8 3	1 5 8	1 4 4	1 3 3	1 2 0	The same Duties as on Candy, Sugar, and Molasses, the Produce of other British Colonies.
Other refined sugar, &c., per cwt. . . .	1 3 4	1 2 8	1 1 8	1 0 8	0 19 8	
White clayed sugar, &c., per cwt. . . .	1 0 5	0 19 10	0 18 11	0 18 1	0 17 2	
Brown sugar, &c., per cwt.	0 17 6	0 17 0	0 18 3	0 15 6	0 14 9	
Molasses, per cwt. . .	0 6 6	0 6 4	0 6 1	0 5 9	0 5 6	

And from and after the respective days next hercinafter mentioned,—

On Sngar or Molasses tho Growth and Produce of any Foreign Country:—

—	From passing of Act to 5 July, 1847.	5 July, 1847, to 5 July, 1848.	5 July, 1848, to 5 Jnly, 1849.	5 July, 1849, to 5 July, 1850.	5 July, 1850, to 5 July, 1851.	From and after 5 Joly, 1851.
	£. s. d.	£. s. d.	£. s. d	£. s. d.	£. s. d.	
Candy, brown or white, double refined sugar, &c., per cwt.	1 11 8	1 10 0	1 7 9	1 5 8	1 3 3	The same Duties as on Candy, Sugar, and Molasses, the Produce of British Colonies.
Other refined sugar, &c., per cwt. . . .	1 8 0	1 6 6	1 4 8	1 2 8	1 0 8	
White clayed sugar, &c., per cwt. . . .	1 4 8	1 3 4	1 1 7	0 19 10	0 18 1	
Brown sugar, &c., per cwt.	1 1 0	1 0 0	0 18 6	0 17 0	0 15 6	
Molasses, per cwt. . .	0 7 10	0 7 6	0 6 11	0 6 4	0 5 9	

And also from and after the passing of this Act,—

On all foreign sugar or molasses not otherwise charged with duty, the duties following:—

	£.	s.	d.
Refined sugar, or sugar candy, per cwt. . .	3	3	0
Brown Muscovado or clayed sugar, not being refined, per cwt.	2	2	0
Molasses, per cwt.	0	15	8

TARRUNTE'NUS PATERNUS, a Roman jurist, was Praefectus Practorio under Commodus, by whom he was put to death. (Lamprid., *Commod.* 4.) He wroto four books De Re Militari, from which there are two excerpts in the Digest. He is mentioned by Vegetius (*De Re Militari*, i. 8).

TARTASH TAGH, or TARTASH-I-LING, is the Turkish name for that mountain-system, which, by the Chinese, is called Thiung-ling, and on our maps Bolor Tagh or Beluth Tagh. These mountains separate Chinese Turkistan, or the province of Thian-shan-nanlu, from Uzbeck Turkistan, or Turan. At their southern extremity they are connected with the two mountain-systems of the Himalaya and Hinducoh Range, and the point where the Tartash-i-ling branches off from them is considered as the place where the two last-mentioned ranges are separated from each other. This place occurs near 35° N. lat., and between 74° and 75° E. long., between Chitral and Gilgit, where a high mountain-mass, the Tutucan Mutcani, rises to nearly 18,000 feet above the sea-level, and some thousands above the snow-line. From this point the mountain-mass extends in a north-by-west direction to 45° N. lat., where its northern prolongation is known by the name of Kosy-urt; it lies between 70° and 71° E. long.

This mountain-mass is of great width, occupying between the parallels above mentioned all the countries which lie between 70° and 75° E. long. But we are not exactly acquainted with the places where its declivities terminate in the plains on the east and west, as these countries are very difficult of access to Europesn travellers, a few of whom only have reached them. A great portion of these mountains appears to be elevated above the snow-line. This is especially the case with an immense snow-region, which occurs between 35° 30′ and 36° 30′ N. lat., and which goes by the name of Puschtikur. It is considered one of the most extensive snow-regions on the surface of the globe. North of this remarkable region is a depression in the range, in the middle of which is a large alpine lake, called Sir-i-kol, in which the river Oxus originates; it runs out from its western extremity. This lake has the form of a crescent, and is about fourteen miles long from east to west, with an average width of one mile. On three sides it is bordered by swelling hills, about five hundred feet high, but along its southern banks they rise into mountains 3500 feet above the lake. As the lake is 15,600 feet above the sea-level, their summits attain more than 19,000 feet. North of this lake lies an immense table-land, which is called Pamir, or, in the emphatic language of the natives, Bam-i-Dúniah (the Roof of the World). In these parts several large alpine lakes are stated to occur, but we are not acquainted with their true position, nor with their extent. In 41° N. lat., the Bolor Tagh crosses the mountain range, which is called Thianshan, and which runs from west to east. That portion of the last-mentioned range, which lies west of the Bolor Tagh, is called Asferal Tagh, or Ak Tagh, and that on the east Tereck Tagh. In these parts the Bolor Tagh appears to be less elevated, so as to permit a passage over it, which connects Chinese Turkistan with Turan; but the mountains even here are always covered with snow. It is also stated that several snow-capped summits occur in the northern prolongation of the range, the Kosy-urt.

In the numerous valleys which open into the adjacent plains, and generally run east and west, different kinds of grain are cultivated. In the valley of Wakhan (37° N. lat.) wheat is grown at an elevation of 10,000 feet above the sea-level, whilst in the Alps it does not succeed in Engadin, at a height of 6000 feet. These valleys are inhabited on the western declivity of the mountain system by Tadjicks, or descendants of the ancient Persians. On the eastern declivity they are in possession of a population of Turkish origin, the Kirghiz. They are of the same stock as the numerous tribes which, under the name of Kirghiz Kaisak, wander about in the wide desert plains which lie on the east and north of the Aral and Caspian seas. They appear also to be closely allied to the Uzbecks, as, according to the statement of Lieut. Wood, their language differs only in a trifling degree from that spoken in Kunduz. This bold traveller describes these mountaineers as being of a middle size, varying between five feet two inches to five feet five and a half inches in height. Their countenance is disagreeable. The upper part of the nose sinks into the face, leaving the space between their deeply seated and elongated eyes without the usual dividing ridge; the brow immediately above the eye is protuberant, but slants back more abruptly than in Europeans; their cheeks, large and bloated, look as if pieces of flesh had been daubed upon them. They have little beard, and with those individuals who have a more luxuriant growth of hair, both beard and whiskers have a close natural curl. Their persons are not muscular, and their complexion is darkened by exposure to weather rather than by the sun. The women are rather good-looking, having a small and delicate form and fair complexion. The Kirghiz roam about in this mountain-region with their herds and flocks, like the Laplander, descending during the winter to the lower parts, and visiting in summer the upper declivities of the mountains. Their wealth consists of sheep, camels, and yaks. The camels have two humps, and Lieut. Wood thinks that this mountain-region is the true native country of these animals, which are called Bactrian camels. The yaks still less than the rein-deer cannot bear a considerable degree of heat, and live always near the places which are covered with snow. The Kirghiz of this mountain-region acknowledge allegiance to Kokand, and pay a nominal tribute to its ruler, but with China and Tibet they are constantly at feud, and they rob all parties from both countries.

We know very little of the mineral wealth of the Bolor Tagh. Gold and silver are said to be found. In the sand of the Oxus gold is found in abundance, and in some parts of its lower course it is washed; it is probably brought down from this region. In Shagnan, a country lying on the western declivity of the mountains, are rich mines of rubies, and deposits of salt occur at many places.

Two commercial roads cross this mountain-region from east to west, connecting Chinese Turkistan with Turan. They enter into the western plains by the valleys of the two great rivers Oxus and Jaxartes (Sir-Diria). The southern unites the Chinese town of Yarkand with Kunduz and Balkh. Leaving Yarkand it gradually ascends the valley of one of the tributaries of the Yarkiang-osteng river, and after passing the crest of the mountains near the lake of Sir-i-kol it descends through the valleys of Wakhan [WAKHAN, P.C.S.] and Badakshan to Kunduz. This road does not appear to be much frequented. The northern road runs from Kasghar in Chinese Turkistan to Kokand and Taschkand. After leaving the first named place it follows the valley of the Kasghar-diria, or river of Kasghar to its source, then turns northward, passing over the crest of the Tereck Tagh to Osch, in the valley of the Sir-diria, and crossing again the northern prolongation of the Bolor Tagh, it reaches Kokand. Numerous caravans pass along this road, and exchange the goods of Chinese Turkistan for those of Bokhara and the other countries of Turan.

(Elphinstone's *Account of the Kingdom of Cabul and its Dependencies*; Burnes' *Travels into Bokhara*; Wood's *Journey to the Source of the River Oxus*; and Humboldt's *Central Asia*.)

TAXATION, LOCAL. There was published, under the direction of the Poor-Law Commissioners in 1846, a valuable work entitled 'The Local Taxes of the United Kingdom, containing a Digest of the Law, with a Summary of Statistical Information concerning the several Local Taxes in England, Scotland, and Ireland.' England includes England and Wales. It is remarked in the Introduction that 'these local taxes are of two kinds: the rates raised in defined districts; and the tolls, dues, and fees paid for particular services or on certain occasions. But those rates only will be here noticed which are authorised by general statutes or the common law; excluding such as derive their origin from special or local Acts.' The rates are divided into three classes:—I. Rates of independent districts, on the basis of the poor-rate. II. Rates of independent districts, not on the basis of the poor-rate. III. Rates of aggregate districts on the basis of the poor-rate. No. I. comprehends—1, the Poor Rate; 2, the Workhouse Building Rate; 3, the Survey and Valuation Rate; 4, the Jail Fees' Rate; 5, the Constables' Rate; 6, the Highway Rates (three); 7, the Lighting and Watching Rate; the Militia Rate. No. II. comprehends—1, the Church Rates (three); 2, the Sewer* Rate; 3, the General Sewers' Tax; 4, the Drainage and Inclosure Rates; 5, the Inclosure Rate; 6, the Regulated Pasture Rate. No. III. comprehends—*Counties:* 1, the County Rate; 2, the Police Rate; 3, the Shire Hall Rate; 4, the Lunatic Asylum Rate; 5, the Burial Rate. *Hundreds:* 6, the Hundred Rate. *Boroughs:* 7, the Borough Rate; 8, the Watch Rate; 9, the Jail Rate; 10, the Prisoners' Rates; 11, the Lunatic Asylum Rate; 12, the Museum Rate. *Counties and Boroughs:* 13, the District Prison Rates.

The head of Tolls, Dues, and Fees, comprehends—1, Turnpike Tolls; 2, Borough Tolls and Dues; 3, Light Dues; 4, Post Dues; 5, Church Dues and Fees; 6, Marriage Fees; 7, Registration Fees; 8, Justiciary Fees.

The following statement is given in the work published under the direction of the Commissioners, as an approximate summary of the present annual amount of the local rates in England and Wales (p. 178):—

The Parish Rates:—	
Poor-rate, including the Workhouse Building Rate, and the Survey and Valuation Rate.	
Relief of the Poor	£4,976,093
Other objects	567,567

* The 3 & 4 Wm. IV. c. 22, the chief provisions of which act have been stated under SEWERS, P.C., was amended by 4 & 5 Vict. c. 45.

Contributions to County and Borough Rates	See below
The Jail Fees' Rate	Unknown
The Constables' Rate	do.
The Highway Rates	£1,312,812
The Lighting and Watching Rate	Unknown
The Militia Rate	Not needed
The Church Rates	406,812
The Sewer Rate, and the General Sewers' Tax—	
In the Metropolis	82,097
In the rest of the country	Unknown
Drainage and Inclosure Rates, The Inclosure Rate, The Regulated Pasture Rate	Unknown
The County Rates, The Hundred Rate, The Borough Rate } Contributed from the Poor-Rate	1,356,457
	£8,801,838
Tolls, Dues, and Fees	2,607,241
	£11,409,079

Some of the taxes are regularly increasing, and the produce of some, as appears from this table, is not known. It is assumed that the Local Taxation of England and Wales may be in round numbers twelve millions; but this estimate, as already shown, does not include the sums raised under special or local acts, of the amount of which sums no estimate can be formed.

A century ago the poor-rate was about 700,000*l.*; it is now about 7,000,000*l.* In 1818 it was 9,320,000*l.* But the sums levied under the name of the poor-rate are expended on various purposes besides the relief of the poor.

The work published under the direction of the Poor-Law Commissioners contains a chapter on the Local Taxes of Scotland, written at the request of the Poor-Law Commissioners, by J. Hill Burton, Advocate, Edinburgh.

The Local Taxes in Scotland are distributed by Mr. Burton under the following heads:—

I. Administration of Justice, which includes Criminal Prosecution, Court-Rooms and County Buildings, Rural Police, Town Police, Prisons. II. Internal Transit, which includes Commutation Roads, Turnpike Roads, Highland Roads and Bridges. III. Navigation. IV. Civic Economy, which includes Direct Municipal Taxes, Petty Customs, Miscellaneous Burdens. V. Relief of the Poor. VI. The Church and Education, which includes the Church of Scotland Education. VII. Miscellaneous Taxes.

Mr. Burton observes 'that the money expended on the ecclesiastical establishment and on education, partakes, in some respects, of the nature of a tax.' The amount of money annually levied by local taxation in Scotland is not accurately known. The sum of 956,678*l.* is the approximate amount given by Mr. Burton.

The local rates levied in Ireland are distributed under the following heads in the work published under the direction of the Poor-Law Commissioners:—

I. Grand Jury Cess (in all the counties, including counties of cities and towns).

II. Poor-rates (in 130 Unions, comprising every townland and denomination of land in Ireland).

III. Lighting, Cleansing, and Watching Rates (in all cities, towns, and boroughs which may adopt the provisions of the statute).

IV. Borough Rates (in certain Boroughs).

V. Pipe Water Rates (in every city and town, except Dublin, Cork, and Limerick, which gives title to a bishop or archbishop).

VI. Parish Cess (in all parishes, unions of parishes or chapelries in Ireland).

VII. Rates for deserted children (in all parishes in Ireland, except those in the city of Cork).

VIII. Ministers' Money (in cities and towns corporate in Ireland).

IX. Board of Health Rates (in parishes in which the lord lieutenant shall direct officers of health to be appointed).

'Besides the above rates leviable under general acts of parliament, there are rates leviable under special acts in many places, as Dublin, Cork,' &c. No account is given in the work here referred to of the provisions of these special acts, but the amount of the sums levied under them, which is considerable in some places, is given so far as it has been obtained.

The rates for Ireland are given at	£1,631,818
Tolls, Dues, and Fees	199,469
	£1,831,287

The amount of annual local taxation of Great Britain and Ireland accordingly amounts to 14,197,044*l.* But it is observed that if the deficient information were supplied, it would appear to be at least 15,000,000*l.* a year: and this, as already observed, does not include the local taxes raised in particular places under special acts of parliament. The sum raised by general taxation in the United Kingdom for the year ended 5th January, 1846, was 51,719,118*l.* The amount of the local and general taxation is accordingly about 67,000,000*l.* a year. The public expenditure for the year ending 5th January, 1846, was 49,061,411*l.*, of which sum 28,253,872*l.* was paid on account of the Funded and Unfunded Debt. This leaves somewhat under 21,000,000*l.* for the rest of the general public expenditure. Accordingly the present amount of the local taxation, 15,000,000*l.*, is nearly equal to three-fourths of the public expenditure after deducting the payments on account of the Funded and Unfunded Debt. It is well remarked in the work from which these facts are derived (p. 190), 'When the Local Taxes are brought under review in this collective amount, it then at once becomes manifest how really deserving of serious consideration are the modes of raising and expending them, so as to secure the most efficient and economical management of a revenue so large and important: a revenue, indeed, which derives its importance not only from the largeness of its aggregate sum, but from the extent of the property and the number of persons affected by it, and from the numerous and diversified public objects to which it is applied.'

TAXICORNES. The second family of the heteromerous coleoptera, in Latreille's arrangement of insects. They have no corneous tooth on the inner side of the maxillæ. They are all winged insects with nearly square bodies, and a thorax which conceals or receives the head. They have short antennæ and legs adapted for walking only. They live in fungi, beneath the bark of trees, or on the ground under stones. This family is divided into two tribes, of which the genera *Diaperus* and *Cossyphus* are respectively the types.

TAXITES, a coniferous fossil genus of plants from Stonesfield. (Brongniart.)

TAXO'CRINUS, the last generic name assigned by Phillips to the group of Encrinites analogous to Taxocrinus (Poteriocrinus) Egertoni. It has several synonyms. (Morris's Catalogue.)

TAYLOR, WILLIAM, was born at Norwich, in the year 1765. He was the only child of an eminent merchant of that city. He first studied under a Swiss refugee, and afterwards became a pupil of Mr. Rochemont Barbauld, the Unitarian minister, at Palgrave, a tutor chiefly selected on account of his religious opinions, which were those of Mr. Taylor and his family. To Mrs. Barbauld, better known as Miss Aikin, Taylor was indebted for much assistance in his early studies; aided by her assiduous care, he soon acquired a correct knowledge of the principles of English composition, and, in after life, he gratefully acknowledged his obligations to this celebrated woman, whom he styled 'the mother of his mind.' On leaving the house of Mr. Barbauld, at the age of fourteen, he was placed by his father in his counting-house at Norwich, who was desirous that he should succeed him in his large and prosperous business. Shortly afterwards he was sent on the Continent, under the care of one of the partners of the firm, for the purpose of perfecting himself in the French and Italian languages, which were of importance to the proper conducting of his father's business. Before leaving England, he had already evinced considerable facility in acquiring knowledge of languages; and he had been but a short time abroad when his letters to his parents, in English, French, and Italian, at the early age of fifteen, gave the promise of that eminence as a writer to which he afterwards rose. On his return to his native city, he was encouraged in the prosecution of his studies by the fond admiration of his parents and friends; and for the two years he remained there, he appears to have given the tone to its literary circles. A second tour to the Continent was resolved upon; and he proceeded to Germany with the view of acquiring a familiar acquaintance with its language and literature. A residence of a year with a clergyman at Paderborn was sufficient for this purpose. Under the influence of his preceptor he imbibed a taste not only for the literature of Germany, but for the philosophy of that country: a taste which ever afterwards characterized his writings. On his second return to Norwich, at the age of eighteen, his parents perceived that their son had an imagination too lively, and a taste too decided for literary pursuits, to allow him to devote himself to the mercantile profession. The affluent circumstances of the father, added to the gratification which he enjoyed of seeing his son arrived at so early an age to a high distinction in letters, induced him to forego the strict accomplishment of his favourite project, and to put no restrictions to the youth's inclinations. The time of young Taylor was now chiefly occupied in making various contributions to the periodicals, and to translations from the best German writers.

When the French revolution had convulsed the Continent of Europe, it extended its influence over no small proportion of the English nation; of this influence the mind of Taylor was adapted to fee the force, and he soon became ambitious to add to his other distinctions that of being a prominent political character. The quiet of the study was now exchanged for the noisy meetings of political debaters.

Taylor allowed himself to be enrolled as secretary of a democratic club established at Norwich. His political activity however, so far from interfering with his desire to obtain literary distinction, served as a stimulus to bring his writings before the public, and thus to extend his reputation beyond the narrow sphere of his native place.

A poetical translation of the 'Lenore' of Bürger was the first publication by which he became generally known. This translation, which preceded that of Spencer, still maintains a high reputation for elegance and accuracy. It contains some variations from the original; that of the most importance being the liberty he has taken to transfer the scene of the poem, which in Bürger is towards the end of the Seven Years' War, to the time of the Crusades; in this he has been followed by Sir Walter Scott, to whom the public is also indebted for a translation of 'Lenore.' This work was soon after followed by several other poetical translations from the same author. Specimens of the other German poets, by him, also appeared in various magazines and periodicals. These he afterwards collected together, with explanatory observations, and published in 1830, in three large volumes, under the title, 'Survey of German Poetry.' The peculiar metre to which he has adapted many of these translations, and a homely and too familiar style of expression, have exposed him to some severe criticisms.

In the year 1798 he became acquainted with Southey, whose political opinions in early life were similar to his own; an interesting collection of their correspondence will be found in the biography of Taylor, referred to at the end of this article. In one of them he describes his first interview with Sir James Mackintosh and Dr. Parr; and vividly, though not perhaps impartially, delineates their manner and peculiarities (vol. i. p. 295).

Severe losses, consequent upon the war of the French Revolution, induced Mr. Taylor to retire from the management of his father's business: a circumstance which enabled him to devote a greater portion of his time to his favourite studies. Magazines and Reviews still continued to be the principal vehicles by which his writings came before the public. As a reviewer, he was remarkable for his close attention and extensive information on the subject he reviewed. Though not profound as a classical or an Oriental scholar, he in a great measure supplied his deficiency in that respect by his intimate acquaintance with the German translations of the classics, and the commentaries upon them. The style, however, of his prose writings was so peculiar, that it was disrelished by many of his readers; and it became a source of constant altercation between him and the editors of the works to which he contributed. 'Were I reviewing my own reviewals,' he writes to Southey, 'I should say this man's style has an ambitious singularity, which, like chewing ginseng, displeases at first, and attaches at last. In his pursuit of the "curiosa felicitas" he often sacrifices felicity to curiosity of expression. With much philological knowledge, and much familiarity among the European classics of all sorts, his innovations are mostly defensible, and his allusions mostly pertinent; yet they have both an *unusuality* which startles, and which, if ultimately approved, provokes at least an anterior discussion that is unpleasant.' A pleasing feature in the reviews of Taylor is the enthusiasm with which he entered into his subject, but which led him occasionally to hazard assertions which, on cooler reflection, he often disavowed. Thus it is stated that in one of his papers on the prose of Milton, he expresses the conviction that it is superior to his poetry.

In 1802, on his return from a visit to Paris, Mr. Taylor accepted the management of a weekly local paper, 'The Norwich Iris,' after having used his endeavours to induce Southey to undertake it. This paper became the organ of the party to whose political opinions he was attached; its success however was not equal to his anticipations, and it was given up after two years. He then applied himself anew to his reviewing labours, the changes which had taken place in his family circumstances affording him an additional motive for literary exertion. The Monthly Review, under the editorship of Dr. Griffiths, was the work in which the greatest number of his contributions appeared. In 1806 he gave to the public his version of Lessing's 'Nathan the Wise;' which was severely criticized in the Edinburgh Review. A succession of pecuniary losses which soon after occurred, rendered the position of Mr. Taylor's family, if not one of privation, at least of diminished comfort. His adversity, however, was cheered by the kindly sympathies of his numerous friends, and by several unexpected offers of assistance, which, though not accepted, were sensibly felt and gratefully responded to. At the same time increase of years and premature infirmities diminished his energies, and his later productions have not added to his fame. Among his last works was a collection of short essays on English Synonyms, which, though incomplete and frequently fanciful, are calculated to assist the philological student, and to lay the foundation of a more complete undertaking. The last years of his life were embittered by the loss of the aged parents, to whom he had proved himself a devoted and affectionate son, and by the decay of his mental powers. He died in the month of March, 1836; his remains were deposited beside those of his parents, in the cemetery of the Octagon Chapel at Norwich.

Mr. Taylor's chief claim to literary celebrity consists in his valuable translations from the German; it was through him that the English first became acquainted with the modern literature of Germany. If his talents as a poet were unequal to the task of producing such a translation as the Wallenstein of Coleridge, to him at least must be assigned the merit of having been the first in the field, and perhaps to have laboured in it more assiduously than any other English writer. A good translation does not only require a perfect knowledge of the two languages, but also the power of approaching in some degree to the style of the original. Hence in poetical translations it is necessary that the translator should be a poet also. 'We know,' says a high authority on this subject, 'the remark of Denham, that the subtle spirit of poesy evaporates entirely in the transfusion from one language into another; and that, unless a new or an original spirit is infused by the translator himself, there will remain nothing but a "caput mortuum." Thebest translators of poetry therefore have been those who have approved their talents in original poetical composition.' (Tytler's *Essay on the Principles of Translation*, p. 373.) These remarks will account for the chief and perhaps only defect of Taylor as a translator.

Memoir of the Life and Writings of the late William Taylor, of Norwich, &c., by T. W. Robberds, F.G.S., of Norwich, 2 vols. 8vo., London, 1843; *Quarterly Review*, vol. lxxxiii. p. 27-68.)

TECO'MA (from Tecomaxochitl, the Mexican name of the species), a genus of plants belonging to the natural order Bignoniaceæ. It has a campanulate 5-toothed calyx, a short-tubed corolla with a campanulate throat, and a 5-lobed bilabiate limb, four didynamous stamens with a sterile filament of a fifth, a bilamellate stigma, a silique-formed 2-celled capsule having the dissepiments contrary to the valves; the seeds winged, disposed in two rows. The species are erect trees or shrubs or scandent plants, with unequally pinnate or digitate simple leaves with terminal panicles yellow or flesh-coloured flowers. They are natives of the Old and New World in tropical and subtropical climates. They are all elegant plants and well worthy of cultivation.

T. radicans is a climbing glabrous plant with rough rooting branches, 9 ovate acuminated coarsely serrated leaflets, the racemes of flowers terminal corymbose on long peduncles, the tube of the corolla 5 times longer than the calyx. This is a hardy plant in our climate. It is a native of North and South Carolina, of Florida, and Virginia. This plant has been a great favourite in this country. It grows against a wall by throwing out roots from its branches in the same manner as ivy. The flowers grow from the ends of the branches in large bunches, and the tube of the corolla gradually swells out in the form of a trumpet; hence this and some of the species of Bignonia have been called trumpet-flowers.

T. stans is a small tree with somewhat tetragonal glabrous branches; ovate-lanceolate, acuminated serrate and glabrous leaflets, the racemes terminal simple. This plant is a native of various parts of South America, the West Indies, and Mexico. The roots of this plant are reputed diuretic.

Several other species of Tecoma have reputed medicinal virtues. *T. speciosa* is said to be a useful diuretic, also a cathartic. *T. impetiginosa* and *T. Ipe* contain large quantities of tannin, and decoctions of the bark are used by the Brazilians as external applications in rheumatism and a gargle in ulcers of the throat. The leaves are milder and are employed in affections of the eyes. In cultivation the species of Tecoma may be treated in the same general way as recommended for the species of Bignonia. (Bignonia, P. C. S.)

(Lindley, *Vegetable Kingdom;* Don, *Gardener's Dictionary.*)

TEESDA'LIA (named after Robert Teesdale, author of a catalogue of plants growing about Castle Howard), a genus of plants belonging to the natural order Cruciferae and the sub-order Angustiseptae. It has a roundish notched pouch, boat-shaped valves, their backs keeled below, narrowly winged above; the seeds two in each cell; the petals either equal or the two outer ones larger. The species are small annual smooth herbs with stalked expanded vertical leaves. The flowers usually small and white.

T. nudicaulis is the *T. Iberis* of De Candolle. It has unequal petals and numerous leaves spreading on the ground. The stamens with remarkable scales within, the pouch emarginate. It is found in sandy and gravelly places in England, France, Germany, Denmark, and Sweden. It is the only British species.

T. lepidium is a native of Europe, particularly of Spain. It differs but little in general characters from the former species; there are two varieties of it.

If the seeds of these little annuals be sown on rockwork or in dry sandy places they will scatter themselves and increase rapidly.

(Don, *Gardener's Dictionary;* Babington, *Manual of British Botany.*)

TELEGRAPH, ELECTRIC. The electric telegraph, although it has only begun to attract the attention of the public from a comparatively recent date, has nevertheless not originated in any sudden but happy idea. The possibility of such an application of electrical power had long been imagined; and from the commencement of the present century, the attempts to render one or other of the phenomena of electricity subservient to such a purpose, have been numerous and interesting. In the sequel we have endeavoured to trace briefly some of the most remarkable of these inventions, of which any authentic account exists. We have arranged them as far as possible, in their proper order of succession, down to the period when the invention assumed that form which it at present retains in England; omitting those subsequent stages of the invention, which have related rather to the improvement of details, than to the adoption of any new principles of construction.

With this subject the Electric Clock is so far interwoven, that we have introduced a short description of its mode of action.

From the earliest date which we can assign to the existence of an electric telegraph, its essential parts have been the same. These are, the source of electrical power; the conducting material by which this power is enabled to travel to the required locality; and finally, the apparatus by which at the distant end of the line, the existence of this power, its amount, or the direction of its action is made known to the observer. In the earlier stages of the invention, the investigations of its promoters were confined to the latter of these three essentials; and so long as the illustration of the idea was confined to the lecture-table of the philosopher, or to the scientific museum, this part justly claimed an undisputed pre-eminence. But with the proposed application of the principle to purposes of general utility, there arose the necessity for an equal, nay, almost for a greater degree of attention to the two former requisites. We shall see, in our brief retrospect of the history of this invention, how this fact developes itself.

The experiments of Dr. Watson and others, about the middle of the last century, and the humorous display of electrical phenomena which Franklin mentions as having been exhibited on the banks of the Schuylkill, at the same period, may possibly have suggested some notions of the conveyance of information, by means of electricity. The earliest authenticated instance of any attempt to reduce this idea to practice, appears to have been that of Mr. Lomond, in 1787. His apparatus was, however, of the simplest possible construction. He employed, as an indicator, a pair of pith balls, which were suspended from one end of an insulated wire, at the other end of which the operator took his station, provided with an electrical machine. On charging the wire with electricity, the pith balls would exercise mutual repulsion, and diverge from one another; but on removing the electrical charge from the wire by the contact of some conductor, the balls would collapse. It is evident that certain numbers of successive divergences might be made to denote particular preconcerted signals. No account is, however, preserved of the manner in which the inventor intended to apply these indications. Subsequently to this, the phenomenon of the spark was used for the transmission of signals. It is well known that on the passage of electricity through an interrupted conductor, a brilliant spark of light is seen, at all the breaks in the continuity of the conducting material. This fact is well known in its application to various electrical toys in the present day. We allude to the outlines of birds, animals, or stars, which are formed of small pieces of tinfoil, attached to plates or strips of glass, at such distances asunder, that an electrical charge may be readily passed through the whole series. When this is done, the figure becomes luminous for an instant, as the electricity leaps across the small intervals between the successive pieces of tinfoil. Were the various letters of the alphabet formed in this manner, upon a table, and connected each one with a distinct and insulated wire, any particular letter might be rendered visible in a darkened room, by passing an electrical charge through the appropriate wire. This in fact constituted the Telegraph of Reizer, invented in 1794.

A somewhat simpler form of apparatus, involving the same principle, was constructed by arranging the several wires in succession, with a single break in each. The various wires bore the names of the different letters or figures, and any required signal was indicated by passing the charge through the proper wire, when the spark visible at the interruption of the circuit would denote the letter to the observer at the farther end.

This was the point to which the invention had progressed, at the commencement of the present century. The discovery by Volta, of the battery which bears his name, forms the commencement of a new era in electro-telegraphs, although no immediate application of the phenomena of the galvanic current appears to have been made. One or two points present themselves for our consideration, before proceeding to the later periods of our history.

In reference to the relative adaptability of the electricity derived from the ordinary machine, and that from the Voltaic battery, to the purposes of electric telegraphs, we may add a few words. The researches of philosophers have established the identity of the force in both cases, and have shown that, in operating with the electrical machine or the Voltaic battery, we are dealing with the same powerful agent, only under different forms. Machine or Frictional electricity presents us with phenomena which indicate its high degree of tension. It possesses the power of passing visibly in the form of a spark, through a greater or less space, even when present in small quantity, so that a slight break in the conductor is not sufficient to prevent its passage. The Voltaic current, on the contrary, unless its intensity be exalted to a high degree, is unable thus to leap across more than a very minute interval. From this difference would arise the necessity for a much more perfect state of insulation, in the wire destined to convey the former, than is requisite in the conductor for the latter. When, therefore, the extension of these conductors over many miles of distance becomes necessary, it will be sufficiently obvious to our readers, that the impediments to the use of the former current were and are almost insuperable, from the difficulty of maintaining through so great a length, the requisite degree of insulation. With the galvanic current, on the contrary, provided that the continuity of the conductor be insured and its capacity be sufficient, a much less perfect insulation will suffice. Another point to which it appears desirable to allude here, is the actual transmission of the electrical force. It is well known, that with respect to the Leyden jar, the shock caused by the passage of the electricity through the body is not experienced, until the circuit between the outside and inside coatings of the jar is completed, by touching them both at once; or by so nearly completing the circuit, that the electricity may leap across the interval in the form of a spark. When we present our knuckle to the conductor of an electrical machine, and take a spark from it, the mode of completion of the circuit is less apparent, though the necessity for it is not less absolute. The body in fact forms the communication between the prime conductor and the earth, from which latter inexhaustible reservoir of electricity the machine draws its constant supply. To extend this same principle farther, if we conceive two wires extended parallel to one another, to any length, and put in connection with the two ends or poles of a Voltaic battery respectively, no indications of the passage of the electric fluid through either can be found. But if the wires be brought in contact at any point, or if a sufficiently good conductor be made to connect them, and thus complete the circuit, the passage of the fluid from one pole of the battery to the other through the extended wires will take place immediately. If this connection be made at any distant point, by an apparatus fitted for such indications, the direction and amount of the current may be appreciated, as certainly as they could be, were the circuit completed between the battery poles by this apparatus only. To use the words of the late Professor Daniell, 'the journeyings of this force must be in a circle, and the arrangements must be made in such a way, that the impulse may return to the point from which it set out; it must *circulate*.' It will be seen how important an influence this necessity exercises upon the construction of the electric telegraph.

We may now return to the point whence we have digressed at so great a length. In 1807, Sömmering at Munich proposed to construct an electric telegraph, on the principle of the decomposition of water by the Voltaic current, as discovered in 1800 by Nicholson and Carlisle. The form of his apparatus was the following:—In a glass trough containing water, thirty-five gold pegs or pins were arranged vertically, this number of pegs corresponding to the letters of the alphabet, together with the nine digits. Each of these pins was connected with a wire, which extended to the place whence the signal was to be transmitted. At this point they terminated in brass strips, arranged in a frame side by side, but like the wires and pins, insulated from each other. Each brass strip bore the name of the letter or figure which belonged to the pin to which it was connected. The operator, when wishing to send any communication, connected the two poles of the battery, with the brass strips bearing the names of the two first letters required. Decomposition of the water in the trough at the distant end, was instantly indicated by the evolution of bubbles of gas, from the two gold pins thus rendered the two electrodes or poles of the battery. The letters forming any communication were to be in this manner denoted in pairs, the inventor ingeniously availing himself of the different quantities of the two gases evolved, to point out the relative position of the letters in each pair. The hydrogen which made its escape in the largest quantity was always employed to indicate the first letter, and of course the operator had to bear this rule in view in making his connection with the battery.

In 1816, Mr. Ronalds of Hammersmith invented an electric telegraph, in which he recurred to the use of frictional electricity. This telegraph, which was shown to several scientific men, at the date above given, was fully described by the inventor, in a work published by him in 1823. Mr. Ronalds employed the divergence and collapse of a pair of pith-balls as the telegraphic indication, in which respect the principle was the same as that adopted by Mr. Lomond; but to this simple apparatus, a distinct contrivance was appended, which would render the communication more rapid and easy. A single wire perfectly insulated by being suspended from silken strings, or buried in glass tubes, surrounded by pitch, and protected by wooden troughs, was extended between the two stations. From the end of this wire were suspended in front of the dial of a clock a pair of pith-balls, so that while the wire was charged the balls would remain divergent, but would instantly collapse, when the wire by contact with the earth, or with the hand of the operator, was discharged. A person at one end, having therefore an electrical machine, by which he could maintain the wire in an electrified state, and the pith-balls at the farther extremity, consequently in a state of divergence; had it of course in his power to give an instantaneous indication to an observer at that farther extremity by touching the wire with his hand, which, discharging the electricity, would allow the balls to collapse for an instant. But instead of merely employing the successive movements of the pith-balls to denote the various signals, Mr. Ronalds added another apparatus for this purpose. Two clocks, very accurately adjusted to the same rate of going, carried, instead of the ordinary seconds hand, light discs, on which the various letters of the alphabet, the figures, and other required signals were engraved. These discs turned with a regular step by step movement, behind a screen of metal, in which was made a small opening, sufficient to allow of one letter at a time being seen. As the discs turned round, each letter in succession would be visible through this space; and it is evident that if the clocks were started with the same signal visible, the movement of the discs would bring similar signals into view at the same time. One of these instruments was situated at each end of the communicating wire. The operator who was about to transmit any communication, watched the dial of his clock until the letter he required was visible, and at that instant discharged the wire. The momentary collapse of the balls at the distant end would then warn the observer to note the letter visible on his instrument, which would form a part of the intelligence to be received. The successive letters or signals constituting any message were denoted in this manner as the clock dials continued to turn round. In order to avoid the necessity for constant attention on the part of the observer, an arrangement was adopted by which a pistol could be fired by the spark at the farther end, to summon the attendant to his instrument. Various signals were also concerted beforehand, by the use of which, the time necessary for the transmission of any intelligence was lessened. These experiments of Mr. Ronalds' were made with the intervention of several miles of wire, carried backward and forward across his grounds.

Mr. Ronalds, in his work on electricity, published in 1823, informs us that an electric clock was constructed in 1815 by Buzengeiger.* A very light pendulum was suspended, with its bob or weight midway between two brass balls, forming the extreme ends of a De Luc's Pile. Having been once set in motion, the pendulum would continue to oscillate between the balls, receiving at the end of each vibration an impulse, from the attraction of the opposite ball to that which it had just touched. The upper end of the pendulum was made to cause the revolution of a small ratchet wheel, by means of the alternate action of two catches, or pallets, one on either side of the wheel. To many of our readers the construction and action of the Dry Pile or column of De Luc may be familiar. It may not however be amiss to add, that it consists of many hundreds, or even thousands, of small discs of silver and zinc foil, piled up in regular order, with the intervention of writing-paper discs between the succeeding pairs. They are then usually enclosed in a glass tube, and pressed firmly together, by means of screw-caps or ends of brass. The ordinary hygrometric moisture of the paper is sufficient to excite weak voltaic effects in the pile, which are manifested by the two ends exhibiting constantly opposite electrical states. The bob of the pendulum in Buzengeiger's clock, after touching one of these ends, received a minute electrical charge; in consequence of which it was repelled by this ball, and attracted by the other. These actions, though very feeble, are long continued, and might suffice to maintain a movement in a very light train for months. In the opticians' windows at the present day, slender frames are often seen revolving, with paper figures of chariots and horses, under the influence of two or more of these Dry Piles.

In 1819, Professor Œrsted of Copenhagen made his great discovery of the action of the galvanic current upon a magnetic needle. He observed that when a galvanic current is passed along a wire, placed parallel and near to a magnetic needle, free to turn on its centre, the needle is deflected to one side or the other, according to the direction in which the current is transmitted. He further noticed that the position of the wire, whether above or below the needle, had an equal influence with the direction of the current in determining the side to which the deflection took place. The power of a single wire in causing this deviation of a needle is very small, but within a short time after Volta's discovery, Professor Schweiger invented the multiplier, as he called it, in which the needle, being surrounded with many successive coils of insulated wire, is acted upon by the joint force of all. This instrument, commonly known in England as the Galvanometer, has been of the most signal use to the philosopher; as it

* Ronalds' Description of an Electric Telegraph, &c., p. 89. Translated from the Stutgard *Morgen-blatter*, September 23rd, 1815. In the same work (page 67) Mr. Ronalds, quoting from Schweiger's Journal, vol. 13, p. 379, states that M. Ramis at Munich, and M. Strelzig at Verona, had each constructed an Electric clock, which received motion from a Dry Pile.

enables him by its extreme delicacy not merely to discover the existence of feeble currents, but also to measure their force and direction with extreme accuracy. Under a somewhat different form, this discovery now forms the basis of the Electric Telegraph, which has spread so extensively over England.

Very shortly after this important discovery had been made, Œrsted, Arago, Davy, and others, succeeded in rendering iron magnetic, by the passage of a galvanic current through a wire coiled around the iron. It was found that, provided the iron to be magnetized were perfectly soft and pure, the magnetic property remained only during the actual transmission of the electricity, and was lost immediately on the interruption of the electric circuit. If the iron which was exposed to the influence of the galvanic current were combined with sulphur, carbon, or phosphorus, the magnetic power became to a greater or less extent permanent in it.*

These two principles have, since their discovery, formed the groundwork of almost all the electric telegraphs which have been proposed, and certainly of all which have hitherto been found practicable. Far be it from us, however, to assume that these principles must henceforward bound the inventive genius of men of science, or that no further progress can be made. Much has been already done, but far more, as yet latent and unknown, may be before us.

M. Ampère suggested the employment of the discovery of Œrsted as early as 1830, and this suggestion was acted upon by Professor Ritchie, in a model Telegraph exhibited by him at the Royal Institution.† Ampère's plan however was far from possessing the simplicity, so essential in an instrument designed for practical use. Not less than thirty pairs of conducting wires were necessary, according to his scheme, for maintaining a Telegraphic communication.

M. Schilling also in 1832, following the idea originated by Ampère, proposed a similar form of telegraph, in which there were as many of these galvanometers, each with its appropriate circuit, as there were letters or signs to be used in the various communications. The momentary deflection of any one of these needles, by the completion of the galvanic circuit with its wires, denoted the required letter or sign. The same plan, to a certain extent, seems to have been followed by M. Alexander, in his telegraph, described about the end of the year 1837. In this instrument a distinct needle was employed for the indication of each letter, as in M. Schilling's apparatus, these needles bearing at one end light screens of paper, which concealed from view a letter or figure, until by the deflection of the needle the screen was removed, and the letter brought into sight. M. Alexander however effected one great improvement, in substituting a single return wire, to which one end of all the coils was joined for the several distinct return wires existing in the previous invention of M. Schilling.‡ At a later period this latter gentleman undertook a series of experiments, with a view to the establishment of a communication by means of a single wire; but some mechanical difficulties appear to have arrested his progress, previous to his death, which occurred while he was engaged in the prosecution of his investigations. In both of these telegraphs all that was requisite, in addition to the indicating apparatus and conducting wires, was a contrivance by which the connection of the voltaic batteries could be made with any pair of wires in the former, and with any single wire and the return-conductor in the latter of the two inventions. In M. Alexander's instrument, a set of keys resembling those of a pianoforte, and corresponding to the number of needles, were arranged on a frame or table. One pole of the battery being connected to the return or common wire, the other pole was joined to a plate of metal, or to a trough of mercury, extending beneath all the keys. On depressing any key, the wire belonging to it, which was continued to the end over the battery connection, was brought into contact with this bar or trough. The current would then flow along the conducting wire, around the multiplier-coil in the distant instrument, and return by the common wire to the voltaic battery. The keys bore the same letters as the needles to which they were connected, so that the operator communicated any letter by pressing down the corresponding key.

* Thomson's *Lectures on Heat and Electricity*, p. 512.

† See Froriep's *Notizen*, &c., vol. 27, p. 88.

‡ In this and other parts of this article, when treating of the transmission of an electric current through a conductor, it is necessary, in order to simplify the description, to represent the electricity as starting from one end or pole of the battery, and returning after its circuit to the other. Theory however warrants us in regarding the phenomena of the circuit as due rather to force developed at once at both ends of the battery, than to any power acting in one direction only.

In these two instruments no use was made of the power which exists, of determining the deflection of the needle, to either side, by merely reversing the connections of the battery. In a telegraph recorded as the invention of MM. Gauss and Weber, the varied deflections of a single needle appear to have formed the code of signals. From the use of a telescope and scale however, to read off the different signals, it is to be inferred that the indications wanted precision and distinctness.

In June, 1837, the experiments of Messrs. Cooke and Wheatstone, which had been progressing for more than a twelvemonth, appeared so far successful as to induce them to apply for a patent for their inventions.* The principal points of novelty in this patent were the use of a much smaller number of needles to denote all the required signals, the employment of the temporary magnetism excited by the current, in soft iron, to ring an alarum, either directly or indirectly, by the means of suitable machinery; and the reciprocal arrangement by which the invention was rendered practically applicable to a long line of communication. The telegraphic instrument shown in the drawings annexed to their specification, and which was brought into use on the Great Western Railway shortly after the date of the patent, contained five needles, arranged with their axes in a horizontal line. The needles when at rest hung vertically, by reason of a slight preponderance given to their lower ends. Each coil was connected with one of the long conducting wires at one end, and was united at the other with a common rod of metal, which joined together the similar ends of all the coils. The current was transmitted from the opposite end of the wires (where an appropriate set of five pairs of finger-keys, for making the connections with the battery, was placed) through two of the wires at once. That is to say, one of the wires, of which one key was pressed down, served to convey the current from one pole of the battery to the distant instrument, while the key of a second wire being brought into contact with the other pole, the current returned by the rod of metal connecting the coils and the second wire to the battery again. Two needles were in this manner deflected at once, and it will be obvious that the current would pass in opposite directions around their coils, and consequently that the deflections must be in contrary directions. The needles would therefore converge, either above or below their line of centres, as one or other of the pair of keys belonging to each wire was depressed. Fixed stops were so placed on each side of the needles as to limit their motion, and when resting against them, the needles were parallel to two converging lines, at the point of intersection of which, a letter was placed. This was the signal indicated by the movement of the needles. In a similar manner, as lines were drawn diverging from the centre of each axis, mutually crossing one another, a number of points of intersection were formed, at each of which was a letter or signal. Any of these letters could be indicated by the simultaneous movement of two needles, so that a communication could be carried on with rapidity and certainty. At the same time a plan was recognised, by which the number of wires requisite for maintaining a communication might be reduced, by using one of them at times as a return wire only, there being no needle in connection with this one. One needle could by the use of this wire be deflected by itself either to the right or left, and thus of course each would furnish two signals, in addition to those formed by its simultaneous deflection with any other. The instruments at the two stations were always rendered reciprocating; that is, at each

* It appears desirable here to add a few words explanatory of the actual origin of the Electric Telegraph. Mr. Cooke first had his attention directed to the subject by some experiments of Professor Moencke, at Heidelberg, which he had the good fortune to witness. Thoroughly impressed with the practicability of the oft-attempted scheme of employing Electricity in the conveyance of intelligence, he at once applied his mind wholly to the prosecution of this idea. In the early part of 1837, after having been engaged nearly a twelvemonth in the construction of various Telegraphic instruments, and in efforts to bring them into use on some of our Northern Railways, Mr. Cooke became acquainted with Professor Wheatstone, whose attention had been already directed to the same subject, and whose experiments and researches in Electricity were of the highest interest and importance. The first patent was taken out in the joint names of these two gentlemen, as were several which succeeded at various intervals. The relative connections of Mr. Cooke, and of Professor Wheatstone, with this invention, to the success of which both have contributed, is well expressed in the following words of Sir M. I. Brunel, with which this note may be appropriately concluded:—'While Mr. Cooke is entitled to stand alone, as the gentleman to whom this country is indebted for having practically introduced and carried out the Electric Telegraph, as an useful undertaking, and Professor Wheatstone is acknowledged as the scientific man, whose profound and successful researches had already prepared the public to receive it as a project capable of practical application; it is to the united labour of two gentlemen, so well qualified for mutual assistance, that we must attribute the rapid progress which this important invention has made since they were associated.'

end of the line were placed an instrument, a set of finger-keys, and a voltaic battery, so that either station could transmit or receive a signal. By a beautiful arrangement, the keys, on being released after depression, were made to resume by themselves the position necessary to enable that which had been the signalling station to become the recipient. By this means messages and answers, or words and their acknowledgments, could follow one another without the necessity for any intervening adjustment of the instruments.

The bell or alarum which was to be rung, when the attention of the clerk at the distant terminus was required, was either direct or indirect in its action. In the first case the attraction exercised by a horse-shoe piece of soft iron, rendered temporarily magnetic by the galvanic current, was made to draw an armature, likewise of soft iron, towards it, and by this action impel a small hammer against a bell. In the second form of alarum, the movement of the armature merely released a detent or catch from a train of clock-work driven by a spring or weight. This clock-work, by the intervention of a scape-wheel and pallets, rang the bell in the manner well known in common alarums.

In the early part of 1838 Mr. Cooke obtained a patent for some further improvements of this apparatus. Of these the most prominent was the mode of introduction of the intermediate apparatus. Before the date of these patents, the two stations at the extremities of a line of telegraph had alone been put in communication with each other; but Mr. Cooke devised means, by which any number of intermediate instruments might be introduced between the two terminals, and any intelligence rendered simultaneously visible in all or in any of them, as required. Furthermore any one of these instruments could be put in communication with the rest, either generally or in part only; and by an admirable contrivance, the same mechanical adjustment which limited the connection of any intermediate instrument to one part of the line, placed its bell in the circuit of the other part. Thus if, while intelligence was being transmitted in one direction from an intermediate station, some message of importance were required to be sent from the terminus, or any other station on the excluded side, the ringing of the bell at the communicating station would warn the attendant to restore his instrument to its intermediate position, and thus leave the line clear throughout.

In the same patent were included some important improvements on the mode of protecting and insulating the wires, which were to be laid beneath the earth, in tubes or troughs of wood, iron, earthenware, or other material; and also in the expedients for detecting the exact position of any accident or derangement, without the necessity of uncovering the whole length. Two needles were also shown to be sufficient for carrying on a complete communication with ease and rapidity.

In the course of the ensuing year (1839) Messrs. Cooke and Wheatstone's telegraph was brought into actual operation upon the Great Western Railway, where its capabilities were tested severely.* The results of this trial were most gratifying to the inventors, and demonstrated that the undertaking, yet in its early infancy, was eminently successful, and that the question of the practicability of the electric telegraph, so long at issue among scientific men, was set at rest for ever. Within less than two years from the date of the existence of the invention of Messrs. Cooke and Wheatstone, the severe test of practical application was borne, not merely without lessening the value of the invention, but in a manner which justified increased admiration in those who witnessed the experiments.

We must here go back a little, to take notice of Dr. Steinheil's telegraph, which was erected between Munich and Bogenhausen in 1837.† In his instrument, two needles or magnetic bars were placed within an elongated coil of fine wire. These bars were suspended on axes passing transversely across the coil, and in their quiescent position lay parallel to one another and to the sides of the coil. They had their poles placed the same way, so that when a current was transmitted along the wire, they had a tendency to move in the same direction, remaining still parallel to each other. Against the outer end of each needle or bar a stop was placed, which checked its motion on one side, but left it free to turn to the other. The opposite poles of the two bars were therefore prevented from moving out from the coil, under the influence of the deflecting current; and the effect of this arrangement was, that the two bars could not move simultaneously, but only alternately. Both were acted upon alike, but when the inner end of one was free to move outward, the other bar remained pressed against its stop, and was fixed: and on reversing the current, the effects upon the two needles were also reversed; that which was before stationary, now moved forward, while the other was fixed. In order to bring back the needles to their ordinary position, a permanent magnet was fixed near to each at the back of the coil, by the attraction of which the needles were again rendered parallel after the cessation of the deflecting power of the coil. The inner ends of these bars carried each a light brass arm, terminating in a cup furnished with a small perforated beak or spout. These cups were filled with printing-ink, which oozed through the beak, and formed a minute bead or drop at its point, which, from its viscid consistence, did not drop off. These beaks were arranged so as to be in the same horizontal line, and at a distance from each other a little less than the width of a strip of paper, which was placed before them. If then a galvanic current were passed through the wire of the coil, so that the right-hand needle tended to pass, with the end bearing the cup, out from the coil towards the paper (the cup on the other needle receding as far as the stop would allow, and then remaining fixed), the little beak would just touch the paper, and leave a minute dot of ink on its surface. By reversing the current the other needle would approach and leave a point of ink on the opposite edge of the strip of paper. By the varied number and arrangement of these dots, on one or both edges of the paper, the various letters of any communication were denoted. The paper used in this apparatus, being obtained in a very long strip or ribbon, and coiled upon a roller, was made to pass slowly lengthwise before the printing points by a simple and obvious application of a weight and cord, which as the printing was effected gradually wound the ribbon upon a second drum or reel. This instrument was also adapted to give audible signals, by the substitution of small knobs for the ink-cups, and of two bells of different tones for the ribbon of paper. One bell being so placed as to be sounded by the first needle, and the other by the second, the pre-concerted combinations of their sounds might indicate various letters to a listener.

In the construction of his telegraph, Dr. Steinheil availed himself of the conducting power of the earth, whereby he was enabled to reduce the cost of erection. The earth in fact occupied the place of the return wire, which has been already spoken of. All that is necessary to enable this to be effected, is that the wire which connects the two ends of the metallic conductor with the earth, shall be carried to a sufficient depth below the surface to be always in contact with moist earth or with water; and that it shall be at this point attached to a plate or other piece of metal, of about two or three feet superficial. For the ordinary Voltaic battery, Dr. Steinheil substituted the magneto-electric machine; in which, according to Faraday's great discovery, the electric current was derived by induction from a permanent magnet.

The electric telegraph invented by Prof. Morse, of America, and which was exhibited by him in September, 1837, was essentially a registering instrument, the various signals being traced on a strip of paper. The plan appears to have been the following:—an electro-magnet was so placed as to be within attracting distance of an armature fixed to the shorter arm of a lever, of which the longer end carried a pencil projecting sideways from it, and pressed lightly against a sheet of paper. This paper, by a contrivance analogous to that of Dr. Steinheil, was made to travel slowly beneath the pencil. So long as no attractive power was exerted by the electro-magnet, the pencil would continue to trace a straight line as the paper moved onwards; but on momentarily making the circuit with the battery, the armature was drawn to the electro-magnet, and the pencil, carried by the arm of the lever upwards, made an angular mark, like the letter V reversed, on the paper. These angles might either be joined in groups, by rapidly succeeding completions of the circuit, or they might be separated by longer or shorter spaces of straight line. The nine digits were represented by corresponding numbers of angles, and these were combined so as to form all possible numbers. A short space intervening between two or more successive groups, denoted that they must be taken together to form a total of two or more places of digits; while a longer space showed the actual completion of one number and the commencement of the next. All the necessary words were represented by various numbers, as arbitrary signs, a previously arranged

* See evidence of C. A. Saunders, Esq., Secretary of Great Western Railway Company, before the Select Committee on Railway Communication. February 6th, 1840. Fifth Report, p. 8. Also Fourth Report of same Committee, July 2nd, 1840.

† Sturgeon's 'Annals of Electricity' for March and April, 1839.

dictionary being used for their interpretation. This plan had also been proposed by Mr. Ronalds, to simplify the working of his telegraph.

In the telegraph erected by Prof. Morse, in 1844, between Baltimore and Washington, a different mode of recording the signals was adopted. The use of the pencil was found objectionable, from its so frequently requiring fresh pointing, and from the risk of breakage. The same arrangements were retained in regard to the paper, bnt it was made in its course to pass under a roller having a groove around it. The long arm of the lever carried a blunt steel point, standing out from its upper surface, vertically under the groove in the roller. When therefore the arm of the lever was elevated, by the attraction of the magnet upon the armature, the steel point pressed the paper into the groove, and produced an indentation. If the attraction were momentary, a depressed point was produced; but if the action were continued for a longer time, a lengthened depression was the result, as the paper was drawn on. The combinations of these two kinds of marks denoted the various letters and figures.

In his first instrument, Mr. Morse produced the requisite groups of angles by means of type having as many projecting ridges or teeth as there were to be angles. These being arranged in a frame, as required for the message, made the successive contacts with the battery as they were drawn under a lever or spring. Subsequently however a single key was used, by depressing which with the finger the circuit might be completed when necessary. The first plan had the advantage of requiring no exertion of memory on the part of the operator, after the message had been set up properly; but nevertheless in practice, the second, in which all depended on the skill and recollection of the person transmitting any signal, was preferred.

In the year 1837 Mr. Davy of London obtained a patent for an electric telegraph. The actual principles of his invention were three: first, the employment with each wire (of which three were to be used) of two magnetic needles, each moveable in one direction, but stopped in the other, in a manner analogous to that in Steinheil's telegraph; secondly, the use of a supplementary battery, to effect the registration of the signals, the connection of this second battery being made by the deflections of the needles; thirdly, the method of registering or recording the various communications, by causing the current of the supplementary battery to pass through a ribbon steeped in a solution of iodide of potassium and starch. The salt being decomposed by the current, a blue spot was produced by the combination of the iodine with the starch, and the position of one or more of these spots across the breadth of the ribbon, determined the nature of the signal transmitted. The action of the two needles in each circuit was exactly similar to that of the bars in Dr. Steinheil's telegraph, in respect to their alternate deflections, according to the direction of the current. Instead however of carrying a cup for ink, each needle bore a small metallic arm on its axis, which, when the needle was deflected away from the fixed stop, came in contact with a brass pin or stud, and thus completed the circuit of the supplementary or registering battery. The stud belonging to each needle was connected with one of a series of platinum rings placed at equal distances asunder around a light drum. The edges of these rings bore lightly upon the prepared ribbon, as it passed over a metallic cylinder driven by a weight and cord. Instead however of allowing the ribbon to move at a uniform speed wholly independent of the rate of signalling, Davy ingeniously connected the two parts of the apparatus together, by such means that the transmission of each signal caused the revolution of the cylinder bearing the ribbon through a small space; so that the successive registrations forming any communication were placed at regular intervals apart upon the fabric. This was done by introducing a small electro-magnet into the circuit of the registering battery, so that whenever this circuit was completed an armature was attracted, and one tooth or division of the cylinder released from a catch or pallet. The ribbon itself was divided into squares by transverse and longitudinal lines, in such a manner that each platinum ring pressed upon the fabric, in the centre between two longitudinal lines, while the space through which the cylinder turned, at each release, corresponded to one of the transverse divisions. Thus successive squares were brought in turn under each ring, as the ribbon passed onwards, receiving the registrations as it moved. If we now suppose one pole of the supplementary battery to be connected with the metallic cylinder bearing the cloth, and the other with the axes of all the magnetic needles, the action of the apparatus will be readily rendered apparent. When a current was transmitted from the communicating station, so as to cause the deflection of the first needle of the first wire (the second needle of the same wire then being pressed against its stop and fixed), the arm of this needle coming in contact with the brass pin or stud, would complete the supplementary circuit in the following manner: supposing the current to start from the end of the registering battery in connection with the needle axis, it would pass from the axis of the deflected needle along its arm to the brass pin, from thence to the first platinum ring, through the ribbon (decomposing the iodide in its course) to the metallic cylinder, and to the pole of the battery joined thereto. When the current from the signalling station was reversed, the second needle would be deflected, and a similar supplementary circuit formed with the second platinum ring, and so on with the others. After each signal the ribbon would be advanced one division, so that the successive registrations would take place in succeeding transverse divisions of the fabric. The person who is to communicate has an apparatus, in which, by depressing different keys, he can transmit the electricity in one or other direction through any wire, making it return either by a spare wire or by the earth; or he can employ another of the signalling wires to return the current. In the first case, he would produce a single spot on the ribbon from one ring only; while in the second, spots from two rings would be produced simultaneously. By the use of the various simple and combined indications, a sufficient number of variations to express the necessary letters and signs could be obtained.

In the beginning of 1840 Professor Wheatstone patented his electro-magnetic telegraph, in which the indicating power was the magnetization of soft iron by the electric current. The object of the invention was to produce, by excitation and cessation of the magnetic power in pieces of soft iron, certain determinate and definite movements of rotation, in dials or indicators; by which movement signals might be given, of various kinds and in various modes. The first part of the apparatus which claims attention is the Communicator. A thin disc of wood, turning horizontally upon a pillar or axis, has its circumference divided into equal spaces, alternately filled up with metal or ivory. The metal divisions communicate with the central column, and through it with one pole of a battery, of which the other pole is connected with the return wire or with the earth. Against the circumference of the disc rests a spring, from the foot of which proceeds a wire going to the line or long conductor. As the disc is revolved on its centre, the spring rests alternately on metal and ivory, and were there no break in the circuit at the distant station, the current from the battery would be transmitted or intercepted accordingly. Over each division of the circumference is placed a letter or figure, so that by bringing one letter after the other opposite to a stop fixed near the disc, the galvanic circuit would be opened and completed alternately with each succeeding letter. For the ease of turning the disc it is provided with spokes or arms radiating around its upper surface. The telegraph which is operated upon by this Communicator, possesses great simplicity both in its principle and construction. Opposite and near to the poles of a temporary or voltaic magnet is placed a small armature of soft iron. When the iron is rendered magnetic the armature is attracted to it, but on interrupting the galvanic circuit the magnetism of the iron ceases, and a small reacting spring throws the armature back to its original position. The armature itself turns on an axis, which carries a pair of pallets, taking into the teeth of an escapement-wheel. In the instrument first constructed according to this patent the recurrence of the attraction and release of the armature actually formed the motive power of the machinery, the two pallets alternately moving the escape-wheel onward, one tooth at a time. For this arrangement another was afterwards substituted, in which a common spring barrel and fusee were employed to turn the escapement-wheel, and the pallets, actuated as above, merely controlled its revolutions like the same parts in a common clock. In either case the object was the same, that is, to communicate to a light paper or mica dial, bearing letters around its circumference, a step by step motion, wholly under the control of the operator at a distant station; so that he might bring any figure or letter on the dial to a small opening in a screen, through which it would be visible to an observer. The number and order of the signals upon the paper disc corresponded with those on the Communicator previously described. Supposing for instance that the letter A were opposite to the fixed stop in the Communicato , and that the same letter were visible through the opening in the screen of the telegraph ; if while in this position the spring of the communicator rested on an ivory division of its circumference, no current would be passing from the battery. But if the communicator were moved one division forward, so that B came to the fixed stop, then the spring would rest on a brass division of the circumference, and the current would flow freely through the circuit and the coil of the electro-magnet. The armature being attracted, the pallets would, by their motion with it, let one tooth of the escape-wheel pass, and the following signal B would appear through the opening in the screen. The movement to C on the communicator, breaking the circuit, would release the armature; and another tooth of the escapement would be let go, bringing round C also on the telegraph. In this manner by turning the communicator round steadily with the finger, until any required letter came opposite to the fixed mark or stop, the same letter could be brought into view on the telegraph dial. A momentary pause would then be made, before continuing the movement to another signal, so as to enable the observer to note each letter in succession as it appeared. The same plan was obviously applicable to causing the rotation of a hand or index around a fixed dial, so as to point to any required letters or signals, one after the other. It is indeed unimportant whether a dial be made to move behind a screen having an opening in it, or, the dial being fixed, a hand travel round so as to indicate any requisite letters upon it. In this, as in the needle instrument, the communicating stations would have a mutual and reciprocal power of sending or receiving signals. From this arrangement another very marked advantage arises. The operator sees upon his own dial or instrument the signals which he makes upon his correspondent's apparatus; so that he is at once aware of any accidental error in signalling, and is prepared to rectify it forthwith. Still further to reduce the chance of an error, each word as it is completed is acknowledged by the recipient by a single preconcerted signal, before the next word is commenced. This telegraph requires only a single wire for its use, the return of the current being provided by the earth.

Several applications of the principle forming the basis of this Invention presented themselves to Professor Wheatstone. Of these we will describe two of the most prominent. It is evident that if the operator were to move the communicating part of the apparatus, step by step, in accordance with the beats of a clock pendulum, a hand upon the telegraph at the distant station would rotate exactly as if attached to the clock, and show precisely the same time. But that the clock itself might be made to do this samo duty, and thus telegraph its own time to any number of distant stations, was an idea which did not long fail to occur to the inventor. This was effected simply by attaching a small communicator-disc to the arbor of the escapement-wheel of the clock; a spring being placed so as to make and break the circuit, as the divisions of the disc passed under it. These electric clocks were either constructed so as to derive their motion wholly from the action of the current, as in the form of electro-magnetic telegraph first alluded to; or the movements of the armature were employed only to control the power of an ordinary spring or weight. It is evident that any number of secondary 'telegraph clocks' might thus, if connected by a single wire, receive their motion from one governing chronometer at a central point. In allusion of Professor Wheatstone's scheme for thus regulating all the clocks of the metropolis, by means of wires passing under the streets, and connecting the subordinate instruments with one central chronometer, an eminent artist aptly remarked, that 'he proposed to lay on Time through the streets of London, as we now lay on water.'

The second application above mentioned to which Professor Wheatstone turned his attention, immediately after having completed the details of the electro-magnetic telegraph, is that of enabling the machine to print its intelligence, instead of rendering it visibly, or to do both at the same time. To effect this it was only necessary to replace the paper dial by a light metallic disc, cut in radiating lines so as to form a circle of delicate springs. On each of these, instead of a visible character only, was placed a small type. The type-disc was then made to rotate, precisely as the paper dial or the index would do, in front of a cylinder covered with white paper; there being interposed between the type and the cylinder, a sheet of the copying or transfer paper well known as the Carbonic ink paper. Any requisite type could therefore, by the same action which brought the various letters into view in the signal telegraph, be placed in the proper position for being impressed on the paper of the cylinder. Immediately that any one was so placed, a small hammer, acting by a train of wheel-work precisely similar to the striking train in a clock, struck the end of the type, and by means of the interposed transfer-paper impressed the letter on the cylinder. The succeeding signals were similarly impressed, one after the other. The train giving motion to the printing-hammer was released by the same armature which moved the type-disc; and by an arrangement sufficiently obvious, this train was made, after each impression of a letter, to move the paper cylinder round through a small space, in readiness to receive the next signal. The cylinder did not turn on a simple axis, but on a screw; so that the words of any communication were arranged in spiral lines around it. When the paper was unwrapped, to be replaced by a fresh piece, the message would be found printed in slightly sloping lines from one side to the other. The action of this instrument was very perfect, and it appeared to possess every requisite which could be demanded in a registering telegraph. There were however some very obvious impediments to its being brought into use, in the increased cost of the apparatus, and the slowness with which signals would be rendered, as compared with the needle instrument.

Towards the end of 1840 Mr. Bain, in conjunction with Mr. Barwise, patented a clock which was to be set in motion by electricity. It was proposed by the inventors to employ the magnetic power of the current, in giving an impulse to the pendulum of a clock, at the end of its oscillations, in the following manner:—An electro-magnetic coil formed the bob of the pendulum, having its ends so placed as to come very near to the ends of two permanent magnets, when at the two extreme points of its swing. On reaching these points, the pendulum itself, by coming in contact with a slender spring, completed the circuit of the galvanic current through the coil, in such a way, that the end of the coil then nearest to the magnet on the side to which the pendulum had oscillated, was momentarily endued with the same polar force as the magnet itself. The result was a mutual repulsion of the coil and magnet, and the former, being free to move, receded from the latter with a small impulse, sufficient to carry the pendulum to the opposite end of its oscillation. The same effects then took place, in respect to the other fixed magnet at that side. A small force was thus communicated to the bob of the pendulum, at each extremity of its arc, which was sufficient to maintain its vibrations undiminished; and at the same time to put in motion, by means of the ordinary arrangement of a scape-wheel and pallets, the works of the clock acting upon the minute and hour hands. By causing the circuit to be completed by the primary pendulum, not merely through its own clock, but through the similar coils of other instruments at distant stations, connected by appropriate wires, a series of such clocks might be made to work together with absolute accuracy.

In July, 1841, Mr. Bain exhibited at the Polytechnic Institution in London an electric printing telegraph, and in the following year he proceeded to patent an improved form of the apparatus. The essential principles of this contrivance are two. First, the employment of type, mounted on the periphery of a disc or wheel, capable of revolving with its edge carrying the type very near to a cylinder covered with white paper, between which and the type-wheel a piece of transferring paper or ribbon was placed. The cylinder had a small movement in a spiral direction communicated to it, after each impression of a signal. The action of this part of the apparatus will be readily understood, from the brief description of the printing telegraph of Professor Wheatstone, already given. It is only necessary to particularize, that in Mr. Bain's machine the type were arranged on the edge of the disc or wheel, radiating from its centre; and that the printing of any one upon the cylinder was effected by the movement forward of the entire type-wheel and its axis, by a crank and connecting gear in the printing train, instead of one punch or type only being struck down by the printing-hammer, in impressing a signal. The second principle is that of the use of two clocks at the two communicating stations, to rotate the type-wheels with a uniform motion. These clocks, having been adjusted to exactly the same rate, and being started from the same signal, would bring continually, at each station, similar type opposite to the paper cylinders at the same moment. The action of this part of the apparatus is exactly analogous to that of Mr. Ronalds, already described. A hand or index revolving on a dial in front of the machine, at the same rate as the type-wheel, indicates to the operator the signals which are successively in a position ready for printing in his own instrument, and therefore, if the clocks go accurately together, in a similar position in his correspondent's instrument. At the same time this hand, by coming in contact in its revolution with a pin, placed by the operator opposite to any signal that he wishes printed, completes the electric circuit at this moment, and by so doing stops the type-wheel, and releases the printing train at each station. A similar figure having thus been impressed on the cylinder at the two ends of the line, the operator removes the pin, and replaces it opposite the next signal he requires to send. The moment the pin is removed, and the circuit therefore broken, the hands and type-wheels at each station resume their revolutions, which are again checked by the contact of the hand and pin as before.

Mr. Bain's single-index telegraph, which was the instrument proposed by him for practical use, consisted of two hollow cylindrical coils of wire, placed horizontally a short distance apart, with their axes in the same line. Between them a small bar magnet was fixed across a delicate spring, which in front passed through the dial-plate of the instrument, and was turned up to form an index. The two coils were connected, so that an electric current entering from the line wire would pass through both. When this was the case, the bar magnet would be attracted towards one coil, while at the same time it would be repelled by the other. These actions tended to carry the magnet to the same side, as far as the spring to which it was attached and a fixed stop would allow of its moving. The reversal of the current inverted the effects of the coils, and the magnet would then pass to the other side. The combinations of these two movements represented the various letters and signals, being denoted to the observer by the index on the dial of the instrument. The movement of the index to the left denoting the letter I, and to the right the letter V, this instrument obtained the name of 'I and V Telegraph.'

In the autumn of the following year (1842) Mr. Bain patented his proposed plan for working an electric telegraph 'without any galvanic battery whatsoever,' or, more correctly speaking, with a peculiar form of battery. At one end of the line he buried in moist earth a large plate of zinc, and at the other end a plate of copper, iron, or other substance such as coke or charcoal, which might act the part of a negative plate to the zinc. Then on connecting these distant plates with a wire insulated from the earth, a current of electricity would constantly pass from the one plate to the other. Indeed the distant plates connected with the wire, as above described, may be regarded merely as a battery of one pair of plates, separated by a very wide interval of exciting material, represented by the earth. It was at first supposed by Mr. Bain that this current would be applicable to all telegraphic purposes, but subsequent experiments showed that it was available only for a few miles of distance; its intensity being insufficient to enable it to travel through any great length of wire. In some cases, where a constant current of low intensity is required, this earth battery would become very useful and important.*

In the early part of the year 1843, Mr. Cooke specified his patent for what has been probably the most important part of the invention, regarded in a commercial point of view. This was in reference to the mode of extending the wires between distant places, so that their insulation from one another, and from the earth, might be maintained without the heavy expense and unavoidable difficulty hitherto incurred. Before this period, the wires having been covered with cotton and insulated by coating them with shell-lac, resin, or pitch, had been laid down in tubes or pipes of wood or iron. This method had been adopted on the Blackwall line, in 1840, and has not since been altered. On the Great Western Railway it was superseded by the new and improved mode of insulation. Mr. Cooke now proposed to insulate the wires by suspending them in the air upon posts or standards of wood or iron; the wires not coming in actual contact with any part of the standard, but passing through rings of porcelain or earthenware. The standards were usually fixed at from forty to sixty yards asunder, and at each quarter of a mile a stouter post was placed, to bear the winding or straining apparatus. This was a simple winding-reel, connected with a ratchet-wheel and click to prevent its recoil, after the wire had been strained up by its means. The intermediate posts within each quarter of a mile only supported the wire, without reference to its tension, which depended solely on the winding posts. Instead of the copper wires hitherto employed, iron wires of a larger size were now used. By the adoption of this method of extending the conducting wires, the cost of construction of an electric telegraph was reduced nearly one-half, and at the same time the risk of imperfect insulation was diminished.* So long as the wires were buried in tubes beneath the ground, it was always deemed prudent to add a return wire, extending from one end of the line to the other; as it was found very difficult to render the insulation sufficiently good to enable the earth itself to be used as half of the circuit. The tendency of the electric fluid to escape from the wires in the tubes, to the earth, was much greater than to another wire lying in the same tube, so that the latter plan was always adopted. But when the suspended conductors came into operation, the insulation was rendered so complete, that the earth was subsequently in all cases used to return the current, by which means an economy of one wire throughout the whole line was effected. In addition to this, another very decided advantage was gained by the suspension of the wires, in the facility with which accidental errors or injuries were discovered and rectified. While the tubes were in use, it was necessary to supply at about each quarter of a mile along the line, a proving or testing post, within which the wires were brought up to a box, so as to afford the means of examining any of them as to their insulation and conducting power. For this purpose Mr. Cooke had invented an instrument called the 'Detector,' by which the perfect state of each wire could be tested, and the position of any error or fault discovered with considerable accuracy. Still with all these appliances, the detection and repair of any derangement of the wires demanded considerable skill, and led to no small expense. But when the wires were in sight throughout, any contact or fracture was at once visible, and was easily and quickly repaired.†

Having traced the invention through a few of its most remarkable stages, up to the time when it assumed the form it at present retains in England, we may add a few words on the method of applying it to the purposes of a railway. Mr. Cooke's first plan was one of admirable completeness in all its details. We can do little more than indicate its outline, as the full description would occupy far too much space. He proposed to divide the entire line of a railway, if necessary, into portions including each from four to six stations, and to make the traffic and communications within each of these divisions wholly independent of those on any other portion. The stations where these partitions occurred were termed Division Stations, and might be regarded each as the terminus to its adjacent portions of the line. At the same time a general system of telegraph connected all the divisions with each other, and with the actual termini of the line, so as to bind the whole of the subordinate parts into one series, and thus maintain the correspondence between the most distant points. Each station possessed a wire of its own, extending from one to the other terminus of its division, and including at every station a coil and needle. The apparatus necessary for transmitting signals by any wire and system of needles, was provided at each point, so that the most ample means of correspondence was secured between all the stations. Each needle was used to denote the condition of that part of the line which was under the control of its own station; and by its means the movements of all trains upon this portion of the railway were made known to the other stations in the same division. As the signals made by any needle were simultaneously visible by the corresponding needle at all the stations, and as all information respecting the arrival or departure of trains, state of the line, accidental impediments, &c. was immediately indicated by known signals upon the telegraph, the station master at any point had only to turn to his instrument, to perceive at a glance the existence of any circumstance which might influence the working of the line. Nothing was left to

* For an account of some experiments with earth batteries see 'Electrical Magazine,' pp. 279, 393, 521.

* Although the plan of enclosing the conducting wires in tubes beneath the ground, when put in practice on a long line, presents many difficulties, it is nevertheless perfectly safe and practicable for a short distance. Combined with some improvements in the method of insulating and protecting the wires, it is now in course of extensive adoption for the purposes of a general commercial system of telegraph throughout England.

† In the preceding paragraphs we have not included an account of all, nor even of the greater number of inventions, having reference to the transmission of intelligence by the aid of electricity. Only a few of the most remarkable have been described, and these examples have been selected with a view rather to the general illustration of the subject, than to a regular and detailed history of the successive steps.

be surmised or inferred, all was evident and visible, and in fact, in the words of Mr. Cooke, the clerk at every station possessed in his telegraph a constant bird's-eye-view of the whole of his division. In addition to these 'line' wires, as they may be termed, two others were in every case to be extended throughout the line, with instruments at each station, so as to afford the means of verbal communication, whenever this might be necessary. The result of such a complete system could hardly fail to be most beneficial, and experience has now proved how accurately and justly all Mr. Cooke's measures were planned beforehand.*

The Blackwall line absolutely depends upon this instantaneous means of communication, not only for its safety, but for the very possibility of its being worked. On this railway however the telegraphic system is different, inasmuch as from its peculiar locomotive plan, the stations do not require any communication between themselves, but only with the two terminal.

Even on railways possessing a double line of rails, so complete a means of information as that described in reference to the Yarmouth and Norwich line, would tend much to the prevention of accidents and increased safety of travelling. To prove this it is hardly necessary to recall to mind the disasters which have occurred, and still do occur at times, from the want of intelligence as to the unexpected approach of a train, or its undue delay on a particular part of the journey. Where there does not exist however an absolute necessity for such a system, its unavoidable expense would be unfavourable to its adoption. In order therefore to meet the requirements of the railway in as economical a mode as possible, a modified system has been adopted. The same plan of divisions and of 'through' communication is still adhered to, but the line-needles are dispensed with, and merely the ordinary telegraph retained at the subordinate stations. Usually the instrument possessing two needles and requiring two wires, is preferred for both the general and the divisional telegraph, as experience has shown that it is, taking all things into account, far superior to any other. The single-needle instrument, with one wire, is sometimes used for the small stations; but where the messages are either of frequent occurrence or of considerable length, it has been found that it cannot be used with advantage, from the diminished rapidity of signalling, as compared with the double needle.

It is evident that in the system above described no subordinate station can communicate directly with another station beyond its own division. Intelligence therefore referring to a distinct portion of the line, would be sent in the first place to one or other of the terminal stations of the division, and from thence would be forwarded again as required.

In England, up to the present time, the electro-magnetic or mechanical telegraph (as it is called in contradistinction to the needle-telegraph), of Professor Wheatstone, has not been adopted; the needle-instrument, from the great rapidity with which messages can be sent, and from other causes, having obtained the preference. It will however become very valuable with particular systems of working a line of railway, and also in some cases for the transmission of political or commercial intelligence, where secrecy is required. It is now in use in France, and has been entirely approved of. Within this last year or two a great and important improvement has been effected in the mechanical instrument, by the use of the electric current derived by induction from a permanent magnet, instead of the voltaic battery. This plan is not applicable to the needle instrument, but is peculiarly so to the electro-magnetic telegraph; while at the same time a permanent and unalterable source of electric power is substituted for the galvanic battery. Although the batteries now employed for telegraphic purposes are singularly constant in their action,† yet this is a most important advantage, obviating as it does all necessity for change or renewal of the source of electrical power.

It may not be uninteresting to our readers to learn the extent to which the electric telegraph has been adopted in England, at the present time. We therefore subjoin the following statement of the lines of telegraph in actual operation:—

		Miles
South-Western		99
South-Eastern		88
,,	Ramsgate branch	30
,,	Maidstone	10
,,	Tunbridge Wells, &c.	12
Blackwall		5
Eastern Counties:	Colchester line	51
,,	Thames junction	3
,,	Cambridge line	88
,,	Hertford branch	7
,,	Ely and Peterboro'	29
Norfolk Railway		38
,,	Yarmouth and Norwich	20
,,	Lowestoff branch	10
Wolverton and Peterboro'		57
Eastern Union		17
Midland Counties:	South line	49
,,	West line	41
,,	North line	73
,,	Derby and Lincoln	41
,,	Sheffield branch	5
York and North Midland		23
Hull and Selby and Milford Extension		40
York and Scarborough		43
Great North of England:	York and Darlington	45
,,	Richmond branch	9
Newcastle and Darlington		39
,,	Durham branch	2
,,	Sunderland ,,	6
,,	Shields ,,	3
Preston and Wyre		20
Great Western		19
South Devon		20
	Total	1041

This list does not include several lines on which the telegraph is yet only in partial operation or now being erected Among such may be specified the Leeds and Bradford, Leeds and Manchester, Syston and Peterboro', Newcastle and Berwick, North British, Hull and Bridlington, &c.

TELLUR-BISMUTH. [TELLURIUM, P. C.]

TEMNOPLEURUS. Some fossil echinida of the Suffolk crag are referred to this genus by Mr. S. V. Wood.

TEMPERATURE OF THE SEA. [SEA, P. C.]

TENT, MILITARY, is a temporary dwelling-place made of canvas, which is supported by one pole, or more, and distended by means of cords, which are made fast to pickets driven into the ground: tents are set up when an army is encamped in the field either for actual service or for the purpose of performing military exercises.

The tents of the private soldiers, whether infantry or cavalry, are of a conical form with circular bases, the supporting pole or *standard* of each being planted vertically in the ground, in the centre: the standard is 10 feet 3 inches long, and the whole diameter of the tent, between two opposite pickets, is 17 feet 3 inches; but from the lower extremity of the cone, at about 2 feet from the ground, the canvas hangs down vertically and forms a cylindrical *wall*, therefore the diameter of the tent within the canvas is 13 feet 3 inches. Fifteen infantry, or twelve cavalry soldiers occupy such a tent. The round tent of an officer is 12 feet 6 inches in diameter within the walls. The marquees of officers, as well as the hospital and laboratory tents, are of oblong forms on the plan; and, in these, the canvas is supported by two standards, which are connected together at their tops by what is called a *ridge pole* 6 or 7 feet long. The length of an officer's marquee is 19 feet, and the breadth 13 feet, both dimensions being taken within the walls: tents of the two other kinds are still greater.

For the rules of modern castrametation, or the dispositions of tents in an encampment, see ENCAMPMENT, P. C.

TENTACULITES, (Schlottheim), a beautiful group of small annulated pointed shells, fossil in the Silurian strata. They have been recently referred by Mr. Salter to the Annulosa. (Reports of British Association for 1845.)

TENTO'RI, CRISTO'FORO, born in 1745, in Spain, of a Venetian family, studied first in his native country, and afterwards removed to Venice, where he spent the greater part of his life. He is known chiefly for his historical works concerning Venice. He published, in 1785, his first work, 'Storia Civile e Politica della Repubblica di

* The Yarmouth and Norwich Railway was provided with this system of telegraphs, in 1844, and has been since that period absolutely free from all accidents arising from trains meeting or overtaking one another, although it is a single line of twenty miles in length, and trains are constantly started from the two ends at the same time.

† This battery, known as the 'sand-battery,' is the result of an accidental discovery of Mr. Cooke, subsequently improved upon and perfected. The metallic elements are zinc and copper, and the exciting substance clean sand moistened with dilute sulphuric acid. When well charged they will last in action for three or four months, with only an occasional addition of a small quantity of dilute acid to replace what is lost by evaporation, &c.

Venezia, con una Descrizione Corografica e Topografica de' suoi Stati,' Venice, 12 vols. 8vo. This was the first condensed history of Venice, being a kind of abridgment of the many and voluminous historians of that republic, and especially of Sandi's 'Storia Civile e Politica,' with the important addition of a topographical and statistical description of all the dominions of Venice. Tentori's second work is a continuation and completion of the first, being an authentic narrative of the destruction of the republic of Venice by the French in 1797: 'Raccolta Cronologico-Ragionata di Documenti inediti che formano la Storia Diplomatica della Rivoluzione e Caduta della Repubblica di Venezia, corredata di Critiche Osservazioni,' 2 vols. 4to., 1799, published without the author's name from prudential motives. Tentori consulted the secret state archives when they were first opened to the public after the fall of the old government, and there he found full evidence of the iniquitous arts by which the catastrophe had been effected. He gives the text of the documents in order of time, and accompanies them with a brief narrative of the events. The perusal of this work is absolutely necessary to form a correct idea of those transactions, and to counteract the erroneous impression produced by the garbled accounts published in France and in Italy; among the rest by an anonymous contemporary work entitled 'Storia degli ultimi Otto Anni della Repubblica,' which was falsely attributed to Tentori himself. [VENICE, REPUBLIC OF, P. C.]

Tentori wrote about the same time an elaborate investigation of the true character of the famous insurrection of Baiamonte Tiepolo and the two Querini in 1309, which had been ignorantly asserted by the modern democrats of Venice to have been a movement in favour of popular liberty, whilst in reality it was a conspiracy of disappointed patricians against heir own order, and for the purpose of supplanting their personal enemy, the Doge Gradenigo: 'Il vero Carattere politico di Baiamonte Tiepolo, dimostrato dall' unanime Consenso degli Storici Veneti ed Esteri,' Venice, 1798. The other works of Tentori are—'Della Legislazione Veneziana sulla Preservazione delle Lagune,' 8vo., Venice, 1792; 'Dialogo sulla vera Regolazione del Fiume Brenta, con una Appendice di Riflessioni sopra il medesimo, corredata di una Carta Idrografica,' Venice, 1790; 'Errata-corrige sulle Memorie Venete del Gallicioli;' 'Osservazioni sulle Memorie suddette,' Venice, 1797. Gallicioli was a contemporary compiler of Venetian history.

Tentori lived and died poor. He filled in the latter years of his life the office of preceptor in the patrician family of Tiepolo at Venice. As a native of Spain he was required by Napoleon's police in 1808 to swear fidelity to the intrusive king Joseph, which having refused to do, he was kept under arrest for a long time, and his papers were inspected by the gendarmes. He died in 1810 at the country residence of the Tiepolo family, at Carbonera.

(Tipaldo, *Biografia degli Italiani Illustri*; Moschini, *Della Letteratura Veneziana*.)

TERATI'CHTHYS, a fossil fish from Sheppey. (König.)

TEREBELLA'RIA, a genus of fossil Milliporidæ from the Bath oolite rocks. (Lamouroux.)

TEREBRA'TULA. This genus has been divided, according to the suggestion of Phillips ('Palæozoic Fossils of Devon'), into Epithyris and Hypothyris. (Morris.)

TERENTIUS CLEMENS, a Roman jurist, whose period is uncertain, but he lived after Julianus, or was at least his contemporary, for he cites him. (*Dig.* 24, tit. 6, s. 6.) He wrote twenty books 'Ad Legem Juliam et Papiam,' from which there are some excerpts in the Digest. He is not cited by any jurist in the Digest.

TERMS, ATTENDANT AND SATISFIED. As the assignment of satisfied terms on the purchase of property was frequently accompanied by great difficulty and expense, it was deemed adviseable to remedy this increasing evil. In the 8 & 9 Vict. an act was passed intituled 'An Act to render the assignment of Satisfied Terms unnecessary.' It provided that every satisfied term on the 31st December, 1845, attendant upon the inheritance, should on that day cease, except that such term, although thus made to cease, should afford the same protection as if the same still subsisted, if it had not been dealt with after the 31st December, 1845. And, by s. 2, That every term of years subsisting or after created, and becoming satisfied after the day mentioned above, and which should after that day become attendant on the inheritance, should immediately on becoming so attendant cease and determine.

The benefit of these provisions will be seen by referring to VENDOR AND PURCHASER, P. C. With respect to the provisions of this Act all must admit that they are beneficial. The principle that by a subtlety a subsequent purchaser might obtain a priority over a prior bonâ fide purchaser was unjust, and would only have been resorted to by judges if the legislature had not left the laws of property in an incomplete state. This devise of assignments of outstanding legal interests was but a clumsy and imperfect substitute for a general registry, with this addition, that it protected one innocent purchaser at the expense of another. There are, in the opinion of many, some technical objections to the statute, which we cannot here enter on, but which it is probable will be removed.

TERRITORIES OF INDIA. The information which was promised, in the article BENGAL, P. C., p. 232, to be given under the head BRITISH INDIA, is given under that of EAST INDIA COMPANY, P. C.

The area of Hindustan, from the Brahmapootra to the Indus and from the Himalaya Mountains to Cape Comorin, has been estimated at about 1,200,000 square miles, and the population at from 130,000,000 to 140,000,000. If the British possessions from the Ganges eastward to the frontiers of Birma be included, the entire area may be estimated at 1,270,000 square miles, and the entire population at 140,000,000.

The following tables are given, in the deficiency of official returns, merely as approximations, in order to afford such a general view as may be useful, though not accurate, of the areas, population, and possessors of the territories of Hindustan:—

BRITISH POSSESSIONS.	Square Miles.	Inhabitants.
Bengal Presidency	320,000	47,000,000
North-west Provinces	100,000	20,000,000
Madras Presidency	140,000	15,000,000
Bombay Presidency	70,000	8,500,000
Sinde	70,000	1,500,000
	700,000	92,000,000
DEPENDENT STATES.		
Hydrabad (The Nizam)	95,000	9,000,000
Berar, or Nagpoor (Raja)	45,000	2,200,000
Mysore (Raja)	27,000	3,500,000
Gwalior and Malwa (Raja)	34,000	4,000,000
Gujerat, &c. (The Guicowar)	25,000	2,000,000
Oude (King)	20,000	4,000,000
Lahore, or Panjab (Raja)	60,000	3,000,000
Cashmere States (Raja)	20,000	1,000,000
Seik Hill States (Chiefs)	20,000	1,000,000
Bundelcund States (Chiefs)	8,000	1,000,000
Rewah (Raja)	7,000	600,000
Bhopal (Raja)	6,000	500,000
Indore (Raja)	8,000	600,000
Dhar (Raja)	500	30,000
Sattara (Raja)	8,000	1,500,000
Colapoor (Raja)	3,000	600,000
Sawuntwarree (Raja)	1,000	30,000
Bhurtpoor (Raja)	2,000	500,000
Travancore (Raja)	5,000	600,000
Cochin (Raja)	1,500	200,000
Sikim (Raja)	2,000	140,000
Bikaneer	14,000	
Bahwulpoor	12,000	
Jessulmeer	9,000	
Joudpoor, or Marwar	25,000	
Jypoor	14,000	
Oodipoor, or Mewar — Rajpootana (Rajas)	10,000	10,000,000
Cutch (Rao)	7,000	
Sirohi	3,000	
Kotah	4,000	
Boondee	2,000	
Dholpoor, Tonk, &c.	2,000	
	500,000	46,000,000
INDEPENDENT STATES.		
Nepaul (Raja)	45,000	1,500,000
Bootan	25,000	500,000
	70,000	2,000,000
British Possessions	700,000	92,000,000
Dependent States	500,000	46,000,000
Independent States	70,000	2,000,000
	1,270,000	140,000,000

The Bengal Presidency comprises the provinces of Bengal, Bahar, Benares, Allahabad, Orissa, Cuttack, Gundwana, the Ceded Districts on the Nerbudda, and the British territory east of the Ganges to the frontiers of Birma.

The North-West Provinces comprise the territory of the late Agra Presidency, which was established by an Act, 3 & 4 Wm. IV. c. 85 (August, 1833), but suspended by a subsequent Act, 5 & 6 Wm. IV. c. 52 (August, 1835), which empowered the Governor-General to appoint a lieutenant-governor of the North-West Provinces, and also from time to time to declare and limit the extent of the territory placed under him, and the extent of the authority to be exercised by him. The North-West Provinces extend at present from Allahabad west and north so as to include the Delhi Doab, and the countries to the west and north of the Delhi Doab; and probably include also the Jullindar Doab and hill-country connected with it, which is added to it in our Table.

The Madras Presidency comprises the Northern Circars, the whole of the Carnatic, and extends westward across the peninsula so as to include all the British territory (Malabar, Canara, &c.) south and west of Mysore.

The Bombay Presidency comprises all the British territory on the west side of Hindustan from Canara northward, the Concan, South Mahratta country, Deccan, Candeish, Surat, &c. The Bombay Presidency will probably be made to include Sinde, which was annexed to the British territory in March, 1843, and is yet (1846) under a separate governor.

The late conquest of Lahore has added to the British territory a portion of the Lahore territory on the east banks of the Garra and Sutlege, and the Jullindar Doab, between the Beas and the Sutlege, with a considerable portion of hill-country which extends north-east towards the upper part of the Indus. By the treaty of peace with the Maharaja of Lahore, the British assume the control, in respect to tolls and ferries, of the Beas and Sutlege, the Garra, and the Punjnud to the confluence of the Indus at Mithunkote, and the control of the Indus from Mithunkote to the borders of Beloochistan.

Each Presidency is divided into Collectorates for purposes of revenue and administration, but accounts are not published of the extent and revenues of the Collectorates separately. A general statement of revenue is published for each Presidency. The last actual statement (not an estimate) is for the year 1843-4, as follows:—

Bengal Presidency		£7,328,500
North-West Provinces . . .		4,195,433
Madras Presidency		3,601,996
Bengal Presidency . . .		2,046,728
		17,172,657
Receipts from assets in England and China		1,131
Total Income . . .		£17,173,788
Total charges in India .	£15,668,843	
Total charges in England .	2,944,073	
		18,612,916
Deficiency		£1,439,128

The total amount of the public debts of the Presidencies, on the 30th of April, 1844, was 37,639,829*l.*, bearing annual interest amounting to 1,781,522*l.*

British India, strictly speaking, comprises only the territory which is actually in the possession of the British government, but the whole of Hindustan, from the Indus to the frontiers of Birma, with the exception of Nepaul and Bootan, is under British superintendence and control, and in fact forms one great body politic, of which the British government is the head. Some of the states are subsidiary, some are tributary, some are feudatory, and some are restricted, according to the circumstances and treaties under which they became dependent. The new Cashmere state is feudatory. Gholab Sing is to give to the British government annually one horse, twelve perfect shawl-goats (six male and six female), and three pairs of Cashmere shawls, as an acknowledgment of the supremacy of the British government. The government of Lahore is left independent, except that the regular army is limited by the new treaty to 25 battalions of infantry, consisting of 800 bayonets each, and 12,000 cavalry. If a larger army should be necessary in any emergency, it may be increased with the concurrence of the British government; and the limits of the Lahore territory are not to be changed without a similar concurrence. All the dependent states are prohibited from making treaties of alliance with each other. The Portuguese still possess Goa, with a small territory around it, and the port of Damaun; the French, Pondicherry, Mahé, and Carrical. Serampore and Tranquebar have been recently purchased by the British government from the Danes.

The circumstances which led to the annexation of Sinde to the British territory are stated in the article SINDE, P. C. S.

The late ruler of the Panjab, Runjeet Sing, always remained on terms of amity with the British government in India, and had not only extended his territories, but had collected before his death a powerful army and large stores of arms and ammunition. He was succeeded by his son, who having since died, and the present Maharaja, Dhuleep Sing, who succeeded, being very young, his mother the Ranee was declared regent. The Sikh army however became mutinous and ungovernable, and the result was that the Lahore government, in order to extricate themselves from the dangers to which they were constantly exposed from the violence of the soldiers, secretly gave its sanction to the leaders of the Sikh troops in making an attack on the British frontier. The Sikh army began to cross the Sutlege, Dec. 11, 1845, and, after investing Ferozepore on one side, took up an intrenched position at the village of Ferozeshah, about ten miles in advance of Ferozepore, and about the same distance from the village of Moodkee. In this camp the Sikhs had placed 108 pieces of cannon, and a force of upwards of 50,000 men, in order to intercept the British force which was advancing from Umballah to the relief of Ferozepore, which had been attacked without provocation or declaration of hostilities. The British army, under Sir Hugh Gough, commander-in-chief, after a rapid march of 150 miles, reached Moodkee, Dec. 18, and on the evening of the same day repulsed an attack of the Sikh army and captured 17 guns. On the following day the army was concentrated at Moodkee, and on the 21st moved towards Ferozepore; and having on the march formed a junction with Major-General Sir John Littler, who had with him 5000 men and 21 guns, Sir Hugh Gough formed the army in order of battle, and attacked the enemy's intrenched camp, and on the evening of Dec. 21 and the morning of Dec. 22 captured 74 pieces of cannon, took possession of the camp, with large quantities of ammunition and warlike stores, and compelled the enemy to retreat to the west side of the Sutlege. The British force on this occasion consisted of 16,700 men, and 69 guns, chiefly horse artillery. The Sikh forces were variously estimated at from 48,000 to 60,000 men, with 108 pieces of cannon of large calibre and in fixed batteries. Sir Henry Hardinge, governor-general of India, was engaged in this battle as second in command. The total killed of the British was 694, the total wounded 1721; in all 2415. The British took 91 pieces of cannon. The loss of the Sikhs must have been very large.

Major-General Sir Harry Smith having with much difficulty and loss of some baggage formed a junction with the troops at Loodiana, who were hemmed in by a formidable body of the enemy's troops, the Sikh army then retreated, and took up an intrenched position at Budawal, from which they were also compelled to retreat down the Sutlege, but having been reinforced by about 4000 regular troops, 12 pieces of artillery, and a large force of cavalry, from the right bank, they advanced towards the British forces in order to intercept their communication with the main army, intrenching themselves near the village of Aliwal. The Sikh camp was carried by storm on the 28th of January, 1846, the whole of the enemy's cannon and munitions of war captured, and his army driven headlong across the Sutlege by a difficult ford. Fifty-six guns were taken by the British, and 11 others were sunk in the river. The total of British killed was 151, the total wounded 413, total missing 25; in all 589. The commander at the battle of Aliwal was Sir Harry Smith.

The result of this second victory was the evacuation by the Sikh garrisons of all the forts previously occupied by detachments of Lahore soldiers on the left bank of the Sutlege, and the submission of the whole of the territory on that side of the river to the British government.

Meantime the main body of the Sikh army had taken a position on the left bank of the Sutlege near Sobraon, had formed a good bridge of boats across the Sutlege, and had constructed a strong battery and intrenchments on the left bank, which Sir Hugh Gough did not deem it prudent to attack till the siege train and ammunition had advanced from Delhi, which having arrived on the 8th, and the army of the commander-in-chief having on the same day been reinforced by Sir Harry Smith with the victorious army of Aliwal, the attack on the Sikhs was made on the 10th of February. The enemy's camp, strongly intrenched, defended by 35,000 men, and 67 pieces of artillery of large calibre, with a considerable camp and some artillery on the opposite bank of the river, was stormed by the British army under Sir Hugh Gough, and after two hours of desperate resistance on the part of the Sikhs, they were driven into and across the river with immense loss, 67 guns having been captured by the British. Sir Henry Hardinge, though suffering from the effects of a fall, was also in this battle. The loss of the enemy is supposed to have been from 8000 to 10,000 men. The loss of the British was 320 killed, 2063 wounded; in all 2383.

After this the remains of the Sikh army retreated from the west bank of the river, having been defeated in every action, with the loss of a vast number of men and 220 pieces of field artillery. The British army crossed the Sutlege, entered the Panjab, and the Maharaja having delivered himself up to the Governor-general, he was conducted back, and restored to his palace in the city of Lahore on the 20th of February, 1846. A treaty of 'perpetual peace and friendship between the British government on the one part, and Maharaja Dhuleep Sing, his heirs and successors, on the other,' was concluded at Lahore, March 9, 1846. A similar treaty was concluded with the Maharaja Gholab Sing at Umritsir, or Amritsir, March 16, 1846.

Sir Henry Hardinge has since been created Viscount Hardinge, with an annuity of 3000*l*., and Sir Hugh Gough has been created Lord Gough, with an annuity of 2000*l*., the annuities to descend to the two next surviving heirs male of the body of each who may succeed to the respective titles; but the Court of Directors of the East India Company having granted to Sir Henry Hardinge an annuity for life of 5000*l*., payable out of the territorial possessions of the East India Company, it was enacted that the government annuity of 3000*l*. should not be paid to Viscount Hardinge till after the annuity of 5000*l*. terminates; and an annuity for life of 2000*l*. having in like manner been granted by the East India Company to Sir Hugh Gough, it was enacted that only one-half of the government annuity should be paid to Lord Gough till after the East India Company's annuity terminates. The two annuities granted by the East India Company commence from the date when the British troops arrived at Lahore. Viscount Hardinge has therefore 5000*l*. a-year, and Lord Gough 3000*l*. a-year. Their two next surviving heirs male of the body of each will have respectively the government annuities of 3000*l*. and 2000*l*.

(*Parliamentary Papers, Maps*, &c.)

TERTULLIANUS, Jurist. [TERTULLIANUS, P. C.]

TERWESTEN, AUGUSTYN, was born at the Hague in 1649. He became at about twenty years of age the pupil of N. Wieling and W. Doudyns; before this time he had maintained himself by working and chasing for goldsmiths. In 1673 he went to Italy, where he studied chiefly in Venice and Rome, and visited France and England; and after an absence of six years returned in 1678 to the Hague, where he distinguished himself by his historical and mythological compositions, sacred and profane, but his favourite author was Ovid. He restored the Academy of the Hague, which had declined to a very inefficient state; and in 1690 he was invited by the Elector of Brandenburg, afterwards King of Prussia, to Berlin, and was appointed his court painter. He contributed chiefly to the establishment of the Academy of Berlin, of which he was made director. He died at Berlin in 1711. He painted with remarkable rapidity and freedom; there are a few etchings by him.

(Houbracken, *Groote Schouburg der Konst Schilders*, &c.)

TESSELATED PAVEMENTS. [TILES AND PAVEMENTS, P. C. S.]

TEST ACT. [BOROUGHS, &c., P. C., p. 202.]

TESTE OF A WRIT. [WRIT, P. C.]

TESTELIN or TETTELIN, LOUIS, was born at Paris in 1615, and was a pupil of Vouet. He was elected one of the original members of the French Academy, though he was only thirty-three years of age at its establishment in 1648. His presentation picture was an historical portrait of Louis XIV. In 1650 he was appointed one of the professors of the academy. Testelin's picture of the Resurrection of Tabitha by St. Paul, painted in 1652, is considered one of the master-pieces of the French school of painting, and is compared with Le Sueur's celebrated picture of Paul Preaching, and the Burning of the Books at Ephesus; it is in the church of Notre Dame; there is a print of it by Bosse and Picard le Romain. There is another celebrated picture by Testelin in the church of Notre Dame—the Flagellation of St. Paul and Silas, which was painted in 1655, the year of his death. St. Louis attending a sick man, in the Hospital de la Charité, is likewise a distinguished work by Testelin. As he died at the early age of forty, his works are necessarily scarce. Le Brun and Testelin were great friends. Testelin had great theoretical knowledge, and he and Le Brun frequently conversed on the principles of art. Testelin never was in Italy, but on one occasion the subject of their argument was the comparative merit of the Roman and Venetian schools, taking their abstract characteristics as their subject, Roman design, and Venetian colour and light and shade, Le Brun advocating the Roman, and Testelin the Venetian. After arguing the whole night through, Le Brun rose, saying, 'My friend, you have charmed me by your profound knowledge; the victory is yours; certainly no man is better instructed in the great maxims of his art.'

(D'Argenville, *Abrégé de la Vie des Peintres*, &c.)

TETRAGONO'LEPIS, a remarkable and numerous genus of fossil ganoid fishes, chiefly from the lias strata of Dorsetshire. (Agassiz.)

TETRA'NTHERA, a genus of plants belonging to the natural order Lauraceæ. The flowers are diœcious, some hermaphrodite, involucrated. The calyx 6-parted, the segments nearly equal or wanting. The fertile stamens generally about 9, in the petaloid flower from 12 to 21. The leaves are variable, with pinnate veins.

T. Roxburghii is a variable plant, a native of the mountains of India and China. The leaves are ovate, oblong, acute at the base, smooth and shining above, more or less downy beneath. The umbels rather compound and nearly white. The fruit is globose, black, and about the size of a pea, yielding a kind of greasy exudation from which the Chinese manufacture candles of a bad quality, and which serves as a basis for salves. This fixed oil is supposed to constitute the principal part of the fruit of *Persea gratissima*, so much esteemed in the West Indies under the name of Avocado Pear.

(Lindley, *Vegetable Kingdom*; Lindley, *Flora Medica*.)

TETRA'ODON. [GYMNODONTES, P. C. S.]

TETRA'PTERUS, a genus of fossil fishes from the Cretaceous and Tertiary strata. (Agassiz.)

TEXAS. This country lately formed a portion of the territory of Mexico. The revolution through which it became separated, arose from the permission given to immigrants from the United States to receive grants of lands. The first permission of this kind was conceded to Moses Austin in January, 1821, which on his death was extended to his son, Stephen Austin, and confirmed by the Mexican Cortes, April 14, 1823. These and other similar concessions were made on condition of bringing into the country from 500 to 200 families as the consideration of each grant of land.

Texas formed part of the State of Cohahuila in the confederation of the Mexican States. It was established as a state August 15, 1824, and the State Constitution was promulgated in March, 1827.

In 1830, the first collision between the Mexican troops and the American settlers occurred. This was followed by various conflicts; and at last the independence of the country was proposed, when Stephen Austin advised that no limits of territory should be mentioned, and that the field should be left open to extend beyond the Rio Grande to Chihuahua and New Mexico.

On the 2nd of March, 1836, a declaration of independence was issued; and, on the 17th, a constitution was proclaimed, founded on the model of those of the southern states of North America. The law of slavery, which Mexico had abolished, was re-instituted—the legislature was denied the power to emancipate slaves—the presence in the country of free coloured persons was interdicted, and the privileges of citizenship were denied to all Africans, and the descendants of Africans and Indians.

On the 21st of April, 1836, the battle of San Jacinto was fought between the Mexican and Texan forces, when the president of Mexico, General Santa Anna, was taken prisoner by General Houston. This event terminated all Mexican authority in the country.

In 1837 the Committee of Foreign Affairs at Washington reported to the House, that the independence of Texas ought to be recognised. This recommendation was laid upon the table—but at the last hour of that session of Congress and of the Presidency of General Jackson, an amendment to the General Appropriation Bill was carried, for the payment of the outfit and salary of a diplomatic agent to Texas when the President should receive satisfactory evidence that Texas was a independent power. Immediately after this bill was signed by the President, the nomination of a Chargé d'Affaires of Texas was sent by him to the Senate and consented to by it—and thus it was, that the Republic of Texas was recognised by the United States. To have effected this recognition by treaty, a majority of two-thirds of the Senate would have been requisite, and such a majority could not then have been obtained. A mere majority was sufficient to confirm the nomination of a chargé d'affaires.

On September 25, 1839, a treaty was signed between France and Texas, and was ratified at Austin, Jan. 18, 1840. This was the first recognition of the independence of Texas by a European power. On Nov. 16, 1840, a treaty between Great Britain and Texas was signed, which was ratified at Austin in Feb., 1841. But no treaty was made between the governments of the United States and Texas; and in consequence of no such treaty being required as a condition precedent to the recognition of Texan independence by this country, the annexation of Texas to the United States was greatly facilitated.

The government of Mexico persisting in its refusal to acknowledge the independence of the country, proposals were made to annex the republic to the United States. The trade and security of the people settled in the western district were constantly disturbed—marauding incursions were common, and the government had not pecuniary resources sufficient to enable it effectively to carry on a war. It had been hoped that the influence of France or of Great Britain would have checked the evils arising from the obstinacy and weakness of the Mexican authorities. Seeing that this did not happen, public opinion became favourable to a union with the United States, and this feeling was further stimulated by the efforts of Presidents Tyler and Polk, both of whom strongly urged upon the Congress of the United States the policy of taking advantage of the opportunities afforded by the political condition of Texas. On the passing of an Act by the Texan Congress to surrender its independence, in December, 1845, an Act of Congress of the United States declared Texas to be one of the States of the North American Union. The boundary between Texas and the United States was fixed by the Florida Treaty of 1819. The Congress of Texas declared the western limits of Texas to extend to the Rio Grande, including the department of New Mexico, which had never formed part of the State of Texas or Cohahuila, and was settled by the Spaniards as early as 1595. The government of the United States, since the annexation of Texas, appears to make a claim to the same extent of territory, and there is also every probability that one of the results of the pending war with Mexico will be to extend the authority of the United States over the entire province of California.

(*Address of J. Q. Adams to the Electors of Braintree*, September 12, 1842; Kennedy's *Texas*; *Congressional Documents of the Senate of the United States*, 1846; Falconer *On the Discovery of the Mississippi*, 1844.)

THAW is the reduction of ice or snow to a liquid state in consequence of an increase of temperature. This effect is produced on the surface of the earth or in the atmosphere during the spring season by the return of the sun to the hemisphere of the observer, the solar rays then falling in greater abundance than before on a given extent of ground; or it is produced by accidental currents of warm air which pass over a frozen mass. The dissolution of the particles of ice in the atmosphere is the cause of the humidity which accompanies a thaw.

As the conversion of a liquid into ice always commences at the surface of the former, and about the sides of the vessel containing it, or about those of a solid body immersed in it, so in ice surrounded by air which has acquired a higher temperature than the ice has, the process of liquefaction commences at the sides and extends gradually from thence inwards; ice being a bad conductor of heat, the central parts of it are the last which are dissolved. It is observed that when solid bodies, whose temperatures are equal to one another and higher than that of ice, are applied to the latter, the ice is dissolved most rapidly by those which have the greatest power of conducting caloric: thus a piece of ice being laid on a plate of polished metal, and a piece of equal magnitude on wood, the ice on the metal will be dissolved before that which is laid on the wood, not only when the temperature of the metal and wood are equal, but even when the temperature of the wood considerably exceeds that of the metal, the latter conveying more abundantly to the ice the calorie which it is continually receiving from the atmosphere.

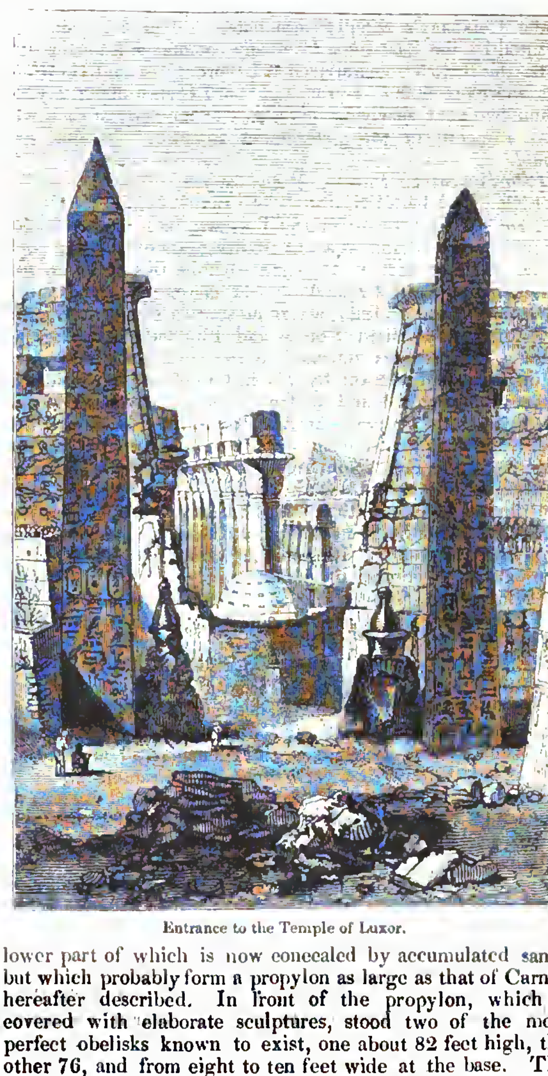
A severe and long-continued frost abstracts so much caloric from terrestrial bodies, as the walls of buildings which are not exposed to the sun, that these are often cooled below the temperature of freezing water; and while in this state, if a current of warm air pass over their surfaces, the water which the air holds in solution deposits itself on the walls, where it is converted into ice or snow: it remains thus frozen for a time after a thaw has commenced, but at length, the temperature increasing, the ice is melted and the walls are then covered with moisture.

It is often remarked that at the time of a thaw taking place there is felt a degree of coldness greater than that which is experienced during the continuance of the frost; this is apparently caused merely by the evaporation of the moisture which is then on the skin, for the thermometer at the same time indicates an elevation of temperature in the atmosphere.

The overflowing of rivers by the dissolution of the snow and ice on the mountains about their sources is well known, and to the liquefaction of the ice formed by the previous congelation of water which has introduced itself in the fissures of rocks is to be ascribed the occasional severance of large masses from the sides of mountains; the expansion of the water in freezing having destroyed the cohesion, so that the parts are only held together by the ice, and on the liquefaction of this the disunion is complete.

THEBES. The writer of the article THEBES, P. C., has, owing to a misapprehension, given references to CARNAC and LUXOR, instead of describing them under the article Thebes. We now supply the omission.

On the site and amongst the ruins of the antient city of Thebes stand four principal villages, Carnac and Luxor on the eastern bank of the Nile, Gournou and Medinet-Abou on the western bank. At Luxor, near the river, are the remains of a temple, the entrance to which is through a magnificent propylon, or gateway, consisting of two pyramidal moles, the



Entrance to the Temple of Luxor.

lower part of which is now concealed by accumulated sand, but which probably form a propylon as large as that of Carnac hereafter described. In front of the propylon, which is covered with elaborate sculptures, stood two of the most perfect obelisks known to exist, one about 82 feet high, the other 76, and from eight to ten feet wide at the base. The smaller obelisk has been removed by the French, and now stands in the Place de la Concorde at Paris. A ship constructed expressly for the purpose of transporting the obelisk sailed from Toulon in March, 1831. The smaller obelisk was selected as not only lighter, but in a better state of preservation than the larger. This obelisk was found to have been placed on a higher pedestal than the other, and somewhat more forward, so as to make the difference of size less observable by the spectator. The obelisk was lowered, conveyed to Paris, and erected Oct. 25, 1836. The cut on the preceding page presents a view of the two obelisks with the propylon seen behind them, and a portion of the ruins of the interior of the temple.

But the remains of Carnac, about a mile and a quarter lower down the river, are still more wonderful than those of Luxor. An irregular avenue of sphinxes, 2180 yards in length, connects the southern entrance of Carnac with the northern entrance of the temple of Luxor. Carnac is about 830 yards from the east bank of the Nile, and is surrounded by a wall of unburnt bricks about 5300 yards in circuit, or more than three miles. An adequate idea of the extent of the remains in this inclosure could only be given by a plan on a large scale. The largest of them, which some have thought to be a temple and some a palace (it may have been both) is 1215 feet in length, 360 feet in its greatest width, and 321 feet in its least width. The entrance to it (the western entrance) fronts the Nile, with which it is connected by an alley of crio-sphinxes (sphinxes formed of the body of a lion and the head of a ram). This alley conducts to a propylon, without sculpture, 360 feet long and 148 feet high, with a great doorway in the centre 64 feet high; passing through which a large court is entered having a range of pillars on the north and south sides, and a double row of lofter pillars down the middle, which terminate opposite two colossal statues in front of a second propylon. A flight of twenty-seven steps then leads to an enormous hall, which has been called the Great Hypostyle Hall of Carnac. It is 338 feet by 170½ feet, and comprises an area of 57,629 square feet. The roof, which is flat, and when perfect was formed of very large slabs of stone, is supported by 134 columns, the largest of which are about eleven feet in diameter and the smallest nearly nine feet. Four churches of the size of that of St. Martin's in the Fields, London, might stand side by side in this vast hall without occupying the whole space. The interior propylon, pillars, and walls are covered with sculptures. Four beautiful obelisks form the entrance from the hall to the adytum, or sacred place, which consists of three apartments, all of granite, and the central room, or sanctuary, is adorned with sculptures, and painting and gilding. Beyond the adytum are porticoes and galleries, which were probably continued to another propylon at the eastern end.

Four propyla, with colossi in front of them, form the entrance on the south side, at the end of the long avenue of sphinxes leading from Luxor; and there was probably a similar entrance on the north side.

(*Library of Entertaining Knowledge*, 'Egyptian Antiquities,' vol. i.; *Penny Magazine*, 1837.)

THEOTOCOPU'LI, DOMINICO, called EL GRECO, was painter, sculptor, and architect. He is said to have been the scholar of Titian. In 1577 he was residing in Toledo, where he appears to have settled, though from his name and his surname of El Greco, the Greek, he was doubtless a native of Greece. He painted many pictures in Toledo, and acquired a great reputation in Spain. El Greco made the marble decorations of the altar (retablo), and the altarpiece of the Parting of Christ's Raiment before the Crucifixion, for the old sacristy of the cathedral of Toledo, on which he was occupied from 1577 until 1587, when he was paid for the whole work 319,600 maravedis, of which 119,000 were for the picture; about 100*l.* sterling altogether, but owing to the change in the value of Spanish money it is now perhaps impossible to calculate the sum accurately. He was however not engaged exclusively on this work all this time; he painted other works in the meanwhile, and for Philip II. an altarpiece of the Martyrdom of St. Maurice for the Escorial, which however Philip was dissatisfied with. It is now in the chapel of the college; a picture by Romulo Cincinnato was substituted for it over the altar of the chapel of St. Maurice in the Escorial. The objections to this picture were a certain hardness of colour and extravagance of design which El Greco is said to have introduced to prevent the picture being mistaken for a work of Titian, which it seems had been the fate of some of his best paintings.

As an architect he designed the Casa del Ayuntamiento or mansion-house, of Toledo, and the churches of La Caridad and of the convent of the bare-footed Franciscans at Illescas; and he executed also a great part of the paintings and sculptures of these churches. In 1590 he designed the church of the Augustines at Madrid, called de Donna Maria de Aragon, and painted the principal altarpiece of their college. He designed also several monuments, which are among his best works. He died at Toledo in 1625, according to Palomino, seventy-seven years of age; and was buried with great pomp in the church of St. Bartholomew.

El Greco's pictures were still very numerous at the end of the last century; Cean Bermudez enumerates a great many in Toledo, Illescas, Escalona, Bayona, in Segovia, La Guarda, Mostoles, Casarrubios, Siguenza, Medina Celi, Valencia, Leon, at the Escorial, and in Madrid. Many have probably since been removed. Mr. Ford, in his 'Handbook of Spain,' notices only three pictures by this painter—Christ bearing his Cross, and a Nativity, and an Adoration, in the Salon de la Sacristia al Toledo.

Richard Cumberland speaks in high terms of the pictures of El Greco, especially the Preparation for the Crucifixion and the Parting of Christ's Raiment in the cathedral of Toledo, already mentioned; and the entombment of Don Gonzalo Ruiz, Count Orgaz, in the church of Santo Tomé at Toledo, which he considers his masterpieces. The first he terms a grand composition so entirely in the style and manner of Titian, that his reputation could have suffered no injury by its adoption. The burial of the Conde de Orgaz was painted in 1584 for the archbishop of Toledo, Cardinal Don Gaspar de Quiroga, for the great sum of 2000 ducats according to Cumberland. The Count Orgaz was the founder of the Augustine convent of San Estevan at Toledo, and this picture was painted in honour of the foundation—the saints Augustine and Stephen are represented depositing the count in his tomb, and the picture contains the portraits of many distinguished persons of the time.

His son, George Manuel Theotocopuli, was also a sculptor and architect of eminence. He was appointed sculptor and architect to the chapter of the cathedral of Toledo in 1625: he died at Toledo in 1631. He was the architect of the ochavo of the cathedral: it is an octagon decorated with precious marbles and a painted dome, and is used as the treasury-house of the Virgin, where her splendid dresses are kept, as well as many precious relics.

(Cean Bermudez, *Diccionario Historico*, &c.; Cumberland, *Anecdotes of Eminent Painters in Spain*.)

THE'LODUS, a fossil fish from the upper Silurian strata of Ludlow. (Murchison.)

THEONO'A, a genus of fossil Zoophyta from the secondary and tertiary strata. (Lamouroux.)

THIBAUT, ANTON JUSTUS FRIEDRICH, a celebrated German jurist, was born on the 4th of January, 1772, at Hameln in Hanover. In 1792 he went to Göttingen to study the law; he continued his studies at Königsberg; and he finished them at Kiel, where he became acquainted with Niebuhr. In this university he took the degree of D.C.L., and in 1796 was admitted as a junior teacher of the law. He soon rose to eminence, and at the age of twenty-seven was appointed ordinary professor of civil law. In 1802 he went in the same capacity to Jena, where he published his 'System des Pandekten-Rechts,' the first systematical attempt of the kind that was written in the German language, the former works on that subject having been written in Latin. The merits of this excellent work were generally acknowledged, and Thibaut was chosen by the Emperor Alexander one of the foreign members of the commission of legislation for Russia, and in 1805 he was invited to the university of Heidelberg, where he remained till his death. Though scarcely passed thirty, he was considered to be the first civilian in Germany after Hugo, Savigny having not yet attained his great reputation. Twice Thibaut was chosen prorector of the university of Heidelberg, and nine times he filled the office of dean of the faculty. He was also chosen deputy of the university in the first chamber of the States of Baden, but as his new duties interfered with those of a teacher, he resigned the office. In 1826 he was made a privy councillor. His fame and his popularity among the students led to his receiving invitations from other universities, as for instance from Leipzig, where the place of professor primarius of law was offered to him with a very large income, besides a prebend in the chapter of Merseburg; but nothing could induce him to leave Heidelberg. In 1830 he was knighted by the Grand-Duke of Baden, his former pupil, who in 1834 appointed him judge for the grand-duchy, in the newly established tribunal of arbiters for the domestic affairs of Germany. In 1837 he was chosen Membre correspondant de l'Académie des Sciences Morales et Politiques, for the section of legislation and jurisprudence. Thibaut died on the 28th of March, 1840, with the well-deserved reputation of being equal to Savigny as a civilian, and superior to him as a teacher and a practical jurist. The great object of Thibaut was to distinguish clearly between the obsolete portions of the Roman law, and those which were of real practical use. In his private life Thibaut was most amiable; to many a poor student he proved a kind father; to many who had talent, a wise friend. His house was open to all his pupils, whether introduced to him by others or by themselves; but he showed particular attention to those who, besides their legal knowledge, showed proficiency in music, of which he was a profound judge. His little work on Purity of Music quoted below is a specimen of his refined taste in this respect.

The principal work of Thibaut is his 'System des Pandekten-Rechts,' mentioned above, of which the eighth edition was published at Heidelberg in 1834, 2 vols. 8vo., and a ninth edition since the author's death, by Professor Buchholtz, Jena, 1846. This work is in the hands of nine out of ten lawyers in Germany, but though of the highest value, it is rather a difficult book to beginners. The following are the other works of Thibaut according to the date of their publication:—1, 'De genuina Juris Personarum et Rerum Indole veroque hujus divisionis Pretio,' Kiel, 1796, 8vo., is a dissertatio inauguralis which brought the young author the honour of being attacked by Hugo. 2, 'Juristische Encyklopädie und Methodologie,' Altona, 1797, 8vo. 3, 'Versuche über einzelne Theile der Theorie des Rechts' ('Essays on several Branches of the Theory of the Law'), Jena, 1798-1802, 2 vols. 8vo.; 2nd edit., 1817, translated into French by De Sandt et De Chassat, Paris, 1811. 4, 'Ueber Besitz und Verjährung' ('On Possession and Prescription'), Jena, 1802, 8vo., a work which caused a great sensation, but was afterwards thrown into the shade by Savigny's work on Possession. 5, 'Civilistische Abhandlungen' ('Essays on Civil Law'), Heidelberg, 1814, 8vo.; 2nd edit., 1822. 6, 'Ueber Reinheit der Tonkunst' ('On Purity of Music'), Heidelberg, 1825, 8vo.; 2nd edit., 1826. 7, 'Ueber die Nothwendigkeit eines Allgemeinen bürgerlichen Rechtes in Deutschland,' Heidelberg, 1814, 8vo. ('On the Necessity of a Common Code of Laws for Germany'). This work placed its author at the head of a great legislative movement, and a short explanation is necessary in order that the reader may understand it. Antient German laws and a large portion of the Roman law exist there together, the former referring principally to landed property, entailed estates and others called 'noble estates,' the different hereditary and temporal tenements of the peasantry, the succession to such estates, the legal consequences of marriage inasmuch as it effects complete communion of property, personal and real, between husband and wife, further the remnants of feudal institutions, and others; while contracts, the common succession to personal property and to land, except entailed estates either noble or villain, testaments (in a great measure) and many other things are regulated by the Roman law. In some parts of Germany the German and Roman elements of the law are knitted together by modern legislation into a regular code, civil and criminal, as the Austrian code; the Prussian, which is in force in the greater portion of the kingdom of Prussia; the Bavarian criminal code, the work of Feuerbach, in Bavaria and Oldenburg. But the civil law in the latter two countries and nearly the whole of Germany, except Austria and Prussia, is that compound of Roman and German elements which has been mentioned above. Besides the 'Common Law,' by which is meant the Roman-German compound aforesaid, there is a variety of provincial and local laws, among which the laws of the cities of Magdeburg, Hamburg, and Lübeck deserve a particular attention, especially the law of Lübeck, since it is not only shaped into the form of a code, but is the common law of nearly all the towns of North-Eastern Germany as well as those in the adjacent provinces of Eastern Prussia and the so-called German provinces of Russia, Courland, Livonia, and Esthonia. To augment the difficulties, the French code became the common law in the Rhenish provinces and in the grand-duchy of Baden.

This sketch, however imperfect, may be sufficient to show that the administration of the law in Germany is no easy matter; and that the difficulties increase in proportion to the extent of the jurisdiction of the different courts; and hence the strange, yet under such circumstances necessary fact, that the faculties of law in the various universities were, and partly still are, so many courts of justice before which cases used to be brought which require more learning, especially historical learning, than is generally possessed by the members of the common courts of justice. Thibaut's proposal was to fashion this legal chaos into a general code, as was done in France; and although he admitted that the task would be very difficult, he maintained that what had been done in France would diminish the difficulty. His plan became soon popular, but he also met with decided adversaries, among whom Savigny took the lead, who contended that Germany was not yet ripe 'for a common legislation; that the idea itself was good, but that there were so many scientific (rather theoretical) differences among the jurists concerning the most important points, that every attempt would prove abortive till matters had previously been settled scientifically.' Savigny also could refer to an example, the Prussian code (*Landrecht*), which, though only an experiment upon a portion of Germany, is yet considered to be a failure: he avoided to speak of the Austrian code. At present the opinion of Thibaut has more adherents than that of Savigny; and since the latter's views depend merely upon an eventuality which cannot but take place, however soon or late it may be, it is to be presumed that the period when Germany will enjoy a common code is not so very distant. Thibaut has entered into many details concerning that important question in several of his numerous essays, dissertations, and treatises in the principal legal reviews of his country. He was the founder of the 'Civilistisches Archiv' and the 'Heidelberger Jahrbücher.'

(*The Life of Thibaut*, in *Heidelberger Jahrbücher*, year 1840.)

THIN PLATES. [Colours of Plates, P. C. S.] We take this opportunity of correcting an accidental mistake in the article referred to. It is there stated (p. 395, col. 2) that the thicknesses of the air at the most and least luminous parts of the rings are proportional to the 'semi-diameters of the rings;' whereas they are proportional to the *squares* of the semi-diameters of the rings.

THLASPI (from θλάω, to compress; seeds compressed), a genus of plants belonging to the natural order Cruciferæ, and the sub-order Angustiseptæ. It has a roundish notched pouch, boat-shaped valves winged at the back; the seeds are numerous, the petals equal, the flowers white.

T. arvense, Penny-cress, has oblong toothed leaves and erect stems, an elongated fruit-bearing raceme, orbicular pouches with a longitudinal wing. It is native throughout Europe and in England. The flowers are small and white, and the whole plant when bruised has a somewhat alliaceous odour.

T. perfoliatum has obcordate pouches, the stem-leaves cordate, oblong, the petals equal in length to the calyx. It is a native of Europe and is found in England on a chalky soil.

T. alpestre is found on limestone mountain pastures throughout Europe and England; the leaves are entire, the radical ones ovate, stalked, the cauline ones sagittate and stem-clasping; the petals nearly as long as the calyx, the pods obcordate, from 8- to 12-seeded.

The species of this genus are hardly worth cultivation except in general collections or in botanical gardens. They succeed best in a light sandy soil.

(Don, *Gardener's Dictionary*; Babington, *Manual of British Botany*.)

THORWALDSEN, BERTEL (*Albert*), was born November 19, 1770, at Copenhagen. He was the son of Gottschalk Thorwaldsen, a carver in wood, and his wife Karen Grönlund, the daughter of a priest of Jütland. Gottschalk was a native of Iceland, and was in very poor circumstances when his son Bertel was born. Bertel assisted his father in his work at a very early age, and when only eleven years old he attended the free school of the Academy of Arts at Copenhagen, and made such progress in two years that he was enabled to improve his father's carvings; and himself undertook to execute the head-pieces of ships. At the age of seventeen he obtained the silver medal of the academy, for a bas-relief of Cupid reposing; and in 1791, when he was only twenty years of age, the small gold medal for a sketch of Heliodorus driven from the temple. Two years later he obtained the principal gold medal of the academy, and with it the privilege of studying for three years abroad at the government expense. Before setting out, however, he devoted a year or two to preliminary general study, for scholarship was not one of his acquirements, and he had much to read and much to learn. On the 20th of May, 1796, he set out for Italy in the Danish frigate Thetis, and he arrived at Naples in the end of January of the following year, in the packet-boat from Palermo. The Thetis cruised in the North Sea until September; in October it touched at Algiers; it then performed quarantine at Malta, made a voyage to Tripoli to protect Danish commerce, and performed quarantine a second time at Malta, when Thorwaldsen left it in a small sailing boat for Palermo, where he took the packet-boat to Naples.

At Naples, wholly unacquainted with the Italian language, and for the first time entirely separated from his own countrymen, Thorwaldsen's heart failed him, and he longed to return to Denmark, which according to his own account he would have done if he had found a Danish vessel about to leave the port at the time. However, in a little time he found courage to engage a place in the coach of a vetturino for Rome, where he arrived March 8, 1797.

Thorwaldsen brought letters of introduction to his distinguished countryman Zoëga, who however did not give the young sculptor much encouragement, nor did he estimate his ability very high. When Zoëga was once asked what he thought of him, three years after his arrival, he answered with a shake of the head, 'There is much to find fault with, little to be contented with, and he wants industry.' Up to this time Zoëga was right, except in the last particular. Thorwaldsen was industrious, but fastidious, and often destroyed what had cost him much labour. This was the fate of a statue of Jason with the Golden Fleece which he had modelled to take back with him to Copenhagen at the expiration of his term of three years allowed by the Academy. He however made a second attempt at the same figure, and this statue satisfied even the difficult Zoëga, with whom Thorwaldsen was about to return to Denmark; and Canova exclaimed, 'This work of the young Dane is in a new and a grand style.' By the assistance of a Danish lady, Frederika Brun, who gave him the necessary funds, which he had not, and praised the statue in song, it was cast in plaster, and Thorwaldsen prepared for his return home: but when on the point of starting and about to step into the vehicle of the vetturino, one of his companions, the Prussian sculptor Hagemann, found that his passport was not in order, and he was obliged to put off his journey until the next day. Thorwaldsen determined to wait with him, the vetturino started without them, this delay was followed by another, and it eventually happened that Thorwaldsen did not return to his native country until 1819, after an absence of twenty-three years. The liberality of Thomas Hope was the immediate cause of Thorwaldsen's finally settling in Rome. The words of Canova upon the statue of Jason were repeated in the artistic circles of Rome, and echoed by the professional ciceroni of the place. One of these ciceroni took Mr. Hope in the year 1803 to the studio of the young Dane to see the statue which the great sculptor had praised. The English connoisseur stood long before the plaster figure, then inquired what Thorwaldsen required for a marble copy of it: '600 ducats,' was the answer; 'You shall have 800,' was the generous reply of the Englishman.

From this time the star of Thorwaldsen was in the ascendant; the statue was however not finished until many years afterwards, but many celebrated works were done in the meanwhile; as the bas-reliefs of Summer and Autumn, and the dance of the Muses on Helicon; Cupid and Psyche; and Venus with the apple. His fame spread far and wide, and Christian, the present king (then crown-prince) of Denmark, wrote him a pressing invitation to return to Copenhagen, communicating at the same time the discovery of a white marble quarry in Norway. Thorwaldsen was eager to return, but commission upon commission rendered it impossible; he could not leave the papal city.

During this busy time Thorwaldsen recreated himself in the summer seasons at Leghorn, in the beautiful villa of Baron Schubart, the Danish minister at Florence: he executed also some of his works here.

In 1812, when arrangements were being made for Napoleon's visit to Rome, the architect Stern, who superintended the preparations, happened to sit next to Thorwaldsen at one of the assemblies of the Academy of St. Luke, and asked him if he could get ready a plaster frieze for one of the large apartments of the Quirinal Palace, in three months. Thorwaldsen undertook the commission, and in three months the plaster sketch of his celebrated bas-relief of the Triumph of Alexander was completed. The immediate subject was Alexander's triumphal entry into Babylon: the length of the frieze is 160 Roman palms, its height five palms: it has been twice executed in marble, with slight variations, and is engraved in a series of plates by S. Amsler, of Munich, after drawings by Overbeck and others.

In 1815 Thorwaldsen modelled, in a single day, two of his most popular works, the bas-reliefs of Night and Day; but he had done nothing whatever for weeks and months before.

In July, 1819, he started in the company of two friends on his first visit to his native land, and he arrived at Copenhagen on the 3rd of October of the same year: his parents had died some years before. His fame was now so well established, that even through Italy and Germany his journey was a species of triumphal passage, and at its termination he was lodged in the palace of Charlottenburg and entertained with public feasts. In about a year he left Copenhagen and returned to Rome through Berlin, Dresden, and Warsaw, where he received several commissions, and made a bust of the Emperor Alexander.

He executed his principal works after his return to Rome,—as Christ and the Twelve Apostles; the group of St. John in the Wilderness; and the monuments to Copernicus, Pius VII., Maximilian of Bavaria, the Poniatowski monument, and others. In 1823 he had a narrow escape of his life: a boy, the son of his landlady, contrived to get hold of one of his pistols, which he had carelessly hung up loaded; the boy, ignorant of the danger, pointed it and discharged it at Thorwaldsen, but the ball, after grazing two of his fingers, lodged in his dress without doing him any further injury.

In 1838 the Christ, the St. John preaching, and the Apostles,—the principal works for the cathedral or church of Our Lady at Copenhagen—and other works for the palace of Christiansburg, on which Thorwaldsen had been many years engaged, were completed, and the Danish government sent the frigate Rota to carry them and their sculptor to Copenhagen. Thorwaldsen was received with enthusiasm by his countrymen; and he remained among them on this occasion about three years, and chiefly at Nysö, the seat of his friend the Baron Stampe, where a studio was built for him; and he finished here some of his last works—the frieze of the Procession to Golgotha, for the cathedral; the Entrance into Jerusalem; Rebecca at the Well; his own statue; and the busts of the poets Oehlenschläger and Holberg.

In 1841, finding the climate disagree with him, he felt compelled to return to Italy, and he executed at this time his group of the Graces for the King of Würtemberg. He returned however to Denmark and Nysö in the following year, and executed two other works, bas-reliefs, which are among his last productions – Christmas Joy in Heaven; and the Genius of Poetry, which he presented to his friend Oehlenschläger. He intended to return to Rome in the summer of 1844, but he died suddenly in the theatre of Copenhagen, on March 24th, in that year, aged seventy-three: he died of disease of the heart. He lay in state in the Academy, and was buried with extraordinary ceremony beneath his own greatest productions in the cathedral church of Copenhagen.

Thorwaldsen's will bears much resemblance to Sir F. Chantrey's: he bequeathed all works of art in his possession, including casts of his own works, to the city of Copenhagen, to form a distinct museum, which was to bear his name, on the condition that the city furnished an appropriate building for their reception. This building was nearly completed before the death of Thorwaldsen; 60,000 Danish dollars were subscribed already in 1842, and the museum fast approaches its completion. Besides casts of the numerous works of Thorwaldsen, which would alone constitute an imposing collection of its class, it contains many works of ancient and modern sculpture, numerous paintings by old and recent masters, casts, vases, engraved gems, cameos, terracottas, bronzes, medals, curiosities, engravings, prints of all descriptions, books on the fine arts, and drawings. With the exception of 12,000 dollars to each of his grandchildren, and the life-interest of 40,000 dollars to their mother Madame Poulsen, his natural daughter, to descend to her children, the whole of his personal estate is to be converted into capital, and to be added to the 25,000 dollars already presented for the purpose by Thorwaldsen, to form a museum perpetual fund, for the preservation of the museum and for the purchase of the works of Danish artists, for the encouragement of Danish art, and to add to the collections of the museum. His daughter, now a widow, resides in Rome, where she was born.

Thorwaldsen's unfinished works are to be completed by Professor Bissen, of the Academy of Copenhagen, and he is superintendent or keeper of the Thorwaldsen Museum; the government is under five trustees, two are always to be professors of the Academy, one a magistrate of Copenhagen, and one a lawyer. The president of the council is to be the senior trustee, and all questions are to be decided by a majority of voices. The trustees themselves will supply all vacancies as they occur. There are at present six, but the perpetual number is fixed at five.

Thorwaldsen is considered by his admirers the greatest of modern sculptors, and many have not hesitated to place him far above Canova, and to compare him with the antique. This is however hardly the rank he will hold with posterity; his style is uniform to monotony, though many individual figures are bold, solid, and of beautiful proportions. His *beau-idéal* appears to have been something between the Antinous and the Discobolus of Nancydes, as it is sometimes called; but as his subjects are seldom heroic, he seldom required more than a moderate expression of heroic vigour or robust strength and activity: in this respect, and in execution generally, he was much surpassed by Canova; but still more so in the grace of the female form, in which Thorwaldsen certainly did not excel. His females are much too square in the frame, the head and shoulders being generally heavy; and in no instance do we find in his female figures, in full relief, that beautiful undulation of line and development of form characteristic of the female, which is displayed in the antique, in the works of Canova, and in those of some other modern sculptors; as, for instance, the Ariadne of Dannecker. Basso-rilievo was a favourite style with Thorwaldsen, and a great proportion of his works are executed in this style. Of this class some of his minor works are the most expressive; but the principal are—the Triumph of Alexander, and the Procession to Golgotha, which is the frieze of the cathedral church of Copenhagen, immediately below the numerous group of John preaching in the Wilderness, in full relief, in the pediment: in the vestibule are the four great Prophets; Christ and the Twelve Apostles are above and around the altar. The Triumph of Alexander, of which there is a copy in marble in the palace of Christiansburg (the first marble copy was made for Count Somariva's villa on the Lake of Como), is a long triumphal procession in two divisions, one meeting the other. In the centre, Alexander, in the chariot of Victory, and followed by his army, is met by the goddess of Peace, followed by Mazæus and Bagophanes with presents for the conqueror. The subject is taken from the work of Quintus Curtius. Much of the frieze is symbolical: perspective is nowhere introduced. The whole arrangement is beautiful, especially that portion which comes from Babylon, comprising the General Mazæus with his family; female figures strewing flowers; Bagophanes placing silver altars with burning incense, musicians, and attendants leading horses, sheep, wild animals, and other presents for the conqueror; next to these are symbolic representations of the river Euphrates, and the peaceful occupations of the Babylonians. The human figures of this work are admirable, as is also the management of the costumes; but the horses are below mediocrity both in design and modelling, especially that of Alexander himself, Bucephalus, which is led following the chariot of Alexander; it is a complete distortion. None of the horses of Thorwaldsen are successful. The colossal animal of the Poniatowski monument at Warsaw, and that (of smaller proportions) of the monument to Maximilian of Bavaria at Munich, are heavy and graceless, and wanting in the finer characteristics of form which belong to the horse. The works of Thorwaldsen do not display extraordinary power or fertility of invention—Flaxman's distinguishing faculty. Flaxman's outlines belong not the less to the province of sculpture from the circumstance of their not having been executed in marble; most of them are designed and well adapted for basso-rilievo.

Many years ago some admirers of Lord Byron raised a subscription for a monument to the poet, to be placed in Westminster Abbey. Chantrey was requested to execute it, but on account of the smallness of the sum subscribed, he declined, and Thorwaldsen was then applied to, and cheerfully undertook the work. In about 1833 the finished statue arrived at the custom-house in London, but, to the astonishment of the subscribers, the Dean of Westminster, Dr. Ireland, declined to give permission to have it set up in the Abbey, and owing to this difficulty, which has proved insurmountable, for the present dean was of the same opinion as his predecessor, it has remained for upwards of twelve years in the custom-house, and has recently (1846) been removed to the library of Trinity College, Cambridge: it was previously taken to the studio of Sir Richard Westmacott. The poet is represented of the size of life, seated on a ruin, with his left foot resting on the fragment of a column; in his right hand he holds a style up to his mouth; in his left is a book, inscribed 'Childe Harold:' he is dressed in a frock-coat and cloak. Beside him on the left is a skull, above which is the Athenian owl. The execution is not of the highest order; both face and hands are squarely modelled; thus fineness of expression is precluded through want of elaboration. The likeness is of course posthumous.

(H. C. Andersen, *Bertel Thorwaldsen, eine biographische Skizze. Aus dem Dänischen übertragen von Julius Reuscher*; *Kunstblatt*, 1844; *Art-Union Journal*, 1845.)

THRINCIA, a genus of plants belonging to the natural order Compositæ and the suborder Cichoraceæ. It has an oblong involucre in one row, with a few additional scales at the base. The receptacle is punctured, the fruit beaked. The pappus in two rows, the outer row setaceous deciduous, the inner one longer, feathery and dilated at the base. The marginal row of fruits enveloped in the scales of the involucre.

T. hirta, the only British species, has lanceolate leaves, sinuate dentate, hispid or hairy. The leaves are all radical, sometimes nearly or quite entire, occasionally runcinate. It is found chiefly in gravelly soil.

(Babington, *Manual of British Botany*.)

THUNBERGIA (in honour of Charles Peter Thunberg, M.D., professor of botany in the university of Upsal), a genus of plants belonging to the natural order Acanthaceæ. It has a double calyx, the outer one 2-leaved, the inner about 12-toothed. The corolla is campanulate; the capsule beaked and 2-celled. The species are handsome climbing plants with a fragrant odour.

T. fragrans has a climbing stem, with cordate acuminate leaves somewhat angular at the base.

T. grandiflora has large flowers with no inner calyx; the leaves are angular cordate; the anthers bearded and spurred. This and the former species are natives of the East Indies.

(Loudon, *Encyclopædia of Plants*.)

THUYITES, a genus of fossil coniferous plants from the oolite of Stonesfield, Collyweston, Gristhorpe, and Solenhofen. (Brongniart.)

THYNNUS, the subdivision of the genus SCOMBER (Mackerel) to which the fish called the Tunny belongs. The Tunnies differ from the Mackerels in the position of their first dorsal fins, which, instead of being separated from the second by a wide interval, are prolonged close to them. Round the thorax they have a corslet of larger scales, a character which is wanting in the subgenus *Scomber*. The Tunny and Bonito are the best known examples. The former fish has nine spurious finlets above and below; the latter has eight above and seven below.

The general form of the tunny resembles that of the mackerel, but it is thicker in proportion to its length. The back is black with a tinge of blue; the corslet and sides of the head are whitish; the belly is grey, with silver spots; the fins variously coloured; the first dorsals, pectorals, and ventrals are dusky; the tail is rather paler, the second dorsal and anal more or less flesh-coloured, and the spurious finlets sulphur-yellow, edged with black. The tunny grows to more than seven feet in length, and when of those dimensions weighs more than four hundred and sixty pounds.

The following interesting account of the modes of fishing the tunny in the Mediterranean is given by Mr. Yarrell in his 'History of British Fishes:'—

In the months of May and June, when seeking a proper situation near the shore upon which to deposit their spawn, the adult fish rove along the coast in large shoals and are known to be extremely timid, easily induced to take a new and apparently open course to avoid any suspected danger. Advantage has been taken of these peculiarities to carry on a most extensive fishery against them at various places, which is as valuable as it is destructive. Cuvier and M. Valenciennes have described the two most common modes of effecting their capture. When the look-out sentinel, posted for that purpose on some elevated spot, makes the signal that he sees the shoal of tunnies approaching, and the direction in which it will come, a great number of boats set off under command of a chief, range themselves in a line forming part of a circle, and joining their nets form an inclosure which alarms the fish, while the fishermen drawing closer and closer, and adding fresh nets, still continue driving the tunnies towards the shore. When they have reached the shallow water, a large net is used, having a cone-shaped tunnel to receive the fish, which is drawn towards the shore, bringing with it all the shoal. The fishermen carry out the young and small tunnies in their arms, the larger are first killed with poles. This fishery, practised on the coast of Languedoc, sometimes yields many hundredweight at each sweep of the nets.

Another mode of taking tunnies is by the madrigue, or, as the Italians call it, tonnaro. This is a more complicated engine, and somewhat expensive to set up. It consists of a series of long and deep nets fixed vertically by corks at their upper edges, and with lead and stones at the bottom. These are kept in a particular position by anchors, so as to form an inclosure parallel to the coast, sometimes extending an Italian mile in length: this is divided into several chambers by nets placed across, leaving narrow openings on the land side. The tunnies, which in their progress proceed along the coast, pass between it and the tonnaro: when arrived at the end, they are stopped by one of the cross nets, which closes the passage against them, and obliges them to enter the tonnaro by the opening that is left for them. When once in, they are driven by various means from chamber to chamber to the last, which is called the chamber of death. Here a strong net, placed horizontally, that can be raised at pleasure, brings the tunnies to the surface, and the work of destruction commences. Sailors who have come off in boats for the purpose, give unequal battle on all sides, striking the tunnies with poles and all sorts of similar weapons. This imposing spectacle, which attracts a great number of curious people to witness it, is one of the great amusements of rich Sicilians, and at the same time one of the most considerable branches of the commerce of the island. When Louis XIII. visited Marseille, he was invited to a tunny-fishing at the principal madrigue of Morgion; and found the diversion so much to his taste, that he often said it was the pleasantest day he had spent in his whole progress through the south.

The tunny is occasionally taken in the British seas, but it can scarcely be regarded as more than a straggler. In the seas of the South of Europe, and especially in the Mediterranean, it is very abundant.

The Bonito (*Scomber pelamys*) of Linnæus, is also an occasional visiter to the coasts of England, but its true realm is in the tropics. It is a very beautiful fish of a fine blue colour, with four dark lines extending from the pectorals along the side of the belly to the tail. It rarely exceeds thirty inches in length. The Bonito of tho Mediterranean, a fish of equal beauty, is a distinct species, and is the *Pelamys Sarda* of Cuvier. Its back and sides are marked by dark oblique transverse bands. It has much stronger teeth than the Bonito of the tropics.

THYSANU'RA, apterous insects, with six legs and peculiar organs of motion on their sides, or at the extremity of the abdomen. They undergo no metamorphosis. They have been grouped by Latreille under two families, of which *Lepisma* and *Podura*, two Linnæan genera, are the respective types. In the first we have a number of brilliant silvery little insects, covered with small scales, which are used as tests for the powers of microscope glasses. They have long setaceous many-pointed antennæ, distinct palpi to the mouth, and moveable false feet on the sides of the abdomen; the body is terminated by articulated setæ, three of which are especially conspicuous. The *Podurellæ* have 4-pointed antennæ, indistinct palpi, an abdomon terminated by a forked tail, which is folded under the belly when the animal is at rest, and serves to aid it in leaping. They are little, long, soft insects. The *Lepismenæ* and *Podurellæ* livo chiefly among wood or under stones.

TICO'REA, a genus of plants belonging to the natural order Rutaceæ. It has a small 5-toothed calyx, a monopetalous funnel-shaped corolla with a long tube, and a 5-cleft limb, either equal or unequal. The stamens are from 5 to 8, of which from 2 to 6 are often sterile. The disk is cup-shaped, surrounding the ovary; the stigma 5-lobed. *T. jasminiflora* is a shrub from seven to eight feet high, a native of Rio Janeiro. The leaves are ternate and stalked; the leaflets lanceolate, from one to six inches long, tapering to the base, acuminate, obtuse, deep green with pellucid dots. Tho calyx is rather downy, the corolla white, downy, glandular with pellucid dots. A decoction of the leaves is drunk by the Brazilians as a cure for framboesia. *T. febrifuga* differs but littlo in its character from the last species, but in its stem being generally arborescent, its panicles contracted, its flowers not more than half the size, the bracts more numerous and foliaceous, and tho style more protruded. The bark is intensely bitter, astringent, and is regarded as a febrifuge. (Lindley, *Flora Medica.*)

TIDAL HARBOURS. On the 5th of April, 1845, ten Commissioners were appointed by the Queen for the purpose of inquiring into the state and condition of the tidal and other harbours, shores, and navigable rivers of Great Britain and Ireland; and to ascertain what changes have taken place in any of such harbours, shores, and rivers, as respects bars, entrance, depth of water, extent and amount of scour, or otherwise; and what encroachments have been made upon them, or upon the waters above such harbours and rivers, by enclosures of lands, embankments, wharfs, piers, or other works; and by whom and by what authority such encroachments have been made; what effect they have produced, or may hereafter produce; and also what injury may have been done or may accrue, by the removal of shingle, rock, soil, or other materials, from any shores, or by the emptying ballast or other materials into or near any such harbours and rivers, or in consequence of wreck not being removed; and what measures are necessary and expedient to remedy and prevent any injury that may have resulted or may be likely to result therefrom; and also whether there are sufficient powers for enforcing such remedy; and whether any and what further powers are necessary. The Commissioners are also authorised to inquire into the state of the law, as regards the powers of the Commissioners who execute the office of Lord High Admiral, for the conservation of all harbours, shores, and rivers of the kingdom; and how the powers given to bodies corporate, commissioners, trustees, local authorities, or other persons, supersede or interfere with the powers vested in the Commissioners who execute the office of Lord High Admiral; and whether any and what legislative or other measures are necessary to confer the necessary powers on that office. The Commissioners are also empowered to inspect personally such harbours, &c., and to employ engineers and others to make surveys; and to call persons before them in order to obtain evidence, and to administer oaths for that purpose; and the Commissioners may from time to time make a report of their proceedings.

The First Report of the Commissioners is dated July 8, 1845. After stating that the labours of the Commissioners had been, in some measure, anticipated by returns from 260 harbours and havens, which had been made by order of the House of Commons in 1844, the Commissioners state that they have determined to confine their inquiries, in the first instance, to a few specific cases, having special reference to the necessity of some legislative measure to be taken without delay, in order to remedy the injuries which they found had already taken place, and which were daily increasing.

The Commissioners select as examples the rivers Clyde and Tay, and harbour of Montrose, in Scotland, and Southwold, Harwich, and Rye, in England. They find that great and increasing injury to the best interests of the country has accrued from negligence of the several authorities in permitting the improper removal of soil and beach, as well as by embankments, weirs, and other obstructions, which check the free flow of the tide, impair its strength, and thus permanently diminish the general depth of the river; and that, on the other hand, when the aid of experience and science have been called in, and a duo vigilance exercised, a proportionate improvement has been the invariable result.

In addition to the above examples, which the Commissioners examine and report upon in detail, numerous instances of encroachments, of neglect, and of want of efficient control, came before them in the course of their inquiries, several of which they mention.

The Commissioners next examine into and report upon the state of the law, and find that in numerous instances the jurisdiction of the Lord High Admiral, which is by prescriptive right and is recognised by statute, has, by charters and acts of Parliament, been superseded, to the great detriment of the public service.

The Commissioners then recommend that a Board of Conservancy be established, for the superintendance and protection of all the tidal harbours and navigable rivers of the United Kingdom of Great Britain and Ireland; that it be in connection with the Admiralty; and that it be permanent. They then explain in detail the powers which they are of opinion should be given to the Board, and its mode of operation in conjunction with the Admiralty.

They recommend, in the last place, that accurate plans and surveys, on a sufficient scale, of all the ports and navigable rivers in tho United Kingdom, should be made with as little delay as is practicable.

The Report is accompanied by Minutes of Evidence, an appendix of matters relating to the inquiry, and by plans of the rivers Clyde and Tay, Southwold Harbour and the river Blyth, Harwich Harbour, and Rye Harbour.

The Second Report of the Commissioners is dated March 20, 1846. It is printed separately, as well as with the Minutes of Evidence, the whole forming a very bulky volume, with numerous plans.

The Commissioners state that a more extended inquiry has fully confirmed the views which the limited examination of the previous year led them to. They find that there is not only a general want of control over the management and revenue of the ports, but that such control, in every one of the numerous cases which came before them, would have been the means of saving unnecessary outlay, of preventing encroachments which can now scarcely be remedied, and of preventing the execution of works which it is now expedient to remove. The income of the various ports of the United Kingdom considerably exceeds 800,000*l.* a year, the whole of which is levied by charters and acts of Parliament, or otherwise, from dues on shipping and on goods borne by shipping, but over the expenditure of which Parliament has not at present the slightest control. After explaining the causes of the misapplication of much of this money, the Commissioners detail their proceedings since the First Report.

They state that they have examined the chief ports on the east coast of England from the river Thames to the Tyne; that on the west coast they have inspected the rivers Lune, Wyre, Ribble, and Dee, and the ports of the Isle of Man; that in Ireland they have visited most of the ports and fishing-piers around the coast, and have been strongly impressed by the great value of its natural harbours, their depth and capacity, and the extent and capability of improvement of its fisheries, which, even in their present state, with the fishery-piers often in ruin from neglect, afford employment to 19,880 vessels and boats, and 93,000 hardy fishermen.

The commissioners next point out in detail the injuries which have arisen, partly from neglect and partly from mismanagement, and which an efficient control would have prevented, in the harbours of Dublin, Wexford, Waterford, Cork, Limerick, Galway, Sligo, Londonderry, Belfast, Newry, Dundalk, and Drogheda. They point out the damage which several of the breakwaters have suffered owing to bad construction, and the distress which has been occasioned by the neglect of repairing many of the fishing-piers. They cite as instances of neglect the injury done to Bantry Harbour, Skerries, and Larne, by discharging ballast and stones into them.

After adverting to the necessity for additional lights and beacons on the Isle of Man, they proceed to animadvert on the rivers and harbours of England:—On the north-west coast, the river Lune and the port of Lancaster, Fleetwood-on-Wyre, the river Ribble and port of Preston, the river Dee and port of Chester; on the south coast, Salcombe, Dartmouth, and Exeter; on the north-east coast, the river Tyne and port of Newcastle with North and South Shields, Sunderland, Hartlepool, Stockton-on-Tees, Whitby, Scarborough, Bridlington, Kingston-upon-Hull, Grimsby, Great Yarmouth, Norwich, Lowestoft, Beccles on the Waveney, Blackney and Cley on the north coast of Norfolk, Wells, near Blakeney, and Harwich Harbour.

It appears, from Parliamentary Returns, that the aggregate debt of the several ports of the United Kingdom, exclusive of docks in the port of London, exceeds 4,000,000*l.* and that consequently one-fourth of the whole harbour-income of 800,000*l.* must be annually appropriated to pay the interest of this debt. This large sum, though borrowed with the sanction of the legislature, has been entirely laid out by the several local boards without the least parliamentary or other special control.

The Commissioners then animadvert on the obstructions and shoals which so seriously impede and endanger the navigation of the Thames between London Bridge and Gravesend, arising from neglect occasioned by the conflicting claims of the Admiralty, the Trinity House, and the corporation of the city of London. The Commissioners finally again urge the necessity of establishing a Board of Conservancy for the superintendence and control of the management of all the tidal harbours of the United Kingdom. The proceedings of the Harbours of Refuge Commission are briefly stated under Refuge, Harbours of, P. C. S.

(*Tidal Harbours Commission—First and Second Reports*, 1845, 1846.)

TIDES. [Acceleration and Retardation of Tides, P. C. S.]

TILES AND PAVEMENTS. The subject of tessellated pavements being already partially treated of under Mosaic, P. C., p. 427, the principal object of this article is to notice some recent improvements by which the revival of this elegant and durable kind of architectural decoration has been facilitated. In doing so we may refer our readers for fuller information to the literary portion of a beautifully illustrated thin folio volume published in 1842 by Mr. Blashfield, a gentleman who has done much for the promotion of this long neglected branch of art, under the title of 'Designs for Mosaic and Tessellated Pavements, by Owen Jones, architect; with an Essay on their Materials and Structure, by F. O. Ward;' or, for a pretty full popular notice of the subject of ornamental pavements generally, to the 'Pictorial Gallery of Arts,' vol. i. pp. 182, 183.

Decorated paving tiles of baked pottery, commonly called encaustic tiles, which were much used in the pavements of churches and other ecclesiastical buildings of early date, have been recently brought into use again with excellent effect in the Temple Church, London, and many other buildings; and improvements in their manufacture introduced by Messrs. Chamberlain, of Worcester, and Mr. Minton, of Stoke-upon-Trent, have, by the aid of great pressure, rendered them much harder and less porous than old tiles of the same character, and therefore even more durable. The process of making these encaustic, or, as they are called from their resemblance to mosaic work, tessellated tiles, as practised at the Royal Porcelain Works at Worcester, is described by an eye-witness in No. 700 of the 'Penny Magazine,' from which we condense the following particulars:—These tiles are formed of two, or, if need be, more, differently coloured clays, one imbedded in the other. The body of the tile, which is about an inch thick, is moulded in stiff clay, of the quality required to form the ground colour of the device, which is frequently brown, in a mould which, in addition to giving the tile its required form, produces depressions about a quarter of an inch deep wherever another coloured clay is required; the process of moulding being effected under pressure by means of a fly and screw. The second coloured clay, which, instead of being made stiff like the first, is mixed to about the consistence of honey, is then applied so as to fill in all the depressions or cavities, it being carefully plastered in with a knife or trowel. Much care and skill are necessary in the selection of the clays, that they may be of such quality as to contract together in baking as if they were one, although they are of such different consistence when moulded. In order the better to guard against injury from irregular shrinking, the tiles are laid aside for about eight weeks to dry slowly, after which the surface is scraped to remove all that may be superfluous of the softer or second clay, and to bring it to a perfectly even face, and they are then baked or burnt in a similar manner to porcelain. Like porcelain also, they may be subsequently coated upon the upper surface with a liquid glaze, which is fixed and vitrified by a second burning. Such tiles may be imbedded in cement, and such holes or other cavities may be formed in their lower surface as will, by affording increased hold for the cement, render it almost impossible to disturb them from their bed.

Among other recently invented methods of imitating the antient Roman tessellated pavements, which are so called from being composed of small pieces termed tesseræ or tessellæ [Tessera, P. C., p. 245], Mr. Ward, in the Essay above referred to, notices a patent obtained early in the present century, by Mr. C. Wyatt, for producing ornamental pavements by inlaying stone with coloured cements; but both these and pavements formed by a combination of cements with terra-cotta appear to have failed from the unequal hardness of the materials used. More recently, according to this writer, Mr. Blashfield has constructed some pavements which have answered pretty well for indoor purposes, though they would not bear exposure to weather, of cements coloured with metallic oxides; and, but with less success, he has tried bitumen coloured in like way. In 1839 a patent was obtained by Messrs. Alfred Singer and Henry Pether for a method of forming tesseræ of pottery or porcelain by cutting them out of sheets of clay, and, after baking, combining them into slabs suitable for laying down to form pavements by means of Roman cement, of which a complete layer is formed at the back of the tesseræ. This plan has been followed, among other places, in a large pavement in the saloon of the Reform Club-house. Under ordinary circumstances it is proposed to form the tesseræ, which may be of any required colour, about an inch square, and to combine them into slabs of about eighteen inches square before laying down. In 1840 Mr. Prosser, of Birmingham, obtained a patent for a method of producing a substance similar to, but very much harder and less porous than common porcelain, by subjecting a mixture of pulverized felspar or flint and fine clay, in as dry a state as possible, to immense pressure between steel dies, so as to condense the powder into about one-fourth of its natural bulk, and then baking it. This process was first applied to the manufacture of a kind of button which has in a great measure superseded those of hone and mother-of-pearl; being, when well made, beautiful in appearance, and cheaper and far more durable than common buttons. Mr. Blashfield perceived the peculiar fitness of this process for making tesseræ for pavements, and the manufacture has been commenced by Mr. Minton with every prospect of success. These compressed tesseræ are made by a simple but powerful machine, which condenses the material from a thickness of about an inch and one-eighth to three-tenths of an inch, and are then baked in an oven; and it was stated by Mr. Blashfield in an explanatory lecture before the Society of Arts (reported in the 'Athenæum' of 1843, p. 266), that they had been found to bear a pressure of forty tons, and to be proof against injury by frost, some having been tried by plunging them in boiling water and immediately exposing them to a freezing temperature. Blue and green colours are imparted by metallic oxides during the baking process; but other colours are mixed with the materials before submitting them to pressure. By this process tesseræ are produced of such perfect regularity and uniformity in size and shape, that when fitted together they unite much more perfectly than those used in antient pavements, in which the beauty is often impaired by broad and irregular lines of cement. In constructing pavements with them, the tesseræ are arranged, face downwards, upon a smooth level surface, and, when a convenient portion of the design has been thus adjusted, a stratum of Roman cement is laid upon the back, and worked into the joints. The compound slabs thus produced are laid down upon the prepared foundation in the same manner as already described in the case of Singer's plan. This mode of producing tessellated pavements possesses many advantages over the antient plan, in which, a level foundation having been prepared by cramping stones together, or forming a thick floor of stucco or concrete, a layer of plaster was spread to receive the tesseræ, which were laid one by one while the plaster continued soft. This method required much time and care to preserve the level, and as that could not be done perfectly, much additional labour was involved in the subsequent rubbing down and polishing of the surface, an operation which, in the case of vitrified tesseræ, would have the further disadvantage of destroying their hard surface. Owing to the imperfect fitting of the antient tesseræ it was also necessary to spread cement upon the surface of the pavement, in order to fill up the joints and crevices, and afterwards to scrape it off again.

By Prosser's process, with the power supplied by an hydraulic press, bricks and other larger articles may be produced, among which may be mentioned slabs, inlaid with coloured devices, for chimney-pieces and other architectural decorations.

An extensive collection of specimens of Roman tessellated pavements, in a very large atlas folio, published by William Fowler early in the present century, together with specimens of antient stained glass, is worthy of the attention of those engaged in the revival of this elegant species of decoration, which, though necessarily expensive, has been so much reduced in cost by the introduction of the compressed tesseræ, that in some cases they have superseded the use of oil-cloth in the covering of halls, the substitution being made on the score of economy, although sanctioned by a refined taste.

TIMBER, PRESERVATION OF. Whatever other causes may combine to promote the decomposition of wood by dry-rot [Dry-Rot, P. C., p. 163] or other forms of decay, there can be no doubt that imperfect seasoning, by leaving in the pores of the timber a large portion of the fermentable juices always found in recently-felled timber, is one of the most important, and therefore that good seasoning is as essential in promoting the durability of wood as it is in lessening the tendency to those changes of form and bulk which so greatly increase the difficulties of the carpenter and joiner. The process of seasoning usually consists simply in the exposure of the timber to the action of air in a dry situation, in stacks or piles so constructed as to allow the free circulation of air in contact with as much as possible of the surface of each piece of timber, until the sap or vegetable juices shall have dried up so far as to offer no facility for the germination of the microscopic fungi which constitute various kinds of rot. In order to the success of this operation it is important that the pile of timber be so far elevated from the ground as to allow the circulation of air beneath as well as through and around it; and also that, if exposure to rain be not entirely avoided, care be taken to prevent the lodgment of moisture in any place where it would be likely to remain long. Great improvements in this respect have, of late years, been introduced in our dockyards, in the stacking of timber upon elevated supports of iron or stone, and the building of ships beneath spacious roofs, which protect their timbers from rain, while they allow an unimpeded current of air around them. In the article House, pp. 53 and 54 of this volume, we have noticed a very simple, though not unimportant, improvement upon the common method of seasoning flooring-boards. Kiln-drying, and the expulsion of sap by charring or scorching the surface of the timber, have also been tried, but without success, as substitutes for the tedious operation of natural seasoning.

Another process, which may seem at first sight very unlikely to succeed, and respecting which indeed the most contradictory opinions are given by writers on the subject, consists in the dissolving and washing out of the fermentable juices by lengthened immersion in fresh or sea water, and subsequent drying. Immersion in sea-water especially has been extensively practised of late years; and it is stated that in some cases where dry-rot had already made its appearance, this treatment has arrested it, the action of the sea-water appearing to destroy the vitality of the fungi. Some authorities however state that ships built of timber which has been so immersed, are unhealthy in consequence of the hygrometric properties acquired by the absorption of salt.

The protecting power of metallic oxides, when applied to the surface of wood in the form of paint, is well known; and many abortive schemes for the preservation of timber have been devised to act upon the same principle, which is that of excluding such external influences as might promote decay. To imperfectly seasoned timber however such applications are worse than useless, because by filling up the pores they impede the natural drying of the vegetable juices, and therefore rather promote than check internal decay. Far more efficient than these are the numerous modes of protection which involve the impregnation of the timber with some antiseptic substance, or with such matters as, by pre-occupying the pores, may render the reception and germination of destructive fungi mechanically impossible. Historical notices of many processes of this character are given in a paper in the 'Mechanic's Magazine,' vol. xxxix. pp. 346-350, extracted from a report made in 1843 by a committee of the Franklin Institute, on the best method of paving highways; and in a previous volume of the same work (vol. xxxvi., p. 406, &c.) is a report of an interesting conversation on the subject, at a meeting of the Institute of Civil Engineers, in 1842, when several of the principal modern inventions were discussed.

Of plans for protecting timber by impregnation, perhaps none has attained such general celebrity as Mr. Kyan's, which was patented in 1832, and has been very extensively practised under licences granted by the Anti-Dry-Rot Company. The preservative agent in this process is bi-chloride of mercury, commonly called corrosive sublimate, which is dissolved in water, and forced into the pores of the timber, in closed tanks, by means of force-pumps, and which combines with the albumen of the wood, and converts it into a compound capable of resisting the ordinary chemical changes of vegetable matter. The idea of using corrosive sublimate for this purpose does not appear to have originated with Mr. Kyan; that substance having been tried and recommended as an anti-dry-rot application by Sir Humphry Davy many years previously. The alleged failure of the precipitate formed by Kyanization to protect timber when exposed to the action of sea-water, led Sir William Burnett, physician-general to the navy, to patent a method for preserving timber by impregnation with chloride of zinc, which process, like Kyan's, is also applicable to canvas, cordage, &c., and to which the name of *Burnetization* has been given. Sir John Barrow has recommended the application of creosote, obtained from the distillation of tar, and applied in the form of gas, by which it may be made to penetrate to the heart of the largest logs. This treatment renders the wood exceedingly hard, so much so indeed as to render it difficult to work. An oil extracted from chips and refuse wood was used for the same purpose by Mr. Mackonochie in 1803. He applied it by placing the timber in a steam-tight chamber, expelling all air and gases from the pores of the timber by the admission and subsequent condensation of steam; and, after repeating this process as often as needful, plunging the timber into the oil, which filled the exhausted pores. Mr. Bethell's more recent invention, of which an account is given under 'Wood-Preserving,' in the 'Supplement' to Dr. Ure's 'Dictionary of Arts,' &c., appears to be somewhat similar, although the impregnation is effected by withdrawing the air and gases by air-pumps, and forcing the injected fluids into the pores by hydrostatic pressure. Dr. Ure mentions the application by this process of oil of tar and other bituminous matters containing creosote, and also of pyrolignite of iron, which holds more creosote in solution than any other watery menstruum. For railway sleepers, piles, posts, and fencing, this process has been extensively and most successfully employed, as timber protected by it is not affected by exposure to alternate wetness and dryness; while the commonest and cheapest Scotch fir is rendered superior to the best and hardest wood in an unprotected state. In the discussion at the Institute of Civil Engineers above alluded to the efficiency of coal-tar in preserving ship-timbers was particularly mentioned. It was stated to be very superior to vegetable tar, and its efficacy in resisting the worm was attributed to its containing sulphocyanic or sulpho-prussic acid, which is highly destructive to animal and vegetable life. Piles protected with coal-oil were stated to have resisted the attacks of the teredo better than those protected by Kyan's process. It is necessary however to observe that the coal must be deprived of its ammonia, which would produce immediate decay if thrown into the timber. In Mr. Bill's method, tried about 1822, some large logs were impregnated with asphaltum; and a five years' immersion in the dry-rot pit at Woolwich showed that timber thus prepared would withstand the fungus-rot, while unprepared timbers were destroyed in one-fifth of the time. M. Pallas, in 1779, proposed to mineralize wood by steeping it to saturation in green vitriol, and precipitating the vitriol by means of lime-water; and in Payne's recent process it is proposed, by the application of both exhaustion and pressure, to impregnate wood with metallic oxides, alkalis, or earths, and, by decomposing them in the pores of the wood, to form new and insoluble compounds. The writer has seen specimens of wood which appeared to be almost silicified or fossilized by this treatment, by which the softest woods may be rendered harder and denser than the hardest in their natural state, apparently indestructible by any ordinary process of decay, and, for all practical purposes, incombustible. In addition to its anticipated utility as a means of preserving timber, this process may probably be useful in increasing the value of many soft and rapidly growing woods, by rendering them applicable where hitherto none but costly woods could be employed. In 1840 Dr. Boucherie presented a memoir to the French Academy of Sciences on the application of pyrolignite of iron (which had been previously used in this country by Mr. Bethell, as above mentioned), or of other metallic salts or earthy chlorides, by a process which he terms *aspiration*, which consists in immersing the lower end of the tree, as soon as it is felled, in the solution, which is thereby drawn into the pores by what may be considered as a continuation of the natural process of circulation. Unless performed immediately after felling, the process will not answer, as the power of absorption becomes very shortly impaired. Other plans have been tried for effecting impregnation from one end of the timber, in some cases by attaching a water-proof bag containing the fluid to the upper end, and thus causing the preserving liquid to trickle down through the substance of the wood, until it drops from the lower end. In connection with all such schemes it is well to remember a fact which has been pointed out as indicative of a valvular structure in wood, namely, that if a trunk be exposed to a running stream, with its butt end towards the current, its vegetable juices will be much sooner washed away than if it be laid in the opposite direction. Dr. Boucherie proposed by his process to infuse such liquids as might prevent dry-rot, warping, and splitting, such as should reduce the inflammability of timber, or such as should impart any desired colour or odour; and it is evident that the same objects might be effected by many of the other modes of impregnation which have been suggested. Mr. Bushell, for example, proposed, in order to render wood fire-proof, to use silicate of potash, or soluble glass, which when heated would melt, and form a protecting film or glaze, impervious to the further action of fire.

A popular article on the preservation of timber, in which several of the above methods are noticed, was given in the 'Penny Magazine' for 1844, p. 135; and much information on the subject is contained in the article 'Ship-Building,' and some other articles of the same kind, in the seventh edition of the 'Encyclopædia Britannica.'

TIME. A reference has been made to this head from the word FUTURE. Time as expressed by the different forms of verbs is considered in the article CONJUGATION, P. C.

TISSUES, ORGANIC. SECTION I.—*General Organic Substances.* In the present section we propose taking a brief sketch of the chemical physiology of the organic kingdom. We commence with the consideration of the origin of those substances which are common both to plants and animals, or which exist in one of them only. The first division contains protein; the second embraces cellulose in plants, and gelatin in animals. We shall show that these substances and their derivatives yield the foundations of the animal and vegetable kingdoms.

Protein is undoubtedly the most important of all known substances in the organic kingdom. It is present in all parts of plants, in roots, stems, leaves, fruits, and in their several juices; in the animal body it is the chief constituent of the blood, the muscles, and many other parts, and is the original source of numerous other compounds. In plants it assumes three different forms, being soluble in water, insoluble in water, or soluble in alcohol; in animals it may be either soluble or insoluble in water. For the mode of obtaining it see CHEMISTRY, P. C. S., p. 349. It is one of the substances directly prepared for the food of plants, and is found in the youngest roots; whether it is only *formed there*, and afterwards conveyed to the other parts, or whether it is produced in any other part of the plant, is uncertain. Its property of being readily soluble in water facilitates its transference to the various organs. It may however assume the solid state and become deposited in cells; in this form it occurs in many seeds, occasionally being their principal constituent. This deposition is effected in a very simple manner. Most acids render it insoluble, and therefore the mere presence of an acid is usually sufficient to accomplish the transformation: again, the insoluble protein may be redissolved by alkalies, and hence, after it has been deposited in the cells in a solid state, it may be removed to another part of the plant through the medium of an alkaline solution.

Whether protein can be formed within the animal body is uncertain, but it cannot be doubted that the protein compounds in vegetables are imparted to animals in their food, and as these compounds form the principal component parts of the animal body, this constituent must be supplied either wholly or in part by plants.

The protein-compounds existing in plants were till quite recently known as soluble albumen, coagulated albumen, legumin, and gluten; Liebig has however applied to the three first the names vegetable albumen, vegetable fibrin, and vegetable casein, asserting that they are identical in their physical properties and in their chemical compositions with the corresponding principles in the animal kingdom. Mulder, the discoverer of protein, denies the accuracy of this statement. 'The special character of these animal substances is,' he remarks, 'determined by the small portions of sulphur and phosphorus they contain, by which they differ from each other and from pure protein. The proportions of sulphur and phosphorus in the three vegetable substances are still unknown; and therefore the names proposed by Liebig cannot be applied to them. Moreover both vegetable albumen and legumin differ so much from animal fibrin and casein, both in form and appearance, that they ought not to have a similar name.' We shall retain the former names, representing by *legumin* the substance which is precipitated in white flocks, when the infusion of crushed peas or beans in warm water is mixed with an acid.

By *soluble vegetable albumen* we mean to designate that substance which, being soluble in water, is precipitated from the juices of plants by heat, alcohol, or acids. It is soluble in weak alkaline fluids, from which it is precipitated by acids, and, independently of the sulphur and phosphorus, has the same composition as protein. By *coagulated* vegetable albumen we mean the compound of protein, sulphur, and phosphorus which is insoluble in water; it exists in the seeds of the cerealea, in almonds, &c. By *glutin* we understand the substance which can be extracted by alcohol from the ordinary *gluten* obtained by washing away the starch from flour. It is the same substance as is described in the article CHEMISTRY, P. C. S., as gliadine. Its composition according to Mulder is 10 (C_{40} H_{31} N_5 O_{12}) + S_2, or 10 $\overline{Pr}$ + S_2 if we take $\overline{Pr}$ as an arbitrary symbol for protein.

The protein-compounds contained in the animal body, as far as we yet know, are the following:—

Fibrin from blood is composed according to the formula 10 (C_{40} H_{31} N_5 O_{12}) + S P, or 10 $\overline{Pr}$ + S P; that is to say, every atom or equivalent of fibrin contains 10 atoms or equivalents of protein with one each of sulphur and phosphorus. *Albumen* from eggs has a similar composition.

Albumen from the serum of the blood is represented by 10 (C_{40} H_{31} N_5 O_{12}) + S_2 P, or 10 $\overline{Pr}$ + S_2 P; that is to say, it differs from fibrin in containing one atom more of sulphur.

Casein from cow's milk, 10 (C_{40} H_{31} N_5 O_{12}) + S, or 10 $\overline{Pr}$ + S.

Crystallin, the substance that forms the principal constituent of the lens, 15 (C_{40} H_{31} N_5 O_{12}) + S, or 15 $\overline{Pr}$ + S.

These are all the protein-compounds of the animal body yet known. The muscular fibre is for the most part composed of a protein-compound, fibrin, which likewise exists in the circulating fluids; and albumen occurs in the brain, liver, kidney, and many other organs, as well as in the blood. The above compounds of protein enter into some very important combinations, a few of which, from their physiological bearings, we shall here notice. The combinations of the leading protein-compounds, fibrin, albumen, and casein, with alkalies, acids, and salts, are especially remarkable. Protein is soluble in weak alkalies, and according to Mulder it exists in the blood as a proteate of soda with sulphur and phosphorus. Enderlin and the Giessen school, on the other hand, deny that it exists in that fluid as proteate of soda. They assert that the cause of the alkalinity of the blood is the presence of the ordinary tribasic phosphate of soda—a salt which has the power of dissolving the protein-compounds: the question whether Mulder or Enderlin be correct is still undecided.

On neutralizing a weak alkaline solution of protein by an acid, its solubility is greatly diminished; a fact which Mulder regards as elucidating the medical properties of certain acids. The sulphuric and phosphoric acids for instance possess the property of stanching blood; acetic acid, on the contrary, by which protein is readily dissolved, is destitute of that property. Very dilute hydrochloric acid occurs in the stomach, and as it possesses the property of dissolving protein, it doubtless renders the food (at least the portion consisting of protein-compounds) tender, and thus assists digestion. Some acids enter into combination with the protein-compounds, producing comparatively insoluble bodies. For this reason certain acids (sulphuric and hydrochloric) are very efficacious in putrid fevers, scurvy, &c. As an illustration of the combinations of the protein-compounds with salts, we may notice that of bone-earth with casein. Bone-earth is a phosphate of lime whose composition is represented by the formula 3 P_2 O_5 + 8 Ca O. In casein, and therefore in milk, it exists in great quantity, and this seems to supply a large amount of earthy matter to the tender bones of young animals.

In addition to albumen and fibrin, a third protein-compound exists in the blood, constituting the cell-wall of the corpuscles. It is termed *globulin*. Its real composition is unknown: Simon regards it as casein. All these protein-compounds contain more or less phosphate of lime, which thus finds its way to the bones.

Two other very important protein-compounds exist in the animal body, namely the binoxide and tritoxide of protein. They both exist to a large amount in the blood in inflammatory diseases, and to a small amount in healthy blood. The latter is soluble in water, the former is not. (For the mode of obtaining them in a state of purity, and for the fullest account of them in the English language, we must refer to Dr. Day's Introduction to Simon's 'Animal Chemistry,' published by the Sydenham Society, London 1845.) At every respiration a small amount of them is produced in the blood, and Mulder (who must be regarded as the highest authority in all that relates to protein) believes that they form around the blood-corpuscles a thin layer having the same composition as the buffy coat or inflammatory crust.

The above sketch is sufficient for our purposes at present. In a later part of this article we shall have occasion to return to the protein-compounds. We now turn to the second group, commencing with the consideration of *cellulose*, or the cellular substance of plants. As the morphology of vegetable cells has been fully discussed in the article TISSUES, VEGETABLE, we shall confine our observations to the chemical characters and metamorphoses of this substance.

This cellular substance may be procured from all the parts of plants without exception, by dissolving (by certain re-agents) the other substances associated with it. Pure cellulose is easily obtained from the pith of the elder-tree, or from very young roots. The substances most commonly associated with it are, starch, gum, fats, resins, vegetable alkalies, salts, sugar, and the peculiar woody matter termed by Payen *matière incrustante*. After the removal of these substances by extraction with alcohol, ether, dilute potash, hydrochloric acid, and water, the cellulose, which was previously solid and dense, assumes a spongy appearance. As a proof of its constant composition, it is worthy of mention that the following substances, previously purified in this manner, gave similar results, viz. the ovula of almonds, of apples, of the Helianthus annuus, the sap of cucumbers, the tissue of the cucumber, the pith of the elder-tree, the pith of the Æschynomene paludosa, cotton-wood, the leaves of endive and of Aylanthus glandulosa, the tracheæ of the Musa sapientum, films from the pith of oak-trees, cellulose from cow-dung (the cow fed with meadow-grass), the internal tissue of the leaves of Agave Americana, the skeleton of a wasp's nest, the perisperm of the Phytelephas, extracted lichen, membranes of the Chara, &c. From these and various other substances, the purified cellulose always gave a result approximating to the formula C_{24} H_{21} O_{21}. It is thus apparent that the proper tissue of all plants leaves a substance which is identical for all of them,—a substance which contains carbon and the elements of water, which is isomeric with inulin [CHEMISTRY, P. C. S., p. 345], and therefore easily convertible into starch and sugar; and that in its turn it may easily be produced from dextrin [CHEMISTRY, P. C. S., p. 343], the change consisting only in the loss or gain of the elements of water. It has been recently shown by Von Baumbauer (in Mulder's Laboratory) that sulphuric acid or diastase will convert cellulose into dextrin. Hence the cellular substance is closely allied to starch, dextrin, gum, and sugar, causing their production in the vegetable kingdom, and no doubt being itself produced from one of them, namely from dextrin. It is therefore of great importance to the animal body. It explains the nourishing power of those plants in which the incrustation of the cellulose is prevented by artificial means, as of greens, endive, sea-kale, &c. The cellulose of these plants, being easily converted into dextrin, may fairly be reckoned amongst the substances which are most serviceable in maintaining the vital functions of animals.

Further, as cellulose exists ready formed in the youngest parts of plants, it belongs, together with protein, to the first vegetable products of the food of plants; and, further, it follows, that from cellulose, or from vegetable substances similarly formed, especially from one soluble in water, namely dextrin, starch, gum, and sugar are occasionally formed. In many parts of plants we find starch, especially in the lichens, which consist for the most part of cellulose. In many fruits containing a large proportion of cellulose, there is much sugar. These different substances may be produced from the same cellulose, simply by a change in its physical character and a new chemical arrangement of its constituents. On the other hand, we observe that fleshy fruits, from being sugary, become mealy when kept through the winter; this being a converse change of sugar into cellulose. Hence, as Mulder remarks, 'we may consider the cellular plants as consisting chiefly of cellulose and of protein-compounds; the vascular plants containing, in addition, the incrusting or real woody matter. These together are the most indispensable constituents of plants; they are found everywhere and in all their organs. Cellulose is to plants what gelatin is to animals; they form together the cells in these two kingdoms. In the cells both of plants and animals protein-compounds are either deposited in solid particles or are dissolved in the liquids with which their organs are permeated. In plants the cell-walls are thickened by the woody matter; in animals, the cells contain fat and other substances; in animals, as well as in plants, the cellular substance is the chief agent in connecting all the other existing organs.'

Mohl and Schleiden have shown that the cellular membrane of many parts of plants is coloured blue by iodine, just as if it contained starch. This apparent identity of re-action would lead us to infer that cellulose can often be modified as it were into starch, though still retaining the appearance of cellular membrane. The similarity of the chemical constitution of these two substances renders their conversion apparently easy.

For 1 eq. cellulose (C_{24} H_{21} O_{21}) = 2 eq. starch (C_{24} H_{20} O_{20}) + 1 eq. water (H O). Hence, by a separation of water and a re-arrangement of the molecules, cellulose may be converted into starch; and conversely, by the absorption of water, starch may be converted into cellulose.

Starch exists in three separate forms: common starch, lichen-starch, and inulin. The first is intermediate between dextrin and cellulose; the second, between dextrin and common starch; and the third, between common starch and sugar.

Common starch occurs in the form of globules, which are found in the most different parts of plants, and present varying forms in consequence of having to adapt themselves to the shape of the cells in which they have been deposited. It has been frequently observed that starch-globules, after being deposited, again disappear under the influence of growth; that is to say, they become dissolved and carried away to other parts by the sap, and give origin to new products. In young parts of plants, such as the extremities of the radicles, no starch is present, but only cellulose and protein-compounds; hence, it is not formed till after the parts in which it has to be deposited have obtained a certain growth. Payen could not detect any starch-globules either in the vessels or in the intercellular canals; hence, if starch is present, it must occur in a dissolved state, or in a modified or changed condition. It is further worthy of remark, that in those bulbs in whose scales there is much starch, it disappears either in part or altogether on exposure to light; that is to say, it becomes converted into other substances. This is the reason why much less starch is to be found in the parts of a plant which are above-ground than in the roots; and that in plants whose stalks contain starch it is found chiefly in the pith. We have already mentioned that starch-globules may be dissolved wholly or in part during the growth of the plant. According to Payen the products of this metamorphosis are dextrin and sugar, and the cause of the action diastase, a substance the effect of which on starch separated from plants is now well known. This is the change which frozen potatoes undergo when all the starch is converted into sugar. It also takes place in the growth of new potato-plants; all the starch disappearing from the tuber, and being replaced by sugar. According to De Candolle, the quantity of starch in potatoes increases during their ripening almost in the same degree as it afterwards diminishes. In August, 100 lb. of potatoes gave 10 lb. of starch; in September, 14·5 lb.; in October, 14·75 lb.; in November, 17 lb.; it remained constant till the end of February; in April it had diminished to 13·75 lb.; and in May, to 10 lb.

There is still considerable mystery regarding the formation of starch. We have undoubted evidence that it gives rise to the formation of dextrin and sugar, and it is just as certain that the same substances may, under different circumstances, form starch. In addition to its uses in forming dextrin and sugar, it is likewise the efficient agent in the production of fat and of chlorophyle.

Lichen-starch. The starch of the cryptogamic plants has been examined by several chemists, especially by Vogel and Dietrich. It is coloured green by iodine, instead of blue, and in several other points differs from ordinary starch.

Inulin is a modification of starch, very abundant in the dahlia, helenium, and taraxicum, but found also in many other plants. [CHEMISTRY, P. C. S, p. 345.] It is very readily converted into sugar, and as it combines with this sugar and carries it with it, it is obvious that ultimate analyses of inulin from different plants must vary. Possessing apparently the same composition as starch, it differs in not being changed into a jelly by hot water; nor does it turn blue with iodine, but yellow. It may as well be termed a variety of sugar insoluble in cold water and destitute of taste, as a variety of common starch. From the facility with which it may be converted into sugar, it must, like dextrin, be placed between sugar and common starch. In many plants dextrin is a transition substance from common starch to sugar, as is the case when either sulphuric acid or diastase [CHEMISTRY, P. C. S., p. 343] acts on it. In other plants inulin seems the transition between starch and sugar, without the formation of dextrin. As its composition is the same as that of cellulose, it is probably produced from that substance and not from starch.

From starch we are led to the consideration of a very important constituent of plants, *dextrin*, which is obtained by treating starch with *diastase.* [CHEMISTRY, P. C. S., p. 343.] Mulder has shown that *dextrin* may also be obtained from cellulose both by sulphuric acid and by diastase. The quantity of diastase required is extremely minute; if too much be used, or the process continued too long, grape-sugar is produced. It is by these or similar means that nature converts cellulose into dextrin, and dextrin or starch into sugar. As in malting barley diastase is naturally produced from starch, there is no reason why it should not in a similar manner be produced in the growing plant, and thus convert the cellulose into dextrin.

The sap of nearly all plants contains a certain amount of dextrin, which, having the same chemical composition (C_{12} H_{10} O_{10}) as gum, and in many other points resembling it, has been in most analyses put down as gum. If one equivalent of water (H O) be taken from one equivalent of cellulose (C_{24} H_{21} O_{21}), two equivalents either of gum or dextrin [2(C_{12} H_{10} O_{10})] are formed. Thus a part of the cellular membranes may be converted into dextrin by catalysis [CHEMISTRY, P. C. S., p. 341] without destroying the cells, if the vegetable sap, while passing through them, contains only a very minute quantity of diastase, or of a substance resembling it.

We have already mentioned that gum and dextrin have been frequently confounded. The most important difference between them is, that the latter may be changed into grape-sugar by sulphuric acid or diastase, while the former is incapable of undergoing that change.

Dextrin belongs to the nutrient matters; all the starch taken as food being converted by the gastric juice into it. The gums are mere excretions, and are apparently of little or no importance.

There seems every reason for believing that dextrin is the source of the cellular matter, for it is a universal constituent of all parts of plants. We are justified in assuming that the sap of plants must contain the elementary matter of cellulose in a state of solution, so as to be able to penetrate through the cell-walls, and to supply new substance to increase the number of cells. No material but dextrin is fitted for this office, though in young plants sugar also contributes to it. By the production, during germination, of dextrin and sugar, we are led to believe that the cellulose of the young plant is really formed from this dextrin and from the sugar in the germinating cotyledons. Whilst many full-grown plants do not contain sugar, all contain dextrin, so that the use of the latter in the formation of cells cannot be doubted.

Dextrin is not merely a source of cellulose, but likewise of starch, sugar, gum, and perhaps other vegetable substances; it is almost as valuable to plants as protein is to animals, for it is a constituent from which their organism derives its most important products. The composition* of dextrin being C_{12} H_{10} O_{10}, the formation of cellulose is accomplished by every two equivalents of dextrin taking up one equivalent of water. Thus

$$2\,(C_{12}\,H_{10}\,O_{10}) + H\,O = C_{24}\,H_{21}\,O_{21} = \text{cellulose.}$$

Starch and gum contain the same elements in the same proportions as dextrin, and hence for their production require merely a re-arrangement of the molecules.

Sugar, as we shall immediately show, requires only the addition or subtraction of water from the elements of dextrin.

The different species of sugar, as far as they are yet known, are—

1 Milk-sugar	. .	$C_{24}\,H_{19}\,O_{19} + 5\,H\,O$
2 Cane-sugar	. .	$C_{12}\,H_{9}\,O_{9} + 2\,H\,O$
3 Grape-sugar	. .	$C_{12}\,H_{12}\,O_{12} + 2\,H\,O$
4 Eucalyptus-sugar	.	$C_{24}\,H_{19}\,O_{19} + 9\,H\,O$

Milk-sugar is an integral constituent of the milk of the mammalia, and has very rarely been met with anywhere else. It has recently been detected in eggs during the process of incubation; but this observation requires to be confirmed. Cane-sugar is the most closely related to starch and dextrin, differing from them merely by one equivalent of water. It is not by any means so widely distributed as grape-sugar, being found in very few plants besides the sugar-cane, beet, and maple. Grape-sugar is identical with the sugar in honey and in diabetic urine, and with the glucose or fruit-sugar of the French chemists. The uncrystallizable sugar which is obtained during the decomposition of many plants, and which is yielded by starch acted on by diastase or sulphuric acid, has the same composition as grape-sugar.

Eucalyptus-sugar is a species of manna produced in Van Diemen's Land by various species of eucalyptus. Whether it

* The formula C_{24} I 10 O_{10} in the article CHEMISTRY, P. C. S., p. 343, is obviously a misprint.

is the natural sap spontaneously escaping, or whether it is the sap extracted by the locust and afterwards excreted, is uncertain. Its properties have been carefully examined by Professor Johnston of Edinburgh.

There is obviously an intimate connexion between these different kinds of sugar, as well as between cellulose, starch, dextrin, and gum. They all contain carbon, in combination with the elements of water. As they all contain C_{12} or a multiple of it, they are produced from each other by a simple change depending on catalytic force. [CHEMISTRY, P. C. S., p. 341.]

If sulphuric acid is allowed to act on gelatin, a species of sugar containing nitrogen, and termed *glycicoll* or *gelatin sugar*, is formed. Its formula is $C_8\,H_9\,N_2\,O_7$; and it is worthy of remark that if from two of its equivalents we deduct one equivalent of cane sugar, we obtain the elements of two equivalents of urea, or

$$2\,(C_8\,H_9\,N_2\,O_7) - C_{12}\,H_{10}\,O_{10} = 3\,(C_2\,H_4\,N_2\,O_2).$$

This relation leads to the belief that sugar is a component part of the gelatinous tissues, and when separated from them it may be presumed to discharge the same functions as when either cane or grape sugar is supplied with the food. In other words, there exists in the substances yielding gelatin a primary matter which exists also in cane-sugar. If then substances or tissues containing gelatin are employed in effecting the metamorphosis continually occurring in the animal body, this primary matter may serve the same purpose as cane-sugar when supplied to feed the body. On these grounds Mulder considers that gelatin-sugar should be classed amongst the nourishing substances. If gelatin be formed in the animal body, then sugar, either derived directly from the food or produced from starch in the alimentary canal, may be used for this purpose.

It is not known in what part of the plant sugar is formed. Mr. Knight states that birch sap contains more sugar the farther from the root it is collected; this seems to prove that the sap, which probably contains much dextrin, is changed into sugar as it passes through the cell-walls. When sugar accumulates in certain parts of a plant, it almost always remains in solution; it is however found crystallized in some few instances, as in the nectary of Fritillaria imperialis.

Closely allied in its chemical composition to sugar is a peculiar substance to which the term *mucilage* is given. Although insoluble in water, it assumes the appearance of a mucilaginous mass when immersed in that fluid. It sometimes accumulates largely in certain parts of plants, as in the perisperm of quince-seed, lint-seed, &c.; it is the chief constituent of the gums tragacanth and Bassora, and is abundant in various roots, as for instance the mallows. According to Mulder's analysis it must be represented by the formula $C_{24}\,H_{19}\,O_{19}$. It has been shown by Schmidt that mucilage when digested with dilute sulphuric acid is converted into sugar. Hence it supplies a link to the following series of analogous substances:

Grape-sugar and fruit-sugar . .	$C_{24}\,H_{24}\,O_{24}$
Cellulose and soluble inulin . .	$C_{24}\,H_{21}\,O_{21}$
Starch, dextrin, gum, insoluble inulin, and lichen-starch	$C_{24}\,H_{20}\,O_{20}$
Mucilage, milk-sugar, and eucalyptus-sugar	$C_{24}\,H_{19}\,O_{19}$
Cane-sugar	$C_{24}\,H_{18}\,O_{18}$

In its physical characters the product of the mucous membrane of the animal body resembles vegetable mucilage. Owing to their insolubility in water, both these substances serve to cover denuded parts of animals, and thus they are both suited to lessen or prevent the influence of acrid matters on the tender parts of the animal frame. It is for this reason that the mucilage of salep, tragacanth, &c. may be made, in certain diseased conditions, to supply temporarily the want of animal mucus. In chemical composition they are perfectly distinct, as animal mucus contains nitrogen. The mucus of the animal body seems however to differ according to the organs by which it is produced. (Day's edition of Simon's *Animal Chemistry*, vol. ii. p. 78, note.)

We now arrive at a peculiar group, occurring both in the vegetable and animal kingdoms—*the fats.*

Stearin, margarin, and olein are the most widely distributed fats in the organic kingdom, but they are not the only ones. They were formerly regarded as salts formed by fatty acids with glycerin [CHEMISTRY, P. C. S., p. 344]; recent investigations have however shown that this view requires a slight modification. Berzelius thinks that glycerin does not exist ready formed in the neutral fats, but that it is a product of the formation of soap; and he considers the base of the neutral fats to be the oxide of a radical ($C_3\,H_2$) which he terms lipyle. Glycerin is then formed from two equivalents of the oxide of lipyle, with three equivalents of water: $2\,C_3\,H_2\,O + 3\,H\,O = C_6\,H_7\,O_5$. (If to this we add one equivalent of water, we obtain the formula given in CHEMISTRY, P. C. S., p. 344.)

According to this view, which is supported by Redtenbacher, Varrentrap, and Mulder, the base of every neutral fat yielding glycerin is a compound which is represented by $C_3\,H_2\,O$.

The most important of the fatty acids are:—

Stearic acid . .	$C_{68}\,H_{66}\,O_5 + H\,O$
Margaric acid . .	$C_{34}\,H_{33}\,O_3 + H\,O$
Oleic acid . .	$C_{44}\,H_{40}\,O_4 + H\,O$

These are universally diffused in plants and animals; and, combined with the oxide of lipyle ($C_3\,H_2\,O$), they form the neutral fats—stearin, margarin, and olein; and this is the form in which they most commonly occur in the organic kingdom. Sometimes however a more powerful base (potash, soda, &c.) removes the oxide of lipyle, and there are then formed compounds of the fatty acids with alkalies.

In connexion with this subject, Mulder observes that 'when salad-oil is conveyed into the stomach, it may pass unchanged into human fat, for both consist of margarin and olein, although in different proportions; and as margarin and olein are found in many vegetables used for food, nothing is more simple than to assume that these substances are directly transferred, without change, into the fats of the animal body.

'But if these same vegetables are eaten by a sheep, the olein and margarin must undergo some change in the body of the animal, since mutton-fat contains a large amount of stearin. In this case the change is easily understood, for 2 eq. margaric acid ($C_{68}\,H_{66}\,O_6$) = 1 eq. stearic acid ($C_{68}\,H_{66}\,O_5$) + 1 eq. oxygen. Thus, from two equivalents of margaric acid, one equivalent of stearic acid is produced, and one equivalent of oxygen is given off. In all probability, such a deoxidation of the margaric acid in the food of the sheep is really effected; and on the contrary, when mutton-fat is used for food by man, stearic acid is most probably converted into margaric acid by the absorption of oxygen.' It is now believed by our first physiologists, that the neutral fats taken as food do not directly form fatty tissue, but that they enter the blood in a saponified state. In fact the alkaline character of the bile as it enters the duodenum renders it impossible for the fat to enter the blood without undergoing this change. If it is saponified, we readily understand how compounds of fatty acids and soda should exist in the blood and in various parts of the body. When a soda-soap however exists in the blood, it cannot form a neutral fat, such as margarin or olein, without combining with glycerin. This leads to the inquiry, in the first place, whether these soaps meet with glycerin; and secondly, if they do, whether the glycerin would combine with the fatty acids and form neutral fats. There is good reason for believing that both these questions may be answered in the negative, for the glycerin set free when the soda-soap is formed, is most probably at once decomposed; and further, glycerin will not remove the soda from the fatty acid and form a neutral fat.

It has been suggested by Mulder, that although glycerin will not enter into this combination, the oxide of lipyle in a nascent state may do so, and that in this manner the fatty acids may be converted into neutral fats and deposited in the cellular tissue and other parts of the body. We have already shown that (according to the opinion of Berzelius) glycerin is the oxide of the radical ($C_3\,H_2$) lipyle. The second oxide of this radical exists in lactic acid, which is supposed by the great majority of chemists to be present in most parts of the body. When lactic acid ($C_6\,H_5\,O_5$) is sublimated, we obtain a white sublimate, the composition of which is $C_3\,H_2\,O_2$; while the composition of the oxide of lipyle is $C_3\,H_2\,O$.

It may happen that there are causes of deoxidation at work in the system, by which some of the substances usually converted into lactic acid are made to produce oxide of lipyle, which in the nascent state unites with the fatty acids, forming neutral fats.

Hence in all probability the neutral fats are not deposited directly and unchanged in the cellular tissue, but are first saponified, and entering the blood as margarate and oleate of soda, are again reduced to neutral fats by the influence of lactic acid.

In many parts of plants, especially in the perisperms of some fruits, a fatty matter (popularly known as *wax*) occurs. It has been known to exist in plants, but it has only recently been shown that bees can prepare it from honey, which does not contain any wax at all. It is the wax that gives to grapes and plums their beautiful purple bloom; it abounds in the skins of apples, and is a component of the green colouring matter of leaves (chlorophyle), of which we shall presently speak. Avequin has analyzed the crystalline wax which collects on the surface of the sugar-cane, and to which he has given the name *cerosia*. He mentions an important peculiarity in connexion with it, namely, that those kinds of sugar-cane which contain much sugar have but little cerosia; while conversely, those which contain much cerosia have but little sugar. From this we should infer, that either wax is used in the plant to produce sugar, or sugar to form wax. That the latter is the case seems definitely proved by the following experiments of Gundlach. He fed bees with a solution of sugar-candy in water, and saw them producing wax. Thus the sugar-cane and bees are both enabled to convert sugar into wax, that is, into a fatty matter.

There are some animals, just as there are some plants, which contain peculiar fats; there are even separate organs in which certain fats are formed.

In butter we find the following acids, chiefly in combination with oxide of lipyle: margaric and oleic acids, and

Butyric acid . . .	$C_8\ H_8\ O_4$
Caproic acid . . .	$C_{12}\ H_{12}\ O_4$
Capryllic acid . . .	$C_{16}\ H_{16}\ O_4$
Capric acid . . .	$C_{20}\ H_{20}\ O_4$

Butyric acid is occasionally present in the urine, the gastric juice, and the sweat; the others occur only in hutter.

Cetine, occurring in a particular portion of the cavity of the skull of the Physoter macrocephalus; *phocenine*, in the fat of Delphinus phocena; *cholesterin*; *ambrain*, in amber; and the hrain-fats known as *eleencephol*, *cerebrot*, *cephalot*, and *stearoconot*—are illustrations of this class.

It is worthy of observation, that both in the vegetable and the animal kingdom there seems a connexion between the protein-compounds and fat: when we find solid protein-compounds deposited in plants, we often find at the same time a large quantity of fat, as in numerous seeds; the brain and milk serve as illustrations of the same point in the animal kingdom.

The next question for our consideration is *the formation of fat*—a subject which has given rise to much angry and intemperate discussion between the leading chemists of France and Germany. Dumas, who may be regarded as the representative of the French school, maintains that all the fat of animals originates in and is obtained from plants; while Liehig, on the contrary, maintains that a portion of it is formed hy the animal itself, from starch, sugar, and gum. The goose was the animal respecting which the dispute originated. When fattened with Indian corn, the starch must, according to Liebig, have been changed into fat, because he had found but a minute quantity (about 1 part in 1000) of fat in that kind of grain. Dumas however extracted 9 per cent. of fat from Indian corn (or ninety times as much as Liehig), and thus he found in the food which the goose had eaten much more fat than had to be accounted for. The actual fact is, that the amount of fat in this grain is so variable that no conclusion can be drawn from the experiment. Liebig quotes many examples of snbstances which, although they contain little fat, are well known hy experience to be especially fit for fattening the animal body. Rice, peas, beans, and potatoes are all known to possess this property; yet rice gives only 0·2 to 0·8 per cent. of matters soluble in ether (the ordinary means of determining the amount of fat); peas 1·20 to 2·1; beans 0·70, and dried potatoes 0·35 per cent. Thus any animal that has eaten 1000 pounds of one of these substances may ohtain from them 2 to 8, 12 to 21, 7, or 3½ pounds of fat respectively. He makes the following calculations:—Three pigs to be fattened in thirteen weeks require 1000 pounds of peas, and 6825 pounds of boiled potatoes, the latter being equal to 1638 pounds of dry potatoes. These contain in all 26 pounds of fat, the peas yielding 21, and the potatoes 5 pounds. One fattened pig gives on an average 50 to 55 pounds of fat, the three yielding 150 to 165 pounds. Each pig before fattening contains on an average 18 pounds of fat—that is, 54 pounds for the three. If to these 54 pounds be added 26 pounds contained in the food, we get 80 pounds; and if we suhtract these from 150 to 165 pounds, there is a remainder of 70 to 85 pounds of fat produced from the starch, &c., of the food. Liebig's opinion is further strengthened hy the circumstance that some fats are undouhtedly produced in the body, as, for instance, the fats peculiar to the brain, cholesterin, cetine, phocenine, &c. To obtain these from other fat requires just as much a new arrangement as if they were produced from starch; hence, in a scientific point of view, there is nothing improhable in the supposition that animals are able to produce fats.

With regard to the formation of fat in plants, it is worthy of observation that all seeds which yield oil on pressure—as the castor-oil seed, hemp seed, &c.—contain starch in their early stages, this starch disappearing as the oil increases, and when the seed is completely developed not a trace of the starch remaining. This renders it probable that these fatty matters are formed from starch. From their ultimate composition it is ohvious that whenever fats are produced from any substance there must be produced at the same time either highly oxidised compounds, or else that oxygen must be itself liberated. Liehig observes that if from the formula for starch, $C_{12}\ H_{10}\ O_{10}$, we take 9 equivalents of oxygen, there will remain in 100 parts—

C_{12} . . .	79·4
H_{10} . . .	10·8
O . . .	9·8

The empirical formula for fat which comes nearest to this is $C_{11}\ H_{10}\ O$, which gives in 100 parts—

C_{11} . . .	78·9
H_{10} . . .	11·6
O . . .	9·5

According to this formula an equivalent of starch, in order to be converted into fat, would lose one equivalent of carbonic acid and seven of oxygen, or (expressed in symbols) $C_{12}\ H_{10}\ O_{10} = C_{11}\ H_{10}\ O + C\ O_2 + 7\ O$.

The same point is also clearly shown by contrasting the ultimate composition of starch and fat.

	Starch.	Human fat (Chevreul).
Carbon . .	44·91 .	79·00
Hydrogen . .	6·11 .	11·42
Oxygen . .	48·98 .	9·58

As we are not acquainted with any constituent of plants which can take up the oxygen thus liberated in the formation of fat, we must regard this as one of the sources of the oxygen given off by plants. Mulder has given the following scheme as illustrative of the mode in which starch may possihly be converted into fat or oil, in the vegetahle kingdom:—

	C	H	O
To 7 equiv. of starch . . .	84	70	70
Add 8 equiv. of water . . .		8	8
And we have	84	78	78
Which are equal to			
1 equiv. of margaric acid . .	34	34	3
1 equiv. of oleic acid . . .	44	40	4
2 equiv. of oxide of lipyle . .	6	4	2
69 equiv. of oxygen			69
Making as before	84	78	78

There is a substance almost universally diffused through plants, which we must here notice, and that is, the green colouring matter of the leaves—the substance termed *chlorophyle*. For the following account of this substance we are almost entirely indehted to the investigations of Mulder. It is a striking fact that young leaves have a much lighter green colour than those which are older, showing that the quantity of chlorophyle increases with the age of the leaves. If chlorophyle were a substance poor in oxygen, and were derived from substances rich in oxygen, this fact alone would be sufficient to explain the power which the green parts possess of separating oxygen. This however is not the case; chlorophyle is rich in oxygen. Nevertheless the leaves give off oxygen not *because* they *are* green, but *whilst* they are *becoming* green.

When green leaves are digested with ether the liquid becomes green. On evaporating the etherial solution, and treating the residue with hot alcohol, a considerable amount of white fatty matter (wax) separates on cooling, while the green colouring matter remains in solution. Before proceeding to the consideration of the green colouring matter, it will be expedient to say a few words respecting the mixture it forms with the wax.

In a physiological or botanical sense this mixture has the name of chlorophyle; in a chemical sense the term is restricted to the actual green pigment. To prevent confusion the former is designated as B. chlorophyle, and the latter as C. chlorophyle; B. indicating the botanical, and C. the chemical signification of the word.

We find similar mixtures of a waxy fat, and colouring matter, in other external parts besides the leaves, namely in the skins of fruits, especially of such as are coloured; and on digesting them in ether we obtain a large quantity of waxy matter in solution, varying in tint according to the colour of the skin; being gray when obtained from apples, and of a beautiful orange colour when obtained from the berries of the mountain ash.

The degree in which the action of light contributes to the change of colour in the C. chlorophyle which exists in the perisperms, and to the production from it of the colouring matter of the skin of ripe fruits may be obviously inferred from the green colour which such fruits retain if they do not receive a sufficient supply of solar light, or from the difference of colour exhibited by the opposite side of the same fruit, as well as from the fact that leaves when deprived of the action of light become colourless, while if completely exposed to its action they secrete a considerable amount of B. chlorophyle.

This apparently anomalous difference in the action of light on the skins of fruits and on leaves is dependent on the same cause as the change of colour in the leaves during autumn: namely, that light can only produce B. chlorophyle when there is a sufficient supply of materials for its renewed formation as often as the existing quantity is decomposed by the influence of the light; and that as soon as this supply is exhausted the green colouring matter is itself decomposed, and other compounds are formed from it.

Light acts powerfully in keeping plants green, and likewise exerts a powerful decomposing action upon all colouring matters, the C. chlorophyle not excepted; thus asparagus, potatoes, young leaves, &c., become green whenever they are exposed to light, and hence there must be a substance widely diffused through plants, which causes the production of chlorophyle. The change takes place not merely on the surface, but beneath it as far as light can penetrate through the semi-transparent parts. All plants however are not coloured green; some have no colour at all, while others are speckled or spotted, or of a colour entirely different from green. Hence we conclude that in these plants or parts of plants, the materials yielding chlorophyle are absent. We may sometimes observe, in summer, one single spot of a green leaf coloured red by the action of insects or by being injured by hail; the green colouring matter is at the spot decomposed by the light; no new portion is formed, and the spot acquires the same colour which the whole leaf would have assumed in autumn. From this we infer that the change of colour in the leaves during autumn is simply dependent on a chemical alteration of the green colouring matter by light.

Mulder, after showing from a large number of facts that wax along with a green colouring matter exists in leaves and unripe fruits,—wax with a red colouring matter, in the red leaves which appear in autumn, and in the red fruits,—and wax with a yellow colouring matter, in the yellow leaves of autumn, and in the yellow fruits, gives a lengthened chemical description of chlorophyle, for an account of which we must refer to the original work.

From Mulder's experiments, and those previously instituted by Berzelius, it appears that the green colouring matter of the leaves is readily decomposed into three different substances, one yellow, another blue, and a third black; and that according to the proportion of these three mixed with the green, a different kind of green must be produced. Hence the difference in the green colour of different leaves depends not only on the presence of more or less chlorophyle, but also on the different mutual proportions of these three colouring matters.

The quantity of pure C. chlorophyle contained in the leaves is exceedingly small; according to Berzelius, it is not more than the amount of pigment in dyed cotton.

If a tincture of pure chlorophyle be exposed to the action of the sun, the green colour becomes in a few hours converted into a yellow. When a solution of pure chlorophyle in ether and hydrochloric acid was kept for five months in a bottle half full, the green was entirely changed into a yellow. From these experiments we learn, first, that the green colouring matter is decomposed and a yellow one left, both with and independently of the influence of light; and secondly that in all probability a similar decomposition (accompanied by a reproduction) of green colouring matter and green leaves is constantly going on under the influence of light. Mulder conceives that the continual decomposition of the green colouring matter may be in part the origin of the wax, since the quantity of the latter is found to have increased when the same leaves are analyzed later in summer. In consequence of the continuance of this reproduction the leaves remain green; when it stops, the leaves become yellow, as in autumn.

It is worthy of notice that decomposed chlorophyle yields a blue colouring matter; it is this which is no doubt present in the skins of many fruits, as for instance those of the grape; the exact nature of the chemical change is not clearly understood.

It is very obvious that the influence of light will convert starch into chlorophyle. Every part of an amylaceous root becomes green on exposure to light. The parts of plants which become green (all without exception) contain starch; and in autumn as this green colour decreases, the starch also decreases, and finally cannot be detected by the iodine-test. Hence starch ceases to form B. chlorophyle under the influence of light; the B. chlorophyle being a complex substance consisting chiefly of wax. The change of starch into botanical chlorophyle may be explained in much the same manner as its conversion into fat.

The wax contained in the leaves and other parts of plants may be chemically represented by the formula $C_{15}\ H_{15}\ O$. Now if no other products be simultaneously produced we may suppose the wax obtained from the starch in the following manner:

5 equiv. of starch .	$C_{60}\ H_{50}\ O_{50}$
With 10 of water . .	$H_{10}\ O_{10}$
Make	$C_{60}\ H_{60}\ O_{60}$
And 4 of wax . .	$C_{60}\ H_{60}\ O_{4}$
Leaving to be given off ·	O_{56}

That is to say, 5 equivalents of starch yield 4 equivalents of wax, and give off 56 equivalents of oxygen. This fully explains the phenomenon why plants *while becoming green*, evolve oxygen, and further indicates the use of starch in the leaves.

Mulder has, as far as we are aware, made only one ultimate analysis of pure C. chlorophyle—that from poplar leaves; from this analysis he calculated the formula $C_{18}\ H_{9}\ N\ O_{8}$.

'Properly speaking,' Mulder observes, 'the green colouring matter in the leaves has nothing to do with the evolution of oxygen; on the contrary, the colourless C. chlorophyle, which seems to be every where present, becomes green by the *absorption of oxygen*. Hence a small portion of the oxygen produced from the conversion of starch into wax is employed for this purpose, and is not mixed with the atmosphere. But this is just the reason why C. chlorophyle is not *formed* by the exhalation of oxygen; it only becomes green instead of white, as it previously was. This can only happen when there is an abundance of oxygen, and this we have seen to be the case when starch is converted into wax. We may therefore assume as proved that white chlorophyle diffused throughout the whole plant, will become green in proportion as starch is converted into wax; because it is enabled, in such proportion, to take up oxygen—to become oxidised, just like white indigo.

'Now, the probable composition of green chlorophyle,—$C_{18}\ H_{9}\ N\ O_{8}$ shows that pure white chlorophyle is not produced from starch. It is necessary that an azotized body in a liquid state, should penetrate into the globule of starch, which during this transformation into wax is converted into $C_{18}\ H_{9}\ N\ O_{8}$. We do not know yet what that substance is, but it is certain that it must be one which is diffused throughout the plant like starch; hence it is probably protein, which is changed into a most beautiful violet-coloured substance by the influence of hydrochloric acid and oxygen.'

We now return to the animal kingdom, and have a few remarks to offer on *gelatin*, a substance yielded by most parts of the animal body. Amongst the component parts of organized bodies, the most frequent is the *cell*. Modified in an infinite variety of ways, it gives rise to the innumerable varieties exhibited both by plants and animals, in the external form, the structure, and consequently the functions of their organs. In the vegetable kingdom the substance employed in the construction of these cells is *cellulose* combined usually with a little protein. In the animal kingdom the case is very similar, although the elementary form of the tissue and its chemical characters are different. In animals we must distinguish between the persistent and the original cellular substance. The original in all probability varies in different cases, while the persistent exhibits a constant and general character. The persistent tissue is consequently a secondary product, and in this respect differs from the cellular substance in plants which is a primary or original one; neither has it an actual cellular form like the latter. There is however a resemblance between the two in several points, especially in relation to the large proportions in which they both exist, and to the several functions which they perform.

Gelatigenous substance is so widely diffused over the body that it would exhibit the entire shape of the principal organs, even if all other constituents were separated. It constitutes the skin, the serous membranes, the cellular sheaths of the muscles, the organic portion of bone, and many other substances. It is insoluble in cold water; acetic acid renders it transparent and bulky; tannic acid renders it solid and prevents its putrefaction; and when boiled it forms a jelly. It is in consequence of the last property that it has received the name of gelatin. The gelatigenous substance (skin, areolar tissue, serous membranes, &c.) is insoluble in cold water, and on boiling is merely physically and not chemically altered. In the process of boiling nothing is taken up and nothing separated; the alteration being similar to that undergone by starch when heated in water.

The composition of gelatin is represented by the formula

$$C_{13} H_{10} N_2 O_5$$

whether obtained from hartshorn, from isinglass, or from silk. Both boiled and unboiled cellular tissue (after its conversion into glue) combine with tannic acid, and produce compounds which are insoluble in water and resist putrefaction; hence the power of all medicines containing this substance to heighten the tone of the system. The protein-compounds in a similar manner form hard and coherent compounds with tannic acid. Peruvian and willow bark, catechu, and many other astringent medicines produce compounds of this nature in the organism.

On boiling gelatin in water for a long time we obtain a hydrate of gelatin which no longer gelatinizes; its composition is 4 ($C_{13} H_{10} N_2 O_5$) + aq.

This peculiarity should be remembered, for the compound is likely to be formed in the preparation of broth, and in the application of Papin's Digester to cooking; and it is regarded by Mulder as doubtful whether this hydrated gelatin can be again converted in the organism into nutrient matter, and whether it may not produce noxious substances in the body.

As gelatin has never yet been discovered in the vegetable kingdom, there is every reason to believe that it is produced in the animal body. It is most probably formed from the decomposition of the protein in the blood, through the action of the alkali in the serum, and the oxidising influence of the atmosphere.

We are likewise imperfectly acquainted with the products of the decomposition of the gelatigenous tissues in the body. Out of the body we know that by the influence of oxidation on gelatin prussic acid is formed, and that, by the action of alkalies, gelatin-sugar, leucin, and extractive matters are produced, while ammonia is disengaged, and an alkaline carbonate formed. Finally, when boiled in dilute sulphuric acid, it yields extractive matters with either gelatin-sugar or leucin. Since leucin is also produced from albumen when decomposed by potash, we perceive an intimate connexion between that protein-compound and gelatinous matters.

Besides the gelatin obtained from cellular tissue and serous membranes there is another kind which has many of its properties, but differs from it in composition. It was first described by Müller under the name of *chondrin*. It is obtained from the cornea, and from those cartilages which do not ossify, by boiling them in water.

Its composition* is 10 ($C_{32} H_{26} N_4 O_{14}$) + S.

The preceding observations on the *general organic substances* which exist in the two great departments of the organic kingdom are sufficient for the clear understanding of the forms and properties of the elementary parts of plants and animals. Both kingdoms however contain an immense number of additional substances. In plants there are acids, bases, colouring matters, oils, and resins; in animals there are the various secretions. As these vegetable products have been fully treated of in many of the articles of the PENNY CYCLOPÆDIA, our attention will in the future part of this article be chiefly confined to the animal products.

According to Schwann, all organic tissues, however different they may be, have one common principle of development as their basis, namely, the formation of cells; that is to say, molecules are never united immediately into a fibre, a tube, and so forth, but always (or almost always) in the first instance into round cells, which subsequently become connected so as to form the various primary tissues as they present themselves in the adult state. The formation of the elementary cells takes place, in the main points, in all the tissues, in accordance with the same laws; their further transformation varies in the different tissues.

SECTION II.—*Microscopic Character of Tissues.*

All organic beings, according to the cell-theory, are composed of a number of minute parts, which in their leading characteristics are identical in the two kingdoms, but which are combined in different ways, and whose products are therefore distinct not only in the animal and vegetable world, but likewise in the different organs of the same animal or plant. These minute parts, which are invisible to the naked eye, although identical in form and development, differ extremely in their combinations and functions. All the tissues that we meet with both in the animal and vegetable world are nothing more than groups of these elementary parts; their functions depending on the nature of the grouping.

The elementary forms which organic matter on becoming organized assumes, are for the most part, if not always, minute vesicles which can only be distinguished by the microscope. These have received the names of *elementary*, *nucleated*, or *primary cells*. They are most easily observed in vegetable and animal tissues in the process of development. They usually contain a fluid, but granules are also not unfrequently observed in them. The vesicle is formed of a thin membrane wherein a *nucleus* is often observable. This nucleus is almost invariably present in animal cells, whilst it can only be distinguished in the young cells of plants. From these simple cells, or slight modifications of them, all organized bodies are constructed; we find them in the blood (as blood-corpuscles), in the lymph, in mucus and pus, and in nearly every solid portion of the animal body; even the germ of the future being (the ovum) is nothing more than a nucleated cell. As the cell-theory in relation to the vegetable kingdom has been already noticed in the article TISSUES, VEGETABLE, P. C., our observations will be entirely confined to the cellular formation and structure of the animal world.

On the addition of acetic acid the cell-wall dissolves while the nucleus remains unacted on; hence the nucleus is a distinct body. It is named by Schleiden the *cytoblast* (κυτος, *a cell*, and βλαστάνω, *I cause to bud*), being supposed by that physiologist to be the originator of the cells. In the nucleus we can usually observe one or more dark spots which have received the name of *nucleoli*. The nature of these nucleoli is unknown; we cannot tell whether they are cavities, vesicles, or solid particles. They lie on the inner part of the nucleus.

The nucleus itself is regarded as a minute cell; it is connected with the cell, and is an essential constituent of it.

The cells are surrounded by a fluid whose consistence increases with the age of the tissue, and which finally becomes solid, forming intercellular substance. The formation of cells takes places in the following manner. In an amorphous, semifluid, sometimes almost gelatinous mass which is named the *cytoblastema*, and wherein the substances necessary for cell-formation are contained, there are formed minute, roundish granules (nucleoli), around which is deposited a layer of granular matter, which gradually becomes thicker and forms the nucleus. On the surface of this nucleus a vesicle arises, resembling a segment of a sphere. This vesicle is thin and transparent, at first smaller than the nucleus, but rapidly enlarges, and when it has attained its full size, the nucleus is seen as a minute body attached to its inner wall. The substance necessary for the formation of the vesicle is yielded by the cytoblastema. The earliest trace of organization is coincident with the appearance of the nucleolus, which gives rise to the formation of a deposit of granular matter around it, and in this way to the production of the nucleus.

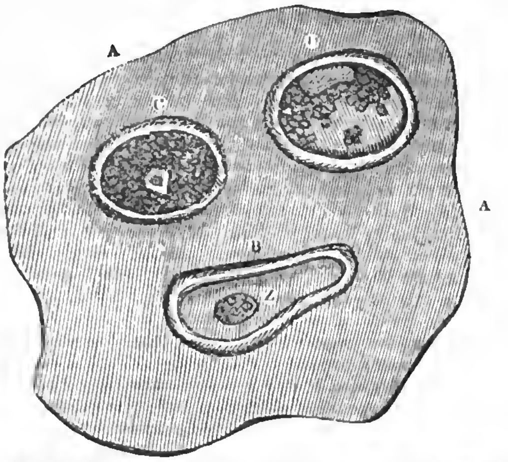
This theory of cell-formation, which is supported by Schleiden and Schwann, proceeds on the assumption that in cells there is always a pre-existing nucleus. It is objected to by Henle and others, on the grounds that there are many classes of cells in which there is no nucleus, or in whose nuclei there are no nucleoli; as for instance in the cryptogamia; and according to Meyen also in many phanerogamia. Similar observations have been made on certain cells in the animal organism, but Schwann combats the objection by the assertion that the nucleus or nucleoli become absorbed during the development of the cell.

According to Schleiden, the membrane of the cell grows from the nucleus, which latter remains as a persistent part of

* Liebig has recently found that albumen, fibrin, and casein contain more sulphur than is generally admitted, albumen containing about 2 per cent., and gelatin containing ½ per cent. of sulphur. This is very nearly the amount of sulphur yielded by the formula for chondrin given in the text, and which is deduced by Mulder from his own analyses.

the cell-wall; Mohl opposes this view, asserting that the nucleus lies within the cell at some distance from its mem-

Fig. 1.



An ideal figure illustrating the formation of a cell. In an amorphous substance (A A), the *cytoblastema*, lie three ideal cells (B, C, D). The cell B appears oval; in its interior we observe an elliptic body (Z), the *nucleus* or *cytoblast*; and within this, round dark corpuscles, the *nucleoli*. The space between the cell-wall and nucleus, the cavity of the cell, is filled with a fluid which escapes observation.

The cell C is round; it contains a nucleus with a single nucleolus in its centre; the cavity is filled with dark granular matter.

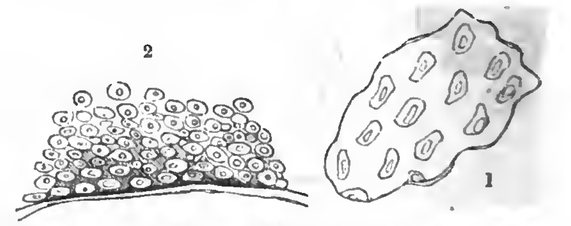
In the cell D the nucleus lies on the inner surface of the cell-wall; no nucleolus is observable. The contents of this cell are granular in the vicinity of the nucleus, but fluid and invisible in the remainder of the cavity.

brane. Valentin has also made similar observations in many of the animal tissues. He has observed cases in which the nucleus was not directly connected with the cell-wall, except by a few radiating fibres. Hence the function of the nucleus in relation to cell-formation is still obscure.

Whenever cells are formed, numerous pre-existing nucleoli are always present. They serve to form the contents of the cell, while the cell-wall is probably formed from the delicate connecting medium which unites these minute granules. These granules, which are the most minute organised particles with which we are acquainted, must be regarded as the most elementary form of all organic structures, since they are a necessary condition for cell-formation: there can be no doubt that they contain a protein-compound, since in the most recent structures in the animal and vegetable world protein is never absent, and indeed appears to be essential to organization. The very simplest form of fungi (such as the common mould-plant) which are produced in non-nitrogenous bodies, such as lactic or tartaric acid under the influence of the atmosphere (and therefore of nitrogen) and of water, contain protein from the first moment of their existence.

Before proceeding to the description of the various forms of cells, we must notice certain delicate membranous expansions in which no definite structure can be detected. They have been especially described by Bowman and Goodsir, the former terming them *basement*, and the latter *primary* or *germinal* membranes. This structure receives the former name from its being the foundation or resting-place for the epithelium-cells which cover its free surface, whilst the latter appellation was selected because it is 'a form of the primary cells of glands, and the source of secondary or secreting-cells.' Bowman considers it to be simple or homogeneous. This is true as far as it contains no blood-vessels, and as regards its external and attached layers; but as in its original condition it consists of cells, and when perfect contains nuclei at equal or variable distances, it must not be considered as simply molecular. 'Germinal membranes,' observes Goodsir, 'are only met with on the free surface of parts or organs. One surface of the membrane is therefore attached, and is applied upon a layer of areolar texture, interspersed with a more or less rich net-work of capillary vessels; while the other surface is free, and it is only on it that the developed or secondary cells of its germinal spots are attached. These secondary cells are at first contained between the two layers of the membrane, these layers being the opposite walls of each of its component cells. When fully developed, the secondary cells carry forward the anterior layer which is always the thinnest, leaving the nuclei or germinal centres in the substance of the posterior layer, in close contact with the blood-vessels.' To show the generality of the primary membrane, it may be observed that it constitutes the outer layer of the true skin; it lines all the cavities formed by mucous membrane, and is prolonged into all the ducts, and ultimate follicles and tubuli of the glands connected with them; it likewise forms the innermost layer of the serous and synovial membranes, and lines the blood-vessels and lymphatics, forming the sole constituent of the walls of their minutest division. The primary membrane must be regarded as a *transitional* rather than a *persistent* structure; furnishing the germs of all the cells which are developed on its surface, as well as the nutriment which they require for their support, its *free* surface must be continuously undergoing disintegration, and must be as continuously renewed at the side in connexion with the blood-vessels.

Fig. 2.



1. A portion of the germinal membrane of the human intra-glandular lymphatics, with its germinal spots or nutritive centres diffused over it.
2. Shows along one edge the thickness of the germinal membrane, and upon it the thick layer of glandular epithelia.
(Taken from Goodsir.)

We now proceed to notice the *history and functions of isolated animal cells*. It is only during the last three or four years that any correct ideas have been maintained regarding the importance of *simple isolated cells* in the animal economy; each of these cells grows and lives independently of all the others, deriving its support from the general nutrient fluid of the part in which it exists.

The animal cell in its simplest form originates from a reproductive granule, previously formed by some other cell; this granule attracts to itself, and assimilates and organizes the particles of nutrient fluid in its neighbourhood, converts some of them into the substance of the cell-wall, whilst it draws others into the cavity of the cell; in this manner the cell gradually increases in size, and whilst it is itself approaching the term of its life, it usually makes preparation for its renewal by the development of reproductive granules in its interior, which may become the germs of new cells when set free from the cavity of the parent. This mode of production and growth is almost identical with that occurring in the vegetable cell; there is however an important difference in their powers. The latter possesses the power of forming organic compounds from inorganic matters; while the former has no productive power of this nature, but can merely transform one compound into another. The best illustrations of simple isolated animal cells are afforded by the corpuscles occurring in blood, lymph, and chyle. There is a certain uniformity in their general character. They are only found in albuminous fluids, and they do not vary very much in size, averaging about the 3000th of an inch in diameter. They are known as lymph or chyle corpuscles, or as the *white* corpuscles of the blood. These white corpuscles have only of late years attracted much attention, though they had been described as far back as the time of Hewson. In man and the mammalia they are often larger than the red corpuscles; they may be recognised by their granular appearance, their peculiar coutour, and the irregular shading of their figure. (*Fig.* 3, parts 4 and 5.) They are also to be distinguished from the red corpuscles by their different actions towards chemical re-agents; they are not attacked by water, but remain in it for a long time without apparent change; they are not rendered transparent, and dissolved by acetic acid; they only become more decidedly granular under its action, and a kind of nucleus is developed in their centre. As they are in all respects similar to those of lymph and chyle, and as they have the same chemical relations, they have been regarded by many as the corpuscles of the lymph mingled with the blood, and have hence been termed *lymph corpuscles* (Hewson, Müller); others have viewed them as globules of coagulated fibrin (Mandl, Weber); and others again as blood-corpuscles in progress of solution or disintegration. They may be seen in the capillary system of living animals (in transparent structures, as for instance in the frog's foot) swimming with the ordinary blood-corpuscles, but not so much moving rapidly in the great current of the blood, as progressing in close contact with the walls of the vessels in a slower stream. They are not elastic, like the ordinary corpuscles, and seem to stick to each other. The exact functions of these corpuscles are still unknown, but there are many facts which seem to indicate that there is a decided relation between them and between the nutritive or organic life of the tissues.

Fig. 3.

1. Red corpuscles of human blood, exhibiting their flattened surfaces
2. The same, adherent by their flattened surfaces so as to form rolls.
3. Red corpuscles of frog's blood.
4. Colourless corpuscles of human blood.
5. The same, enlarged by the imbibition of water.

On examining a drop of blood under the microscope, we find, in addition to these cells, which are comparatively rare, an immense number of what are termed *red corpuscles*, but which usually present a yellow appearance. These red corpuscles have been already noticed in the article Blood, P. C. The following are the most important additiona made to our knowledge of them since the publication of that article. The blood of numerous animals has been submitted to microscopic examination by Nasse, Wagner, Gulliver, and other observers. In the article Blood it is stated that the 'red particles of the blood have a circular form in all animals constituting the class mammalia.' A remarkable exception to this rule has been shown by Mandl to occur in the corpuscles of the camel tribe. The mean long diameter of the blood-corpuscles of the dromedary be found to be the 3254th of an inch, while the mean short diameter was only the 5921st of the same standard. In the paco (Auchenia paco) and guanaco (Auchenia glama) the blood-corpuscles scarcely differed in form and size from those of the dromedary, whilst in the vicugna they were slightly smaller. In structure and magnitude however these oval corpuscles of the Camelidæ belong entirely to the mammiferous type; they have no perceptible nucleus, like those of birds, and they are not much more than half the size of even the smallest that have been observed in birds or reptiles.

The difference of size in the corpuscles of different mammalia is also worthy of notice. The averago diameter of those of man, according to Mr. Gulliver, is the 3300th of a inch, but the average diameter of those of the elephant, according to the same observer, is as much as the 2745th of an inch (which were the largest he observed amongst the mammalia), whilst those of the Napu musk-deer were no more than the 12,325th, and some were as small as the 16,000th of an inch in diameter. There is also an exception to the general statement that the corpuscles of fishes are oval; in one class, namely the Cyclostomi, or lamprey tribe, they are circular. Neither is the statement now correct that the corpuscles of the skate are the largest known; those of certain reptiles, as for instance the *syren* and the *proteus*, are considerably larger, and are even visible to the naked eye as very minute specks.

There can be no doubt that the red corpuscles go through the same course as other cells. We have undoubted evidence of their rapid regeneration in cases where much blood has been lost, and of the peculiar power which chalybeate medicines have in forwarding their production. The precise method in which they are developed is however not exactly known.

With respect to the chemical composition of the blood-corpuscles, we have already stated that the *globulin* of which the walls are formed seems undoubtedly to be a protein-compound. The red colour is due to a pigment which has received the name of *hæmatin*, and is enclosed in the vesicles of globulin. It has been generally assumed that this substance exists in two distinct states in arterial and venous blood, having in the former an excess of oxygen, and in the latter an excess of carbon or carbonic acid. Mulder has however shown that its elementary composition is the same whether obtained from arterial or venous blood, and that it may be represented by the formula $C_{44}\,H_{22}\,N_{3}\,O_{6}\,Fe$; the following being the analyses from which he deduced it:—

	1	2	3	4	5	According to the formula.
C	66·49	65 91	66·20	65·73	65·90	65·84
H	5·30	5·27	5·44	5·28	5·27	5·37
N	10·54	..	10·46	10·57	10·61	10·40
O	11·01	..	11·15	11·97	..	11·75
Fe	6·66	6·58	6·76	6·45	..	6·64

1, 2, and 3, were arterial, and 4 venous ox-blood; 5 was the mixed blood of a sheep.

It may be shown by conclusive experiments that the red colour is not dependent on the iron, for that constituent may be removed from the hæmatin without materially altering its tint, although it is very firmly combined with the four organic elements. The condition in which the iron exists in hæmatin—whether as an oxide, a carbonate, a carburet, or in the metallic state—has long been disputed. According to Liebig the iron of the hæmatin is the most essential constituent of the blood in relation to the respiratory process. The following is his view of the theory of respiration:—'During the passage of the venous blood through the lungs, the globules change colour, and oxygen is absorbed from the atmosphere. Further, for every volume of oxygen absorbed, an equal volume of carbonic acid is, in most cases, given out. The red globules contain a *compound of iron*, and no other constituent of the body contains iron.' Whatever change the other constituents of the blood undergo in the lungs, this much is certain, that the globules of venous blood experience a change of colour, and that this change depends on the action of oxygen. Now we observe that the globules of arterial blood retain their colour in the larger vessels, and lose it only during their passage through the capillaries. All those constituents of venous blood which are capable of combining with oxygen, take up a corresponding quantity of it in the lungs. Experiments made with arterial serum have shown, that when in contact with oxygen it does not diminish the volume of that gas. Venous blood in contact with oxygen is reddened, while oxygen is absorbed, and a corresponding quantity of carbonic acid is formed. It is evident that the change of colour in the venous globules depends on the combination of some one of these elements with oxygen; and that this absorption of oxygen is attended with the separation of a certain quantity of carbonic acid gas. This carbonic acid is not separated from the serum; for the serum does not possess the property, when in contact with oxygen, of giving off carbonic acid. On the contrary, when separated from the globules, it absorbs from half its volume to an equal volume of carbonic acid, and at ordinary temperatures is not saturated with that gas. Arterial blood, when drawn from the body, is soon altered; its florid colour becomes dark red. The florid blood, which owes its colour to the globules, becomes dark by the action of carbonic acid, and this change of colour affects the globules, for florid blood absorbs a number of gases which do not dissolve in the fluid part of the blood when separated from the globules. *It is evident therefore that the globules have the power of combining with gases.* The globules of the blood change their colour in different gases; and this change may be owing either to a combination or to a decomposition. Sulphuretted hydrogen turns them blackish green and finally black; and the original red colour cannot, in this case, be restored by contact with oxygen. Here a decomposition has obviously taken place. The globules darkened by carbonic acid become again florid in oxygen, with disengagement of carbonic acid. The same thing takes place in nitrous oxide. It is clear that they have here undergone no decomposition, and consequently they possess the power of combining with gases, *while the compound they form with carbonic acid is destroyed by oxygen.* When left to themselves out of the body, the compound formed with oxygen again becomes dark, but does not recover its florid colour a second time by the action of oxygen. The globules of the blood contain a compound of iron. From the never-failing presence of iron in red blood, we must conclude, that it is unquestionably necessary to animal life; and since physiology has proved that the globules take no share in the process of nutrition, it cannot be doubted that they play a part in the process of respiration. The compound of iron in the globules has the characters of an oxidized compound; for it is decomposed by sulphuretted hydrogen, exactly in the same way as the oxides or other analogous compounds of iron. By means of diluted mineral acids, peroxide (sesqui-oxide) of iron may be extracted, at the ordinary temperature, from the fresh or dried red colouring matter of the blood. The characters of the compounds of iron may perhaps assist us to explain the share which that metal takes in the respiratory process. No other metal can be compared with iron for the remarkable properties of its compounds. The compounds of protoxide of iron possess the property of depriving other oxidized compounds of oxygen; while the compounds of peroxide of iron, under other circumstances, give us oxygen with the uttermost facility. Hydrated peroxide of iron, in contact with organic matters destitute of sulphur, is converted into carbonate of the protoxide. Carbonate of protoxide of iron, in contact with water and oxygen, is decomposed; all the carbonic acid is given off, and by absorption of oxygen it passes into the hydrated peroxide, which may again be converted into a compound of the protoxide. Not only the oxides of iron, but also the cyanides of that metal, exhibit similar properties. Prussian blue contains iron in combination with all the organic elements of the body; hydrogen and oxygen (water), carbon and nitrogen (cyanogen). When it is exposed to light, cyanogen is given off, and it becomes white; in the dark it attracts oxygen, and recovers its blue colour. All these observations, taken together, lead to the opinion that the globules of arterial blood contain a compound of iron saturated with oxygen, which in the living blood loses its oxygen during its passage through the capillaries. The same thing occurs when it is separated from the body and begins to undergo decomposition. The compound, rich in oxygen, passes therefore, by the loss of oxygen, into one far less charged with that element. One of the products of oxidation formed in this process is carbonic acid. The compound of iron in the venous blood possesses the property of combining with carbonic acid; and it is obvious that the globules of the arterial blood, after losing a part of their oxygen, will, if they meet with carbonic acid, combine with that substance. When they reach the lungs, they will again take up the oxygen they have lost; for every volume of oxygen absorbed, a corresponding volume of carbonic acid will be separated; they will return to their former state, that is, they will again acquire the power of giving off oxygen. For every volume of oxygen which the globules can give off, there will be formed (as carbonic acid contains its own volume of oxygen without condensation) neither more nor less than an equal volume of carbonic acid. For every volume of oxygen which the globules are capable of absorbing, no more carbonic acid can possibly be separated than that volume of oxygen can produce. When carbonate of protoxide of iron by the absorption of oxygen passes into the hydrated peroxide, there are given off, for every volume of oxygen necessary to the change from protoxide to peroxide of iron, four volumes of carbonic acid gas. But from the one volume of oxygen only one volume of carbonic acid gas can be *produced*. And the absorption of one volume of oxygen can only cause directly the *separation* of an equal volume of carbonic acid; consequently the substance or compound which has lost its oxygen during the passage of arterial into venous blood, must have been capable of absorbing or combining with carbonic acid; and we find, in point of fact, that the living blood is never, in any state, saturated with carbonic acid; that it is capable of taking up an additional quantity without any apparent disturbance of the functions of the globules. Thus, for instance, after drinking effervescing wines, beer, or mineral waters, more carbonic acid must necessarily be expired than at other times. In all cases where the oxygen of the arterial globules has been partly expended otherwise than in the formation of carbonic acid, the amount of this latter gas expired will correspond exactly with that which has been formed; less however will be given out after the use of fat and of still-wines than after champagne. According to the views now developed, the globules of arterial blood in their passage through the capillaries yield oxygen to certain constituents of the body. A small portion of this oxygen serves to produce the change of matter, and determines the separation of living parts, and their conversion into lifeless compounds, as well as the formation of the secretions and excretions. The greater part, however, of the oxygen is employed in converting into oxidized compounds the newly-formed substances which no longer form part of the living tissues. In their return towards the heart, the globules which have lost their oxygen combine with carbonic acid, producing venous blood; and when they reach the lungs, an exchange takes place between this carbonic acid and the oxygen of the atmosphere. The organic compound of iron, which exists in venous blood, recovers in the lungs the oxygen it has lost, and in consequence of this absorption of oxygen the carbonic acid in combination with it is separated.'

Mulder is strongly opposed to this theory; he denies that the iron takes any essential part in the respiratory process; and he refers the process entirely to the oxidation of the protein-compounds. He alleges the following grounds against the probability of the correctness of Liebig's views:—

1. The iron is so intimately connected with the other elements of hæmatin, that it cannot be removed even by long digestion of this constituent in dilute hydrochloric or sulphuric acid. If these re-agents cannot effect its oxidation, it is highly improbable that it should be oxidized in the lungs. Respecting Liebig's assertion that dilute acids remove iron from dried blood, Mulder proves that this fact is valueless in relation to his theory, because other constituents of the blood besides the hæmatin contain this metal, apparently in an oxidized state.

2. If, as Liebig asserts, peroxide of iron exists in arterial blood, and carbonate of protoxide of iron in venous blood, almost any dilute acid would be capable of removing it. But this is not the case. Hæmatin, properly prepared, may be digested with dilute hydrochloric or sulphuric acid for many days without the least diminution in the quantity of the iron. From hæmatin treated in this manner Mulder obtained by combustion 9·49 per cent. of peroxide of iron, which is the constant quantity always left after the combustion of well-prepared hæmatin.

3. The probability that the iron exists in a *metallic state* is strongly supported by the observation that hydrogen is evolved when a clot of blood is digested in sulphuric acid, and water is added. Mulder suggests that it occurs as an integral constituent of hæmatin in just the same manner that iodine occurs in sponge, sulphur in cystin, or arsenic in the cacodyl series.

4. The amount of hæmatin in the whole mass of the blood is far too inconsiderable to carry a due supply of oxygen to the whole system.

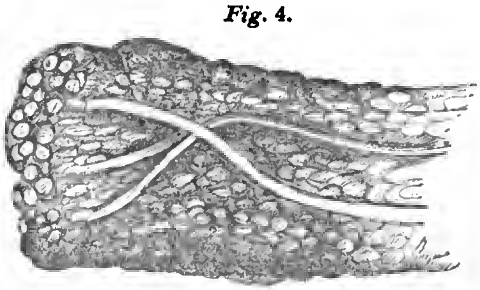
Having thus shown the principal objections to which Liebig's celebrated theory is open, we shall endeavour briefly to explain the rival theory of Mulder. We have at an early part of this article shown that the protein-compounds are capable of undergoing oxidation when in contact with the oxygen of the air. When a protein-compound becomes oxidized, it assumes a plastic character, that is to say, it has a tendency to become solid and to adhere to solid substances. Now we have already mentioned that the blood-corpuscles are cells, of which the wall consists of a protein-compound named *globulin*. When a respiration is performed, the exterior layer of such of the corpuscles as are exposed in the lungs to the action of the air, becomes converted into oxidized protein; it becomes whitish and less transparent. This is the state in which the corpuscles exist in arterial blood. As they reach the capillary system, this white exterior layer is employed in the change of material of the body, and is in that way consumed. Having lost this white layer, they again become transparent. The dark colouring substance in the corpuscles of arterial blood, shining through a white layer, must necessarily appear of a bright red tint, as may be shown by pouring dark red blood into a vessel of milky glass.

The preceding observations have been made with the view of showing the utility of these isolated animal cells—the blood-corpuscles—in the *respiratory process*. (We shall revert again to the distinctions between the characters of venous and arterial corpuscles in our remarks on the *colour of the blood*.)

In our remarks on various tissues we shall often again have to notice the functions of isolated cells. We shall now give another illustration of their utility, namely, their importance in the *process of nutrition*. Mr. Goodsir has recently shown that there is a continual development of cells at the extremity of each villus in the small intestine, and that these cells are the agents by which the *secretion* of the nutritious fluid is accomplished, and by which it undergoes its first preparation for the purposes it is subsequently to fulfil. The process is so singular and interesting, that we give Mr. Goodsir's observations in his own words, omitting those portions which do not bear specially on the point.

'As the chyle begins to pass along the small intestine, at increased quantity of blood circulates in the capillaries of the gut. In consequence of this increased flow of blood, or from some other cause with which I am not yet acquainted, the internal surface of the gut throws off its epithelium, which is intermixed with the chyme in the cavity of the gut. The cast-off epithelium is of two kinds,—that which covers the villi, and which, from the duty it performs, may be named protective epithelium; and that which lines the follicles, and is endowed with secreting functions. The same action then, which in removing the protective epithelia from the villi prepares the latter for their peculiar function of absorption, throws out the secreting epithelia from the follicles, and thus conduces towards the performance of the function of these follicles. The villi, being now turgid with blood, erected, and naked, are covered or coated by the whitish-grey matter already described. This matter consists of chyme, of cast-off epithelia of the villi, and of the secreting epithelia of the follicles. The function of the villi now commences. The minute vesicles which are interspersed among the terminal loops of the lacteals of the villus, increase in size by drawing materials from the blood through the coats of the capillary vessels, which ramify at this spot in great abundance. While this increase in their capacity is in progress, the growing vesicles are continually exerting their absorbing function, and draw into their cavities that portion of the chyme in the gut necessary to supply materials for the chyle. When the vesicles respectively attain in succession their specific size, they burst or dissolve, their contents being cast intn the texture of the villus, as in the case of any other species of interstitial cell. The debris, and the contents of the dissolved chyle cells, as well as the other matters which have already subserved the nutrition of the villus, pass into the looped network of lacteals, which, like other lymphatics, are continually employed in this peculiar function. As long as the cavity of the gut contains chyme, the vesicles of the terminal extremity of the villi continue to develop, to absorb chyle, and to burst, and their remains and contents to be removed along the lacteals. When the gut contains no more chyme, the flow of blood to the mucous membrane diminishes, the development of new vesicles ceases, the lacteals empty themselves, and the villi become flaccid. The function of the villi now ceases till they are again roused into action by another flow of chyme along the gut. During the intervals of absorption, it becomes necessary to protect the villi from the matters contained in the bowel. They had thrown off their protective epithelium when required to perform their functions, just as the stomach had done to afford gastric juice, and the intestinal follicles to supply their peculiar secretions. In the intervals of digestion the epithelium is rapidly reproduced.'

Fig. 4.



Extremity of a villus with its absorbent vesicles distended with chyle, and the trunks of its lacteals seen through its coats. Very highly magnified.

The researches of Mr. Goodsir have likewise thrown much light on the general process of secretion. He shows, by an admirably selected series of observations (chiefly on the lower animals), that secretion is a function of the nucleated cell.

If the membrane which lines the secreting portion of the internal surface of the ink-bag of *Loligo sagittata* (Lamarck) be carefully freed from adhering secretion by washing, it will be found to consist almost entirely of nucleated cells, of a dark brown or black colour. These cells are spherical or ovoidal. Their nuclei consist of cells grouped together in a mass. Between these composite nuclei and the walls of their containing cells is a fluid of a dark brown colour. This fluid resembles in every respect the secretion of the ink-bag itself. It renders each cell prominent and turgid, and is the cause of its dark colour.

The dilated terminal extremities of the ducts in the liver of *Helix aspersa* (Müller) contain a mass of cells. If one of these cells be isolated and examined, it presents a nucleus consisting of one or more cells. Between the nucleus and the wall of the containing cell is a fluid of an amber tint, and floating in this fluid are a few oil-globules. This fluid differs in no respect from the bile as found in the ducts of the gland. The liver of *Modiola vulgaris* (Fleming) contains masses of spherical cells. Between the nucleus and the wall of each of these cells a light-brown fluid is situated, bearing a close resemblance to the bile in the gastro-hepatic pouches. The nucleated cells which are arranged around the gastro-hepatic pouches of *Pecten opercularis* are irregular in shape, and distended with a fluid resembling the bile. The hepatic organ which is situated in the loop of intestine of *Pirena prunum* (Fleming) consists of a mass of nucleated cells. These cells are collected in groups in the interior of larger cells or vesicles. These nucleated cells are filled with a light-brown bilious fluid. The hepatic organ situated in the midst of the reproductive apparatus, and in the loop of the intestine of *Phallusia vulgaris* (Forbes and Goodsir), consists of a number of vesicles, and each vesicle contains a dark-brown bilious fluid.

The hepatic cæca in the liver of *Patella vulgata* contains vesicles enclosing a body which consists of a number of nucleated cells, full of a dark fluid resembling the bile. The kidney of *Helix aspersa* (Müller) is principally composed of numerous transparent vesicles. In the centre of each vesicle is situated a cell full of a dead-white granular mass. This gland secretes pure uric acid. The ultimate elements of the human liver are nucleated cells. Between the nucleus and the cell-wall is a light-brown fluid with one or two oil-globules floating in it. The vesicular cæca in the testicle of *Squalus cornubicus* contain nucleated cells, which ultimately exhibit in their interior bundles of spermatozoa. The generative cæca of *Echiurus vulgaris* (Lamarck) contain cells full of minute spermatozoa. *Aplysia punctata* secretes from the edge and internal surface of its mantle a quantity of purple fluid. The secreting surface of the mantle consists of an arrangement of spherical nucleated cells. These cells are distended with a dark purple matter. The edge and internal surface of the mantle of the *Janthina fragilis* (Lamarck), the animal which supplied the Tyrian dye, secretes a deep bluish purple fluid. The secreting surface consists of a layer of nucleated cells, distended with a dark purple matter. If an ultimate acinus of the mammary gland of the bitch be examined during lactation, it is seen to contain a mass of nucleated cells. These cells are generally ovoidal, and rather transparent. Between the nucleus and the cell-wall of each a quantity of fluid is contained, and in this fluid float one, two, three, or more oil-like globules, exactly resembling those of the milk.

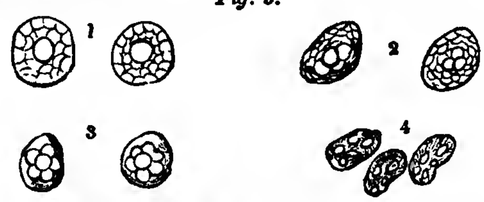
The secretion within a primitive cell is always situated between the nucleus and the cell-wall, and would appear to be a product of the nucleus.

The ultimate secreting structure then is the primitive cell, endowed with a peculiar organic agency, according to the secretion it is destined to produce. Mr. Goodsir names it the *primary secreting cell.* It consists, like other primitive cells, of three parts—the nucleus, the cell-wall, and the cavity. The nucleus is its generative organ, and may or may not, according to circumstances, become developed into young cells. The cavity is the receptacle in which the secretion is retained, till the quantity has reached its proper limits, and till the period has arrived for its discharge. Each primary secreting cell is endowed with its own peculiar property, according to the organ in which it is situated. In the liver it secretes bile; in the mamma, milk, &c. The primary secreting cells of some glands have merely to separate from the nutritive medium a greater or less number of matters already existing in it. Other primary secreting cells are endowed with the more exalted property of elaborating from the nutritive medium matters which do not exist in it. The discovery of the secreting agency of the primitive cell does not remove the principal mystery in which this function has always been involved. One cell secretes bile, another milk; yet the one cell does not differ more in structure from the other, than the lining membrane of the duct of one gland from the lining membrane of the duct of another. The general fact however, that the primitive cell is the ultimate secreting structure, is of great value in physiological science, inasmuch as it connects secretion with growth, as phenomena regulated by the same laws. The force, of whatever kind it may be, which enables one primary formative cell to produce nerve and another muscle, by an arrangement within itself of the common materials of nutrition, is identical with that force which enables one primary secreting cell to distend itself with bile and another with milk.

Instead of growth being a species of imbibing force, and secretion on the contrary a repulsive, the one centripetal, the other centrifugal, they are both centripetal. Even in their latter stages the two processes, growth and secretion, do not differ. The primary formative cell, after becoming distended with its peculiar nutritive matter, in some instances changes its form according to certain laws: and then, after a longer or shorter period, dissolves and disappears in the intercellular space in which it is situated; its materials passing into the circulating system if it be an internal cell, and being merely thrown off if it be an external cell. The primary secreting cell, again, after distension with its secretion, does not change its form so much as certain of the formative cells, but the subsequent stages are identical with those of the latter. It bursts or dissolves, and throws out its contents either into ducts or gland-cavities.

The general fact of every secretion being formed within cells, explains a difficulty which has hitherto puzzled physiologists, namely, why a secretion should only be poured out on the free surface of a gland-duct, or secreting membrane. We have attempted to illustrate Mr. Goodsir's views by the accompanying figure.

Fig. 5.

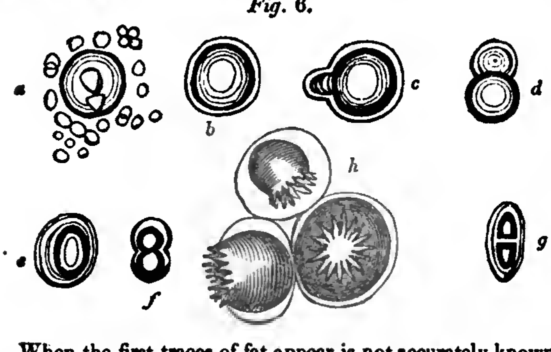


1. Cells from the kidney of *Helix aspersa;* the contained secretion is dead-white and presents a chalky appearance.
2 Cells from the ink-bag of *Loligo sagitta.*
3. Cells from the liver of the *Patella vulgata.* In this instance the bile is contained in the cavities of the secondary cells, which constitute the nucleus of the primary cell.
4. Cells from the mamma of a bitch. In addition to their nuclei these cells contain milk-globules.

Persistent tissues. We now proceed to the histological and chemical investigation of the most important constituents of the human organism.

1. *Adipose tissue* is usually associated with *areolar tissue* (which see), the two being generally known collectively as *cellular tissue.* It must be distinguished from *fat*, the former being a membrane of extreme tenuity in the form of closed cells or vesicles, while the latter is the material contained within them. The membrane of the adipose vesicle does not exceed the 20,000th of an inch in thickness, and is quite transparent; it is moistened by watery fluid, for which it has a greater attraction than for the fat it contains. Each vesicle is a perfect little organ, varying, when fully developed, from the 300th to the 800th of a line; minute capillaries may be observed on their external surface. When fat-vesicles are deposited together in large numbers, as is usually the case, they assume a more or less regular polyhedric form from their mutual pressure.

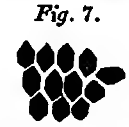
Fig. 6.



When the first traces of fat appear is not accurately known. In a well-formed five-months human fœtus Valentin found in the subcutaneous cellular tissue of the sole of the foot not merely fat-cells, such as occur in adults, varying from the ordinary size to the 125th or 100th of a line, within and around which were numerous small vesicles (*Fig.* 6, *a*), but other forms which threw more light on their structure and development. In some the surrounding cell-membrane was much more distinct than as it occurs in adults (*b*). In others there appeared to be a deposition of fat, not occupying the whole space of the cell (*c*); the remainder of the cell having often a striped or streaky appearance, and forming a lateral projection; this is seen in *c*, and in a more marked degree in *d* and *e*. In other fat-cells there were observed to be two vesicles, separated by a septum, against which they were partially flattened by pressure (*g*), or merely separated by a constriction in the external walls, as in *f*. This form leads us to conclude that fat-cells increase by division. For the chemistry of this constituent we must refer to the article Fat, P. C., and to an early part of the present article. It is sufficient here to remark that the fat-vesicle of the human subject contains *margarin*, a solid, and *olein*, a fluid fat. These sometimes separate spontaneously, presenting a very beautiful microscopic appearance. The margarin collects in a spot on the inner surface of the cell-membrane, and presents the appearance of a small star, whilst the olein occupies the remainder of the vesicle, unless when the quantity of fat in it is rather smaller than usual, in which case we may observe a little aqueous fluid between the olein and the cell-membrane. We have attempted to depict this separation in *h*.

2. *Pigment.*—In certain parts of the animal organism we meet with definite and well-marked colorations, not dependent on any peculiar arrangement of fibres, &c., but on the presence of *pigment-granules* of various colours. These granules are usually inclosed in cells, termed *pigment-cells.* In all races of men we find a most remarkable development of these cells on the inner surface of the choroid coat of the eye, where they form several layers known as the *Pigmentum nigrum.* They are probably always mingled with the epidermic cells, giving rise in the dark races to the deep colour of the skin; and presenting themselves in the white races in the form of freckles, the areola round the nipple, &c. The pigment-cells are usually flat and laterally compressed into the polygonal form. The granules in their interior are extremely minute, retain their dark colour under high magnifying powers, but exhibit various forms. In the choroid membrane of the human eye their form is very regular; in the adult no nucleus

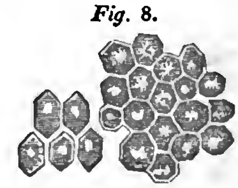
Fig. 7.



Cells from the choroid coat of an adult.

can be seen, a structure which is obvious in corresponding cells from the fœtus. The pigment-cells have not always a simple rounded or polygonal form; they sometimes

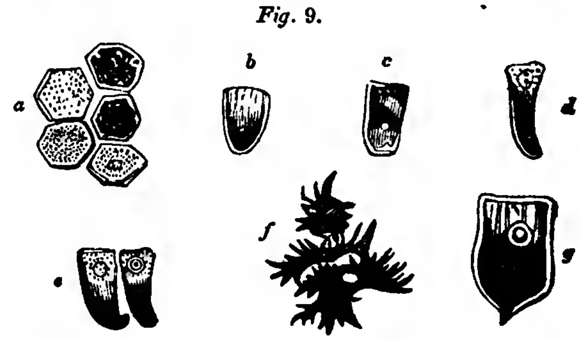
Fig. 8.



Similar cells from a fœtus at the third month.

present remarkable stellate prolongations and other singular shapes, which we have attempted to depict in *Fig.* 9, repre-

Fig. 9.



senting pigment-cells from a frog. *a*, *b*, *c*, *d*, *e*, and *g*, *Fig.* 9, are representations of various pigment-cells from its choroid coat, while *f* is intended to exhibit the stellar shape in which these cells occur on the skin of that animal. The nucleus is sufficiently obvious in one of the cells in *a*, in *c*, *d*, *e*, and *g*.

Little is known of the chemistry of the animal pigments. Scherer has made three analyses of the black pigment from the eye of the ox, from which he concludes that it consists of

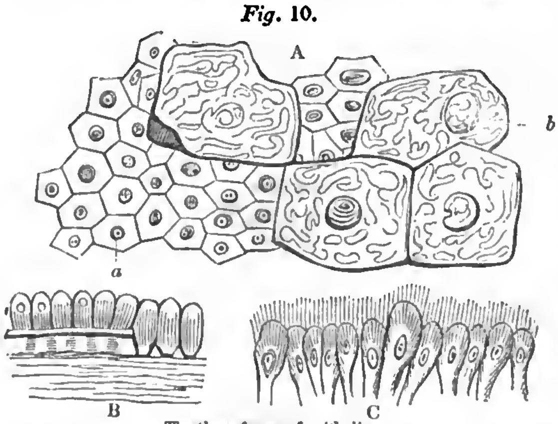
Carbon	58·284
Hydrogen	5·918
Nitrogen	13·768
Oxygen	22·030

From these analyses it appears probable that the black pigment contains a larger amount of carbon than any other constituent of the animal body.

3. *Horny tissues.*—Under this general name are included not only true horns, but feathers, hairs, cuticle, the various forms of epithelium, and the crystalline lens. We shall confine our observations to the microscopic characters of *epithelium* and *hair*, and then briefly advert to the general chemical characters of the class.

The *epithelium* may be regarded as a delicate cuticle covering the free *internal* surfaces of the body, just as the epidermis (to which it is closely allied) invests the external surface. Some of the uses of the epithelial cells have been already noticed in our remarks on isolated cells, in addition to their obvious use in protecting the surfaces on which they are placed. This structure was first investigated by Henle (in Müller's 'Archiv,' 1838), and has been since carefully examined by Bowman (art. 'Mucous Membranes,' in Todd's 'Cyclopædia of Anatomy and Physiology,' 1842), Goodsir, and others. From the forms presented by the epithelial particles they have received different names. Henle divided them into *pavement or tessellated epithelium*, *cylinder epithelium*, and *ciliated epithelium*, and although they frequently run in one another, yet on the whole these distinctive terms are serviceable.

Fig. 10.



The three forms of epithelium.

The *pavement epithelium* consists of broad flattened particles, or scales, having an angular outline and a nucleus; these scales form layers of extremely variable thickness. *Fig.* 10, A, shows very clearly how they are superimposed over one another, forming an effectual protection to the basement membrane beneath them. As a general rule the nucleus is large in proportion to the youth of the cell. In this figure we have attempted to exhibit these cells in two stages, a recent and a mature stage. In the young cells marked *a* the nucleus is relatively much larger than in *b*. This figure is intended to represent the epidermic scales of the frog; the larger cells, *b*, lying above the younger and smaller cells, *a*.

This form occurs on all synovial and serous membranes, and on most of the mucous membranes.

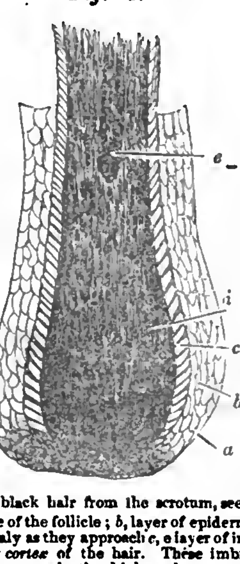
In the *cylindrical epithelium* the particles have the shape of small rods disposed endways on the basement membrane in a single layer. In consequence of their mutual compression they usually assume a prismatic rather than a cylindrical form, and hence Bowman applies the term *prismatic* to this form of epithelium. This form is perhaps best seem on the villi of the small intestine, or the conjunctival surface of the cornea of the eye. We have attempted to depict the latter in *Fig.* 10, B.

The *ciliated epithelium* is little more than cylinder epithelium on whose free surface numerous cilia or delicate filaments are observed in actual motion (*Fig.* 10, C). When in motion each filament appears to bend from its root to its point, returning again to its original state like corn moved by the wind. The motion of the cilia is not only quite independent of the will of the animal, but seems even to be independent of the life of the rest of the body; it has been seen after the death of the animal, and proceeding with perfect regularity, in parts separated from the body. Dr. Carpenter states that ciliary movement has been observed fifteen days after death in the body of a tortoise. The motion may be readily observed in the oyster or muscle. In the human subject this form of epithelium exists in the air-passages with their various offsets, as the nasal cavities, eustachian tube, lachrymal ducts, &c., and in the upper part of the vagina, the uterus, and the fallopian tubes. Its purpose is evidently to propel fluids over the surfaces on which it occurs.

Hair. The *shaft* of the hair is that portion which is fully formed and projects beyond the surface. On examination we find it lodged in a follicular involution of the basement membrane (*Fig.* 11, *a*), which usually passes through the cutis into the subcutaneous areolar tissue. This *hair-follicle* is bulbous at its deepest part, like the hair which it contains. Its sides have a cuticular lining, *b*, continuous with the epidermis, and resembling the cuticle in the rounded form of its deep cells and the scaly character of the more superficial ones, which are here in contact with the outside of the hair, *c*. The hair grows from the bottom of the follicle, and the cells of the deepest stratum, there resting on the basement-membrane, are very similar to those which in other parts are transformed into scales of cuticle. A gradual enlargement occurs in these cells as they mount in the soft bulb of the hair, which indeed owes its size to this circumstance. If the hair is to be coloured, the pigment-grains are also here developed, for the most part in scattered cells, which may send out radiating processes; at other times, in a diffused manner around the nuclei of the cells generally. It frequently happens that the cells in the axis of the bulb become loaded with pigment at one period, and not at another; so that, as they pass upwards in the shaft, a dark central tract is produced of greater or less length, often only in irregular patches, and the hair appears here and there to be tubular, *e*. The shaft is much narrower than the bulb, and is produced by the rather abrupt condensation and elongation into hard fibres of the cells, both of those which contain pigment and those which do not. The granules of pigment assume a linear arrangement between the fibres, which are firmly united into a solid rod by a material similar, it may be supposed, to that which cements the scales of the cuticle.

The human hair has a proper bark, or cortex, formed in the following way:—A single layer of the cells immediately surrounding those about to form the fibrous tissue of the shaft are seen near the bottom of the follicle to assume an imbricated arrangement (*Fig.* 11, *c*), and gradually to mount on the hair, becoming more compressed against it in their ascent, until they form upon its surface a thin transparent colourless film, in which the overlapping of the delicate cells is still exhibited by elegant and exceedingly fine sinuous

Fig. 11.

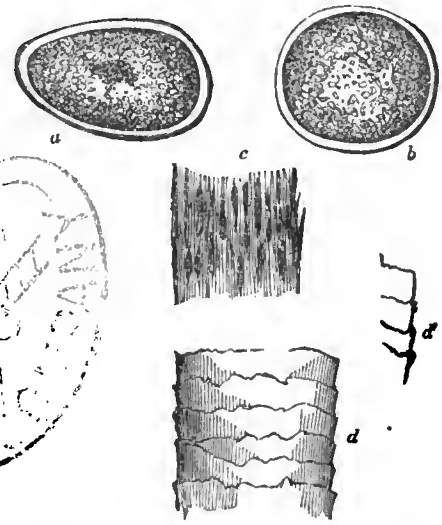


Bulb of a small black hair from the scrotum, seen in section.

a, basement-membrane of the follicle; *b*, layer of epidermic cells resting upon it and becoming more scaly as they approach *c*, a layer of imbricated cells forming the outer lamina or *cortex* of the hair. These imbricated cells are seen more flattened and compressed, the higher they are traced on the bulb. Within the cortex is the proper substance of the hair, consisting at the base, where it rests on the basement-membrane, of small angular cells, scarcely larger than their nuclei. At *d* these cells are more bulky and the bulb consequently thicker: there is also pigment developed in many of them more or less abundantly. Above *d* they assume a decidedly fibrous character and become condensed. *e*, a mass of cells in the axis of the hair, much loaded with pigment.

cross lines (*Fig.* 12, *d*, *d'*). The fibrous interior and this peculiar cortex together compose the shaft of the hair. By the continual emergence of fresh portions of the shaft from the follicle, fragments of the cuticular lining of the latter are apt to be drawn up upon the hair, aided probably in this by the imbrication of its surface, and are often found clinging around it for some way; but they are not to be regarded as any part of the hair itself. From the preceding description it will be evident that the fibrous part of the hair is a peculiar development of the cuticular cells resting on the bottom of the follicle, that the imbricated cortex is formed by a single series differently developed at the circumference of these, and that beyond this series comes the cuticular lining of the follicle, so that the hair is neither covered nor underlaid by cuticle, but it is in fact the modified cuticle of the bottom of the follicle.

Fig. 12.



a, Transverse section of a hair of the head, showing the exterior cortex, the fibrous tissue with its scattered pigment, and a central space filled with pigment. *b*, a similar section of a hair at a point where no aggregation of pigment in the axis exists. *c*, longitudinal section, without a central cavity, showing the imbrication of the cortex, and the arrangement of the pigment in the fibrous part. *d*, surface showing the sinuous transverse lines formed by the edges of the cortical scales. *d'*, a portion of the margin, showing their imbrication.

The figures and the description of the structure are copied from Todd and Bowman's 'Physiological Anatomy and Physiology of Man,' vol. ii. p. 418.

The chemistry of horny tissues has been specially investigated by Scherer and Van Laer. The following analyses of various tissues of this class have been analyzed by the former chemist (Liebig and Wöhler's 'Annalen,' vol. xl. p. 53) :—

	Buffalo horn.	Nails.	Cuticle from sole of the foot.	Hair of the beard.	Hair of the head.	Calculated C_{48}, H_{39}, N_7, O_{17}.
Carbon . .	51·162	51·089	51·036	51·522	50·622	51·718
Hydrogen . .	6·397	6 824	6·801	6·687	6·613	6·860
Nitrogen . .	17·284	16·901	17·225	17·936	17·936	17·469
Oxygen } Sulphur } . .	24·959	25·186	24·938	23·848	24·829	23·953

From the analyses of Van Laer it appears that the average amount of sulphur in human hair is 5 per cent. From a series of well-devised experiments he concludes that 'the hair consists essentially of –

'1. A connecting medium consisting of a tissue yielding gelatin, and represented by the formula $C_{13}\ H_{10}\ N_2\ O_5$;— and

'2. Of bisulphuret of protein, $C_{40}\ H_{31}\ N_5\ O_{12}\ S_2$

'The large amount of sulphur is the cause of its colour being affected by various metallic salts. As there is no constant difference to be observed in the results obtained by the analysis of hair of various tints, it is to be presumed that the colour is dependent on peculiar arrangements of the ultimate particles.' Hair further contains about 0·4 per cent. of peroxide of iron, which is supposed by Van Laer to be chemically combined with the protein.

4. *Fibrous and Areolar tissues.—Fibrous tissue* is now usually considered under two heads, namely as the *white* and the *yellow* tissue.

White fibrous tissue occurs in ligaments, tendons, and membranes requiring great strength. On carefully dissecting away the areolar tissue with which it is associated, it seems, when examined under the microscope, to consist of extremely delicate fibrillæ running parallel to one another, and taking an undulating course. There is however reason to believe it does not in reality consist of a bundle of fibrillæ, but that it is simply a mass with longitudinal parallel streaks, and which has a tendency to split up in a longitudinal direction (*Fig.* 14, *a*).

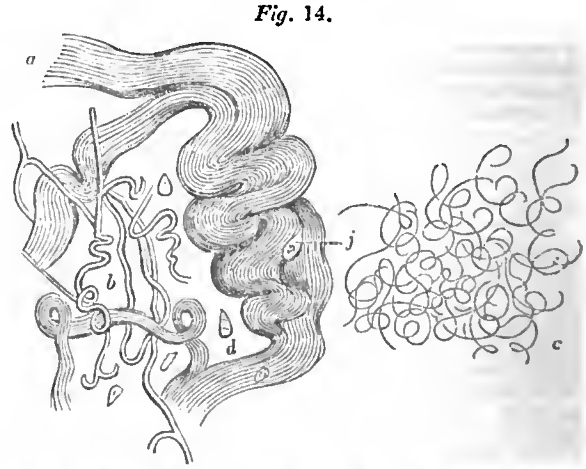
Yellow fibrous tissue differs in many essential points from the preceding form. It is remarkably elastic, is of a yellow colour, and is arranged in bundles or fibres, invested by a thin sheath of areolar tissue. In man we find it extended between the laminæ of the vertebræ, in several other ligaments, and in the transversalis fascia of the abdomen. It forms the *ligamentum nuchae* of animals. Examined under the microscope it is seen to consist of fibres varying in diameter from the 5000th to the 10,000th of an inch. They bifurcate or even divide into three, and freely anastomose with each other.

Fig. 13.

Yellow fibrous tissue showing the curly and branched disposition of its fibrillæ.

Areolar tissue is dispersed over almost every portion of the body, being the substance most commonly (but incorrectly) termed *cellular tissue*. The following are the microscope characters of this tissue, as described by Bowman and Todd :—When a fragment is examined, it presents an inextricable interlacement of tortuous and wavy threads, intersecting one another in every possible direction. They are of two kinds. The first are chiefly in the form of bands of very unequal thickness, and inelastic. Numerous streaks are visible in them, not usually parallel with the border, though taking a general longitudinal direction. These streaks, like the bands themselves, have a wavy appearance, but can be rendered straight by being stretched. The streaks seen have more the marks of longitudinal creasing than a true separation into threads ; for it is impossible to tear up the band into filaments of determinate size, although it manifests a decided tendency to tear lengthways. The larger of these bands are often as wide as the 500th of an inch ; the smaller can only be detected with high powers. These are the *white fibrous element*. The others are long, single, elastic, branched filaments, with a dark, decided border, and disposed to curl when not put on the stretch. They interlace with the others, but appear to have no continuity of substance with them. They are most commonly about the 8000th of an inch in diameter. These form the *yellow fibrous element*.

Fig. 14.

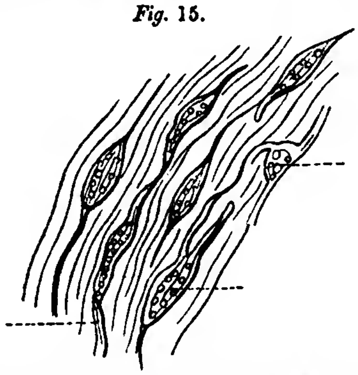


The two elements of Areolar Tissue in their natural relations to one another. *a*, the white fibrous element, with cell-nuclei, *j*, sparingly visible in it ; *b*, the yellow fibrous element, showing the branching or anastomosing character of its fibrillæ ; *c*, fibrillæ of the yellow element, far finer than the rest, but having a similar curly character ; *d*, nucleated cell-nuclei, often seen apparently loose.

These two tissues may be most easily discriminated by the addition of a drop of dilute acetic acid, which at once swells up the former and renders it transparent, whilst it produces no change in the latter. It thus brings into view corpuscles of an oval shape, which are probably the nuclei of the cells from which the bands have been originally produced. Oval corpuscles (*Fig.* 14, *d*), either altogether isolated or having very delicate prolongations with the adjacent threads, are sometimes noticed. They seem to be either advancing or receding stages of the tissue.

In *Fig.* 15, which represents the areolar tissue from beneath the skin of a five-months fœtus, we can perceive the cells elongating into fibres.

Fig. 15.



In a chemical point of view the leading difference between the white and yellow tissues is, that the former is acted on by acetic acid in the manner already described, and yields a considerable amount of gelatin in boiling; while the latter resists the action of acetic acid, and yields little or no gelatin.

5. *Nervous Tissue.*—In a microscopic point of view nervous tissue may be separated into two elements, the *vesicular* and the *fibrous*. The vesicular nervous matter is grey or cineritious in colour and granular in its texture, containing nucleated nerve-vesicles, and being largely supplied with blood. The fibrous nervous matter is, on the other hand, usually white, and composed of tubular fibres, although in some parts it is grey, and consists of solid fibres; it is also less vascular than the preceding. The former is more immediately associated with the mind, and is the originating seat of the force manifested in nervous actions; while the latter is simply the propagator of impressions made on it. The union of these two kinds of matter constitutes a *nervous centre*, and the threads of fibrous matter which pass to or from it are called nerves. The smaller nervous centres are termed *ganglia*; the larger ones are the *brain* and *spinal cord*.

Two species of primitive fibre have been observed by microscopists in the fibrous matter; they have been named the *tubular* fibre, or the *nerve-tube*, and the *gelatinous* fibre; the latter is comparatively rare, and is seldom found except in the sympathetic system.

The *tubular fibre* is a tube composed externally of a fine transparent homogeneous membrane, very much resembling the *sarcolemma* of muscle, which will be presently noticed. Nucleated cells may however be occasionally seen in it, as in *Fig.* 16, which represents a portion of the sciatic nerve of a frog. This may be termed the *tubular membrane* of nerve. The

Fig. 16.

contents of this tube consist of a soft, semi-fluid, whitish, pulpy substance, which is readily pressed out of its cut extremity. This is termed by Schwann the *white substance*, since the white colour of the nerve-tubes is dependent on it. Within this and occupying the centre of the tube is a transparent, somewhat flattened band, which is extremely delicate, and in which it seems impossible to recognise any more definite structure. Hence the tubular fibre consists of three distinct elements.

The tubes when quite fresh are perfectly cylindrical; but very slight pressure or almost any disturbing influence gives rise to swellings or enlargements in the course of the fibre, causing it to assume a varicose appearance. Two conditions seem to favour the production of this change; namely, a feeble power of resistance in the tubular membrane, and a semi-fluid state of the contained nervous pulp. In the nerves of the special senses the tubes are very delicate in structure, and are very apt to exhibit this change of form, and in the brain and spinal cord they present the same tendency. We mention this appearance because Ehrenberg formerly supposed that these varicosities were natural and existed during life, and that they furnished a valuable morphological character of the nerves of the spinal senses and the cerebro-spinal centres.

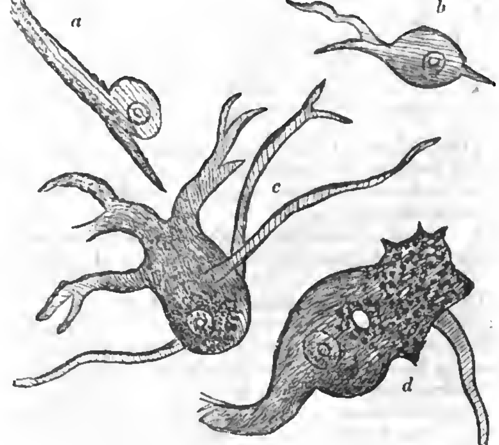
In point of size the nerve-tubes present considerable variety even in the same trunk; and in the different classes of animals the differences are well marked.

In man and other mammalia they vary from the 1625th to the 6500th of an inch; in birds, from the 2000th to the 3000th of an inch; in reptiles—in the frog—from the 1260th to the 2280th of an inch; in fish—in the eel—they are the 1043rd of an inch, and in the optic nerve of the cod-fish they are the 650th of an inch. These primitive tubules present no subdivision or branching. Whatever be the connexion which each primitive tubule forms with the nervous centre and with the textures to which it is distributed, it passes from one point to the other without any change, save perhaps in size, and without any communication with neighbouring tubules, beyond possibly investment by a common sheath.

The *gelatinous nerve-fibre* is a term applied by Henle to certain fibres occurring principally in the sympathetic nerve, and which may be regarded as its distinctive element. They are flattened, soft, and homogeneous in their appearance, bearing a considerable resemblance to unstriped muscular fibres; and like them, they contain numerous cell-nuclei, which are frequently arranged in a tolerably regular manner. These nuclei are brought in view by acetic acid, which dissolves the rest of the fibre, leaving them unchanged. These fibres contain nothing analogous to the white substance of Schwann, and hence are devoid of that whiteness which characterizes tubular fibre. It seems that the grey colour of certain nerves depends chiefly on the presence of a large proportion of the gelatinous fibres. Hence they are sometimes termed *grey fibres*. They are usually smaller than the tubular fibres, their diameter ranging between the 6000th and the 4000th of an inch. Both classes of fibres appear to run continuously from one extremity of the nervous cord to the other, without anything like union or anastomosis; each ultimate fibre probably having its distinct office which it cannot share with the other.

We now proceed to the consideration of the *vesicular nervous matter*, which in its normal form may be regarded as globular (*Fig.* 18, A, *a*, and B, *a*). This form is however liable to great variation, and from the compression to which these *nerve* or *ganglion-globules*, as they are termed, are exposed, they may become oval or polygonal, or they may extend

Fig. 17.



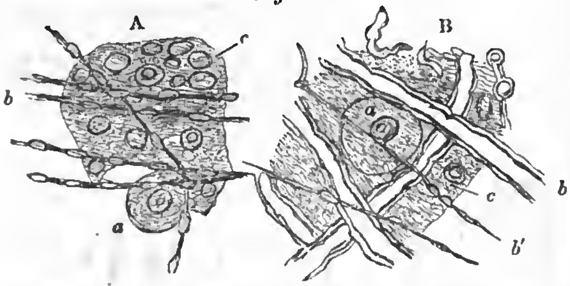
Ganglion-globules with their processes, nuclei and nucleoli.

a, From the deeper part of the grey matter of the convolutions of the cerebellum. The larger process is directed towards the surface of the organ. *b*, Another from the cerebellum; *c*, *d*, others from the posterior horn of grey matter of the dorsal region of the cord. These contain pigment which surrounds the nucleus in *c*. In all these specimens the processes are more or less broken. Magnified 200 diameters. From Todd and Bowman.

into one or more long processes, giving them a caudate or star-like aspect.

The wall of each vesicle consists of an exceedingly delicate membrane, containing a soft but tenacious finely granular mass. The *nucleus* is generally eccentric, much smaller than the containing vesicle and adherent to some part of its interior. Its structure is apparently the same as that of the outer vesicle. The *nucleolus* is a minute, remarkably clear, and brilliant body, also vesicular, enclosed within the nucleus. The processes to which we have alluded contain the same granular matter as the cells, with which they seem to be continuous. They are extremely delicate, and generally break off close to the nucleus; sometimes however they may be traced to a considerable distance, and will be found to divide into two or three branches, which undergo further subdivision. It is most probable that they either serve to connect distant vesicles or that they become continuous with the flattened bands occurring in the centre of the tubular element. In most situations where vesicular matter is found in the nervous centres, tubular fibres and sometimes both varieties of fibre are also present. We have attempted to depict this union in *Fig.* 18.

Fig. 18.



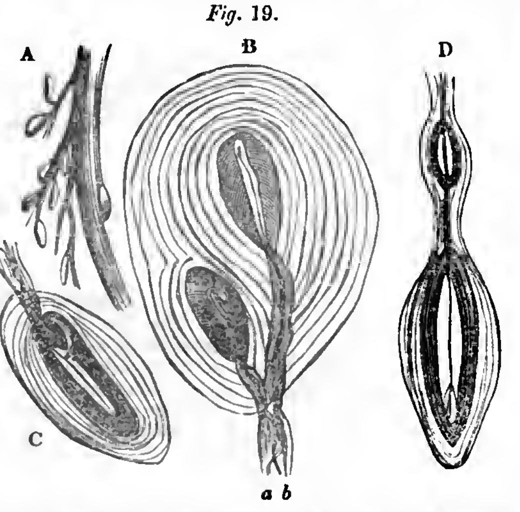
A, vesicular and fibrous matter of the laminæ of the cerebellum. *a*, ganglion-globule; *b*, very minute nerve-tubes traversing a finely granular matrix, in which are numerous rounded nuclei, *c*.

B, blending of the vesicular and fibrous nervous matter in the dentate body of the cerebellum; *a*, ganglion-globule with its nucleus and nucleolus; *b*, nerve-tube, slightly varicose, in close contact with the ganglion-globule; *b'*, a smaller nerve-tube. These parts all lie in a finely granular matrix interspersed with nuclei, *c*. From Todd and Bowman.

Chemistry of Nervous tissue. In the 'Annales de Chimie,' for 1841, there is a memoir by Fremy on this subject. From the fatty matter of the brain, which usually amounts to 5 or 6 per cent., he isolated several secondary compounds; namely, 1, Cerebric acid; a white substance in the form of crystalline grains, abounding in carbon, and containing a minute proportion of phosphorus. 2, Cholesterin; 3, Oleo-phosphoric acid, a peculiar fatty acid containing about 2 per cent. of phosphorus in the form of phosphoric acid; and 4, Traces of olein, margarin, and fatty acids. The following table has been drawn up by L'Heretier from his own researches. The numbers in each instance represent the mean of six analyses:—

	Infants.	Youths.	Adults.	Aged Persons.	Idiots.
Water . . .	82·79	74·26	72·51	78·85	70·93
Albumen . .	7·00	10·20	9·40	8·65	8·40
Fat . . .	3·45	5·30	6·10	4·32	5·00
Osmazome and salts	5·96	8·59	10·19	12·18	14·92
Phosphorus . .	0·80	1·65	1·80	1·00	0·85

Fig. 19.



A, nerve from the finger, natural size, showing the Pacinian corpuscles; B, unusual form from the mesentery of the cat, showing two included in a common envelope; *a*, *b*, are the two nerve-tubes belonging to them; C, another from the same, showing an offset from the central cavity, containing a branch of the nerve; D, rare form from the mesentery of the cat, showing two corpuscles placed in succession on a single stalk, and furnished with the same nerve-tube, which resumes its white substance in the interval between them. From Todd and Bowman.

The varying amount of phosphorus has been supposed to stand in some connexion with the mental powers; this view must however at present be deemed merely hypothetical. The nerves according to L'Heretier contain more albumen, less solid and more soft fat, than the brain.

Pacinian Corpuscles. These bodies, so called from Pacini their discoverer, are found in the human subject in great numbers in connexion with the nerves of the hand and foot, but they also exist sparingly on other spinal nerves and on the plexuses of the sympathetic, though never on the nerves of motion. In the mesentery of the cat they may be almost always detected by the naked eye, being pellucid oval grains rather smaller than hemp-seeds.

A gives a correct idea of their relation to the nerves in the palm and sole. In the human subject they vary from the 10th to the 20th of an inch. The structure of these bodies is highly singular. They consist, first, of a series of membraneous capsules, from thirty to sixty or more in number, enclosed one within the other; and, secondly, of a single nervous tubular fibre enclosed in the stalk, and advancing to the central capsule, which it traverses from end to end.

Fig. 20.

Pacinian corpuscle from the mesentery of a cat; intended to show the general construction of these bodies. The stalk and body, the outer and inner system of capsules, with the central cavity, are seen.

a, Arterial twig, ending in capillaries, which form loops in some of the intercapsular spaces, and one penetrates to the central capsule. *b*, The fibrous tissue of the stalk, prolonged from the neurilemma. *n*, Nerve tube advancing to the central capsule, there losing its white substance, and stretching along the axis to the opposite end, where it is fixed by a tubercular enlargement. Todd and Bowman.

In the above figure, which exhibits the general structure, the ten or fifteen innermost capsules may be observed to be in contact with one another, while the rest are separated by a clear space containing fluid.

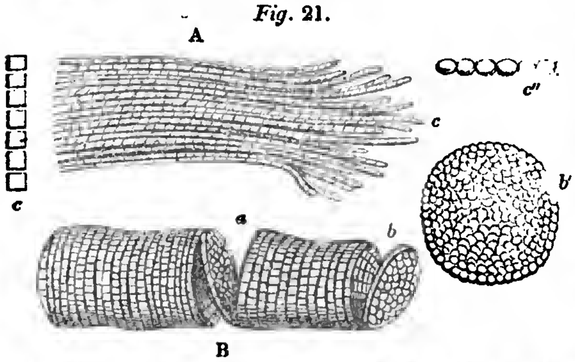
Respecting the *function* or *use* of these corpuscles no satisfactory account has yet been given. Pacini is himself inclined to believe that they may be concerned in the phenomena of what is called animal magnetism.

6. *Muscular tissue.* There are two forms of muscular fibre, differing extremely in their microscopic characters. The fibres of the voluntary muscles, as well as the fibres of the heart and some of those in the œsophagus, are *striped* or *striated*; while all other muscles, including those of the alimentary canal, the uterus, and bladder, all of which are involuntary, are *unstriped* or *non-striated*. [MUSCLE. P. C.]

. The elementary fibres of the voluntary muscles are arranged in sets parallel to one another, whilst those of the involuntary muscles usually cross at various angles, and interlace, forming membranous organs, enclosing a cavity which their contraction serves to constrict.

The *striated fibres* are usually of about the same length as the muscle to which they belong. In the sartorius they often exceed two feet in length, while in the stapedius (in the middle ear) they are not two lines. They vary in diameter from the 60th to the 1500th of each inch, being largest in crustacea, fish, and reptiles, where their irritability is most enduring, and smallest in birds, where it is most evanescent. In man their average diameter is the 400th of an inch. The fibre always presents upon and within it longitudinal dark lines, along which it subsequently splits up into fibrillæ; but it is by a fracture alone that these fibrillæ are obtained; they do not exist as such in the fibre. Sometimes, on the application of violence, cleavage takes place in a different manner, in a plane at right angles to the long axis of the fibre. In this case discs, and not fibrillæ, are obtained; and the cleavage is just as natural as the former, though less frequent.

Fig. 21.

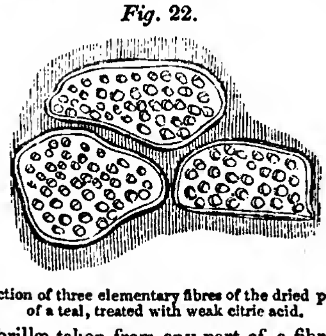


Fragments of elementary fibres, showing a cleavage in opposite directions.
A, Longitudinal cleavage. The longitudinal and transverse lines are both seen. *c*, Fibrillæ separated from one another by violence at the broken end of the fibre, and marked by transverse lines equal in width to those on the fibre. *c'*, *c''*, represent two appearances commonly presented by the separate single fibrillæ (more highly magnified) At *c'* the borders and transverse lines are all perfectly rectilinear, and the included spaces perfectly rectangular. At *c''* the borders are scalloped and the spaces bead-like. When most distinct and definite the fibrilla presents the former of these appearances. B, Transverse cleavage. The longitudinal lines are scarcely visible. *a*, incomplete fracture following the opposite surfaces of a disc, which stretches across the interval and retains the two fragments in connexion. The edge and surface of this disc are seen to be minutely granular, the granules corresponding in size to the thickness of the disc, and to the distance between the faint longitudinal lines. *b*, Another disc, nearly detached. *b'*, Detached disc more highly magnified, showing the sarcous elements. Bowman in Todd's Cyclopædia.

Hence tho fibre must be regarded neither as a bundle of fibrillæ nor a pile of discs, but as 'a mass in whose structure there is an intimation of the existence of both, and a tendency to cleave in the two directions.' The same particles compose the disc and the fibrilla, and they have received the names of the *primitive* or *sarcous* elements. Tho cross stripes of the fibre are formed, according to the views of almost all the best observers of the day, by the apposition, side by side, of the dark points seen on the separated fibrillæ. That they are not caused by a structure distinct from the fibrillæ, and present only on the surface of the fibre, is evident, according to Todd and Bowman, from the following facts:

1. That a transverse section of a fibre shows it to be solid and not hollow, and that the ends of tho fibrillæ, as seen on its section, exist throughout its interior, just as on its surface.

Fig. 22.



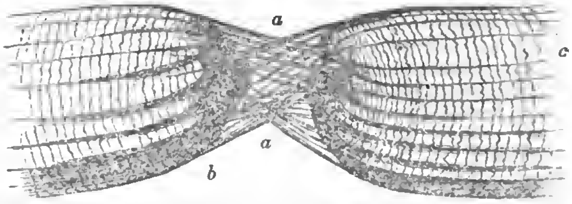
Transverse section of three elementary fibres of the dried pectoral muscle of a teal, treated with weak citric acid.

2. That fibrillæ taken from any part of a fibre are marked with light and dark points, corresponding in distance and force with the transverse stripes of the fibre

3. That with a high magnifying power applied to a thick fibre we may bring all parts of its interior into focus in succession, and perceive throughout the same kinds of stripes.

The *Sarcolemma*, or tubular sheath enclosing the striated fibre, consists of a transparent, very delicate, but tough and elastic membrane, which isolates the fibre from all other tissues. It most commonly has no appearance of structure, but occasionally small corpuscles, the remains of cell-nuclei, are observed in it.

Fig. 23.

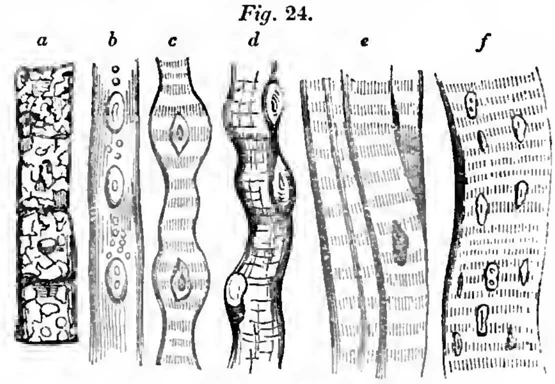


Fragments of the elementary fibre of a skate held together by untorn but twisted sarcolemma.

If the fibre be immersed in acid, it swells, bursts the sheath, and forms small protrusions or herniæ.

The researches of Valentin and Schwann have thrown much light on the development of muscular tissue in the embryo. In its earliest stage, muscle consists of a mass of nucleated cells which first arrange themselves in a linear series, and then unite to form the elementary fibres.

Fig. 24.



Stages of development of striated muscle fibre.
a, Arrangement of the primitive cells in a linear series.
b, The cells united, the nuclei separated, and some broken up; longitudinal lines becoming apparent. From a fœtal calf, three inches long.
c, *d*, Transverse stripes apparent. In *c* the nuclei are internal and bulge the fibre; in *d* they are prominent on the surface. From a fœtal calf, two months old.
e, Transverse stripes fully formed and dark; nuclei disappearing from view. From the human infant at birth.
f, Elementary fibre from the adult, treated with acid, showing the nuclei *a* From Schwann. The rest from Bowman.

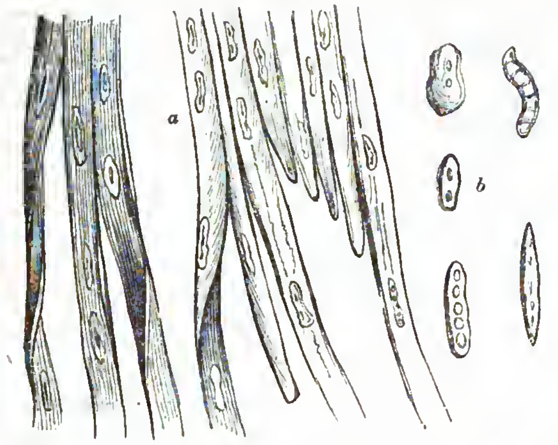
As the cells unite, a deposit of contractile material gradually takes place within them. The deposition assumes a granular form, the granular or sarcous elements being of the same size as in the perfect muscle; for this reason the transverse stripes resulting from their apposition are of the same width as in the adult. Muscles grow by an increase, not of the number, but of the bulk of their elementary fibres.

The *unstriped or non-striated* fibres consist of flattened bands, generally of a pale colour, bulged at intervals by oval or elongated corpuscles. Their texture seems to be homogeneous. By transmitted light they have usually a soft and very finely mottled aspect; their ordinary diameter varies from the 3000th to the 2000th of an inch.

Chemical characters of Muscle.—In consequence of the difficulty that exists in separating muscular fibre from areolar tissue, vessels, and nerves, it is impossible to speak with certainty regarding its behaviour towards re-agents. Playfair and Boeckmann have analyzed the dried muscular flesh of the ox, and found it to be identical in its composition with dried blood. For analyses of the flesh of man and of various animals we refer to Simon's Chemistry, vol. ii. p. 422-425.

7. *Cartilaginous Tissue.*—The simplest form of cartilage consists merely of nucleated cells, and closely resembles the cellular tissue of plants. This kind is found in the rudimentary spinal column of the early embryo; it also exists in the chorda dorsalis of the cartilaginous fishes. In other kinds of cartilage the cells are embedded in an *intercellular* substance, presenting certain varieties of appearance.

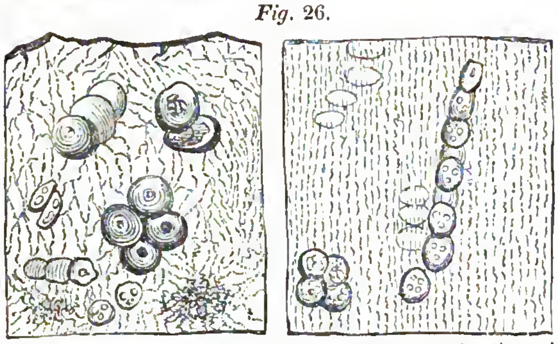
Fig. 25.



Fibres of unstriped muscle:—c, in their natural state; a, treated with acetic acid, showing the corpuscles. b, Corpuscles or nuclei detached, showing their various appearances.

Fig. 26.

A



B

Articular cartilage from the head of the humerus. Vertical sections: A, section close to the surface; B, section far in the interior.

In articular cartilage the cells are oval or roundish, dispersed in groups through a nearly homogeneous intercellular substance. The cells measure from the 1300th to the 900th of an inch. In the interior part of the incrusting cartilages the cells usually assume a more or less linear arrangement. In the different cartilages the cells vary in size and form. For the chemistry of cartilage, see Simon, vol. ii. p. 415.

8. *Osseous Tissue* has, during the last few years, been examined closely, with much success. These examinations have increased our knowledge of the nature of bone, as regards both its minute structure and its development. We must here confine ourselves to the former point.

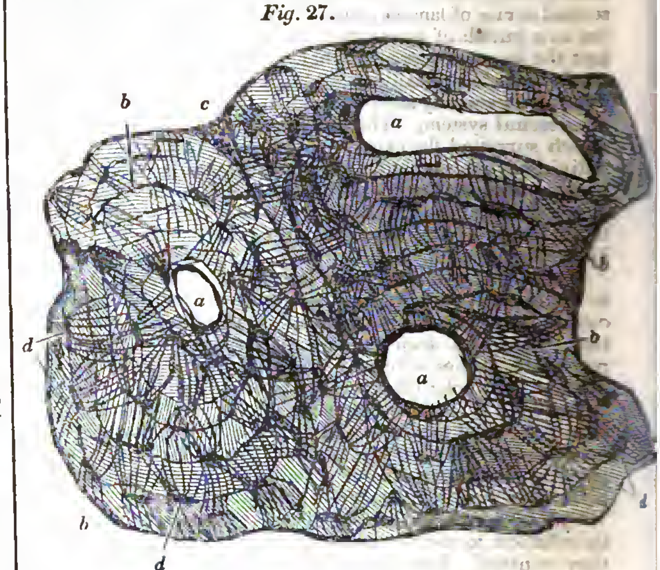
The canals which are everywhere found traversing variously the substance of bone, and giving passage to the blood-vessels for the nourishment of the tissue, are called *Haversian Canals*, a name given them in consequence of Clopton Havers having been the first who gave a full account of them. The parietes of these canals have a laminated arrangement. The laminæ themselves are numerous and placed concentrically; the internal lamina, that which is in immediate contact with the vessel or vessels, being the most distinctly marked, and each succeeding one having a less distinct outline.

Besides the concentric laminæ, there are others which surround the exterior of the bone, and may be known as the superficial laminæ. In connexion with both the concentric and superficial laminæ are a third set, which cannot belong to either of the other orders, but which are placed between them, and form the bond of union between each system.

Much has been lately written on the *bone-corpuscles*. These are small cells, of oval form, placed between the laminæ, and having numerous distinct tubes running from them in almost every direction. They have been sometimes compared to a spider with many legs. The corpuscles, or, as they are occasionally called, the calcigerous cells, have a definite relation to the Haversian canals and to each other.

The Haversian Canals, the osseous laminæ, and *the bone-corpuscles* are therefore the leading points to be mentioned in treating of the structure of the bone. Upon a closer view, however, it will be seen that it is only the laminæ which are bone; the canals and corpuscles are spaces existing in bone, and are not really necessary to the existence of osseous tissue, though they are requisite where the amount of substance is appreciable to the unaided senses.

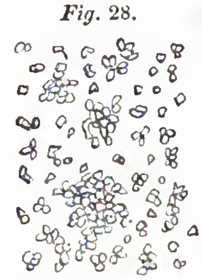
Fig. 27.



Transverse section of the dense portion of the femur.
a, Haversian canals; b, Concentric laminæ; c, Laminæ of connexion; d, Corpuscles with their system of tubes.
The parts marked a, b, and d, constitute an Haversian system.

Of the substance of Bone, or Hyalitic Substance.—The substance of bone has been considered, with but one or two exceptions, as homogeneous, and without appreciable structure. If it be examined however under advantageous circumstances, with high magnifying powers, there will be no difficulty in detecting a very definite though delicate structure. A very small portion of a thin plate of bone should be taken for the purpose of examination; such may be found in the ethmoid bone of small animals, as of the rat. If the piece is properly chosen it will be found to contain no Haversian canals nor corpuscles, but will be extremely thin and transparent. A piece of this kind will present a delicate granular aspect with the surface nodulated. This granular appearance proceeds from the substance of the bone being composed of minute irregularly spherical granules. This structure may be traced without much difficulty in any specimen of bone, although it varies much in distinctness in different specimens. The object should be placed between two slips of glass with a little plain water for examination. A delicate spiculum from the point where ossification is going on illustrates the granular tissue exceedingly well. The granules may be obtained separated from each other, so that each individual may be examined independently of the others.

Fig. 28.



Ultimate osseous granules, obtained by depriving bone of its animal matter.

When seen in this manner they exhibit a tolerably regular character, being mostly spherical, though a few have an oval form. In a few specimens the oval form predominates.

Of the Laminæ.—The form assumed by the osseous tissue is that of laminæ, and these laminæ have a definite arrangement, so much so that three distinct systems are recognised, namely: laminæ of the Haversian canals; secondly, the laminæ which connect the Haversian systems; and, thirdly, the laminæ which form the surface of the bone, and enclose the two previous orders. The laminæ of the Haversian canals have a concentric arrangement, and when divided transversely present a series of more or less distinct and perfect rings.

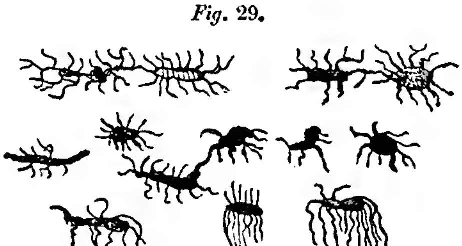
They vary very much in number, but the most common amount is ten or twelve. Of these, the internal lamina, that which forms the parietes of the Haversian canal, is most distinctly marked, while each succeeding one as we proceed outwards becomes less distinct. Connecting these Haversian systems is a second series of laminæ, without which the former would exist but as a bundle of loose tubes (*Fig.* 27, *c*). In this substance we find the laminated arrangement less distinct, far less regular, and the laminæ individually subject to great irregularity of thickness. They are generally more transparent than either the Haversian or external system. The last division consists of those laminæ which surround the exterior of the bone. These have greater individual extent, but are the least numerous. They are continuous with the laminæ of the Haversian system whenever the latter arrive at the surface of the bone; the external laminæ in this case being continuous with the inner laminæ of the Haversian system.

The effect of madder upon the osseous system, when given to an animal with its food, may here be noticed, since the colour is imparted to the laminæ. By introducing madder into the stomach, a deep red tinge is very soon observed: in a pigeon the bones were rendered brilliantly red in twenty-four hours. A similar effect was produced on a young pig in three weeks. On making sections of bone so affected, the colour is found to be present in the external laminæ of the bone, and in the inner laminæ of the Haversian system, thereby proving that the action of colouring takes place upon those surfaces which lie in contact with vessels.

Of the Haversian canals.—These canals must be considered in relation to their number, their size, and the parts which they contain. The number of canals in a given space vary perhaps a little, but this variation will be regulated in some degree by the situation of the bone, but more especially by its age. Thus the transverse section of the femur of a human fœtus of seven months will present many more canals than a section of equal measurement from the femur of an adult. The size of the Haversian canals takes a considerable range, varying from the 300th to the 500th of an inch. The Haversian canals undoubtedly give passage to blood-vessels, this being their principal if not only purpose.

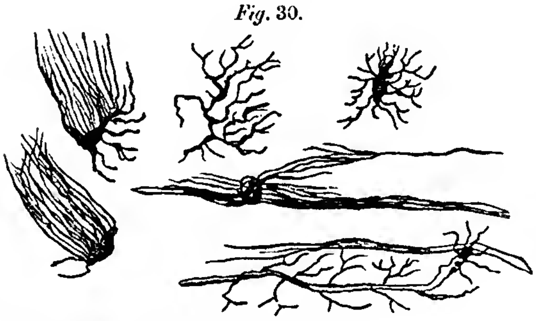
The corpuscles or cells of bone cannot be described as having any definite unvarying shape or size. The general form is a compressed oval, though not unfrequently they are circular. Again, they are sometimes almost triangular in their outline, while in other instances they approach n linear shape. These are the most common varieties of outline to which the bone-cells are subject, as they occur in the bones of man and the higher animals. In the four great classes of animals,

Fig. 29.



The forms assumed by the bone-cells in man.

Fig. 30.



Various forms of bone-cells found in the bone of the boa-constrictor.

namely mammalia, birds, reptiles, and fishes, it has been shown by Mr. Quekett that there are certain characters connected with these cells by which a bone of one class may be distinguished from that of another. He has shown that they are smallest in birds, a little larger in mammals, and largest of all in the reptiles; while in fishes they are altogether unlike those in the preceding classes. The importance of this observation in relation to fossil osteology is obvious. Connected with the cells are numerous delicate branching tubes, which are slightly dilated as they enter the cells. The number arising from each cell does not allow of any very definite enumeration, since no two cells will be found possessed of a like number of branching tubes. The general arrangement of the tubes is radiate, as regards the cells which form their common centre. The connexions are so numerous between the tubes and between the cells through the tubes, that a fluid introduced into one cell in a bone, may enter every other cell in that bone. The cells are situated between the laminæ, or on their surface; but where concentric laminæ occur, as in the Haversian system, the cells are placed in circular lines between the laminæ, each line of cells having the Haversian canal as an exit common to it and the connecting laminæ. When the canals for vessels are in great abundance, the bone-cells are more rarely met with; indeed in some cases they are almost entirely absent. When the cells are seen by transmitted light, particularly in a transverse section of bone, they are frequently opaque. There is no doubt that the bone-cells perform the function of circulation.

The Chemistry of Osseous Tissue has recently met with much attention from Valentin, Lehmann, Marchand, and more especially Von Bibra. From the bones of a man aged forty years, who committed suicide, Lehmann obtained—

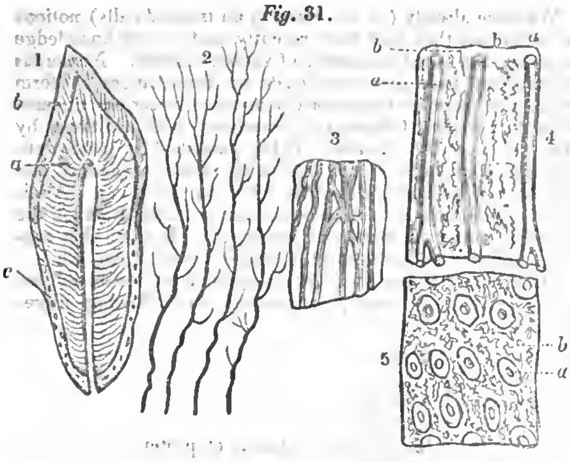
	Humerus.	Femur.
Phosphate of lime and fluoride of calcium	56·61	58·93
Carbonate of lime	9·20	9·28
Phosphate of magnesia	1·08	1·09
Chloride of sodium	0·37	0·40
Soda	1·35	1·04
Organic matter	31·52	28·81

For a full account of the chemistry of bone we must refer to Simon's 'Chemistry,' vol. ii. pp. 396-414, or Von Bibra, 'Chemische Untersuchungen der Knocken,' &c., Schweinfurt, 1844.

9. *Tooth.*—The structures entering into the composition of the teeth are three: *dentine*, or *tooth-substance; enamel;* and *cement*, or more properly *tooth-bone*. The enamel invests the more prominent parts of the crown, from which points it gradually diminishes in thickness, till it terminates in a line on the neck of the tooth. The cement, or dental bone, is thickest at and near the end of the root, and gradually becomes thinner as it advances towards the crown of the tooth. In a tooth that has been used for some little time, the cement terminates where the enamel commences, but there is reason to believe that a thin layer is continued over the enamel. Of these tissues, dentine, as forming the great bulk of the tooth, and thereby becoming the most important, will first demand our attention. The pulp-cavity occupies the centre of the dentine, and on its surface are superimposed the enamel and the tooth-bone, the former investing the crown and the latter the surface of the fang. These two tissues form a layer of variable thickness in different parts of the teeth. This layer, however, is soon worn off when the tooth comes into use. If the enamel and cement be removed from a tooth, and the dentine alone allowed to remain, the tooth still retains much of its original shape, losing most at the two extremities, while in point of size the loss sustained is comparatively slight; thus showing the dentine to constitute by far the greater portion of the tooth.

The dentine is made up of two distinct parts: first, dentinal tubes; secondly, intertubular tissue. The tubes have distinct parietes, equal in thickness to their calibre. In some instances they appear to contain a minute granular matter, but in many, perhaps in the majority of cases, they are perfectly free from solid contents. If a vertical section, passing through the pulp-cavity, be taken for examination, the dental tubes may be traced from their commencement on the surface of the pulp-cavity, to their termination at the junction of the cement, and the dentine on the enamel of the latter, or they may be seen passing into these external structures. The tubuli commence at a right angle with the surface of the pulp-cavity, and proceed outwards towards the surface of the tooth, giving out in their way numerous small branches, which, meeting with other similar branches from neighbouring tubes, anastomose with them, or meeting with simple cells in the intertubular tissue, there terminate. Towards the surface of the dentine it is not uncommon to see a tube alter its course, and by joining another, form a loop. The tubes all commence in the pulp-

Fig. 31.



1, longitudinal section of a canine tooth, showing the three tissues: *a*, the dentine or ivory; *b*, the enamel; *c*, the cement or dental bone.

2, dentinal tubes as seen by a low power.

3, a longitudinal section of dentine, showing a dentinal tube dilated, and sending off anastomosing branches.

4, longitudinal section of dentine, highly magnified. *a*, The dentinal tubes; *b*, Granular intertubular structure.

5, transverse section of dentine. *a*, The tubes, showing their parietes and area; *b*, The intertubular tissue.

cavity, and pass outwards towards the surface of the dentine. Their course, as regards each other, is divergent, so that the proportion of the intertubular tissue increases relatively as their distance from the pulp-cavity is greater or less. This preponderance of the intertubular over the tubular tissue near the periphery of the tooth is, however, in a considerable degree lessened by the more frequent branching of the tubes, and by the occurrence of cells near the surface of the dentine. If a single tube be traced through its whole extent, it will be found to make two undulations; and in addition to these, which are called the primary curves, a number of smaller undulations. In examining this structure a thin section may be taken from the fang, and, with the aid of the microscope, viewed by transmitted light. A tube will then appear as a very definite dark line pursuing its tortuous but definite course towards the surface, giving out numerous minute branches on its way, and at last dividing into two terminal branches, which end either by passing into a cell of the intertubular tissue, or by anastomosis with a collateral tube, or by passing into the cement. If a section of the dentine and enamel be taken, then the tubes will be seen to give out comparatively few branches till they come near to the latter, when they divide and anastomose freely, and some few terminal branches may be traced entering the enamel. It is by no means uncommon for a tube in its course to suddenly dilate and give out branches from the dilatation, then again contract, and pursue its original course. In such a case the dilatation forms a cell in every way similar to the bone-cell. The point of the greatest diameter of the dental tubes is at their commencement on the walls of the pulp-cavity, though in their course previous to the division of the trunk into two terminal branches they suffer but little loss in calibre. In tracing this structure in the teeth of various animals, we find every form of branching; sometimes the branches are few, in others extremely numerous; in some instances they are given out from one side of the tube only, in others from each side; but whatever the modification in the number or form of the branching given out, the primary tube always commences by an open extremity on the walls of the pulp-cavity, or upon the walls of a canal for a blood-vessel; and the direction taken by the tubes is invariably towards the periphery of the tooth, always anastomosing in their way by the numerous branches. In the temporary, and not unfrequently in the permanent teeth, the tubes, instead of presenting an uninterrupted line, present on their surface numerous indentations, just as though they were composed of a series of hollow beads, which were united and made to communicate with each other.

The second part composing the dentine is the intertubular tissue, which occupies the spaces between the tubuli, everywhere surrounding and investing them, and thereby contributing greatly in rendering tho whole dentine a solid dense mass, the area of the tubes and cells being the only hollow portion. In a favourable specimen of this tissue Mr. Tomes observed that it was composed of very minute granules, united to each other on all sides, thus forming a solid mass, of which, in character of formation, oolite would give a coarse illustration. The granularity is best seen near the external surfaces of perfect dentine, or in tho tissue when developing. In the intertubular tissue, hemispherical or elliptical cells are found, especially near the surface of the dentine of the fang, where they form a layer joining the cement.

Structure of the Enamel.—The enamel is the hardest of the dental structures, being composed of dense semi-transparent fibres, placed side by side, and closely united. Their form is an approximation to a six-sided prism, and their size is tolerably uniform, being about the $\frac{1}{4000}$th of an inch in diameter. The direction taken by the enamel-fibres is for the most part vertical to the surface of the dentine upon which they rest; those therefore which proceed from the flat surface of the crown will rise vertically, while those from the lateral surface of the tooth will be horizontal. When the coronal surface of the dentine is concave, the enamel fibres of the opposite sides of tho concavity form with each other angles, and meet at their external ends. This juncture is frequently imperfect, and leaves a fissure, under which the dentine, being less protected from external influence than on tho other parts of the crown of the tooth, is more frequently attacked by disease. The fissures on the crown of the molars are often subject to this defect of development. The ends of the enamel fibres are received into shallow hexagonal depressions in the coronal surface of the dentine, from whence in their course they frequently describe curves. The direction taken by neighbouring fibres is not however at all times perfectly parallel; indeed, they often diverge or cross each other at considerable angles. The curves also seem less regular than those formed by the dentinal tubes.

The Bone or Cement.—Where the enamel ceases to encase the dentine, the cement commences in a layer, gradually increasing in thickness to its termination at the apex of the root, although a very thin (rudimentary) layer is continued over the crown, investing the enamel. The histological characters of this structure are so completely identical with those of ordinary bone that we need offer no additional remarks on them.

For the importance of the microscopic investigation of the teeth in tho classification of existing and the determination of extinct species of vertebrated animals, we must refer to Professor Owen's 'Odontography,' one of tho most splendid works ever published.

Chemistry of the dental Tissues.—Von Bibra has instituted numerous analyses of the teeth of man and the lower animals. We select the following by way of illustration:—

	Molar tooth of a woman aged 25 years.		Molar tooth of an adult male.	
	Enamel.	Osseous portion.	Enamel.	Osseous portion.
Phosphate of lime, with a little fluoride of calcium	81·63	67·54	89·82	66·72
Carbonate of lime . . .	8·88	7·97	4·37	3·36
Phosphate of magnesia .	2·55	2·49	1·34	1·08
Soluble salts	0·97	1·00	0·88	0·83
Cartilage	5·97	20·42	3·39	27·61
Fat	a trace	0·58	0·20	0·40

The osseous portion includes the dentine and cement.

We have thus taken a brief survey of the microscopical and chemical characters of the most important structures entering into the composition of the human body. In addition to, and perfectly distinct from these are numerous morbid products—the results of disease. In this class we must place pus, granular cells, the various forms of morbid tumours, cancer, tubercle, scrofulous deposits, &c. These however hardly fall within the scope of this article; and for information regarding them we must refer to Vogel's 'Pathological Anatomy of the Human Body,' an English translation of which has recently appeared by Dr. Day.

Section III.—*Nutrition and the Secretions.*

We shall here notice those points in the chemistry of the blood—*the general nutrient fluid*—which the labours of recent investigators have evolved since the publication of the article Blood, P. C., and adopt a similar course in relation to the various secretions yielded by it.

We shall, in the first place, however, offer a few remarks on *nutriment* in connexion with *nutrition*, with tho view of bringing the article Food, P. C., up to the present state of our knowledge on that subject. The classification of foods in that article is not at present adopted by chemists and physiologists.

There are very strong reasons for believing that foods containing nitrogen are alone capable of conversion into blood, and of forming organised tissues; hence Liebig has termed them the *plastic elements of nutrition*. The *non-nitrogenous foods* are, according to Liebig, incapable of transformation into blood, and are therefore incapable of forming organised tissues. They are, however, not without their use; their function being, according to Liebig, to support the process of respiration, by yielding carbon and oxygen, whose oxidation is attended with the development of heat. These latter foods he terms the *elements of respiration*.

Nitrogenous Foods, or Plastic Elements of Nutrition.	Non-nitrogenous Foods, or Elements of Respiration.	
Vegetable fibrin.	Fat.	Pectine.
Vegetable albumen.	Starch.	Bassorine.
Vegetable casein.	Gum.	Wine.
Animal flesh.	Cane-Sugar.	Beer.
Animal blood.	Grape-Sugar.	Spirits.
	Sugar of Milk.	

Liebig believes that a second use (an abnormal rather than a natural one) of the second group is, in relation to the formation of fat (p. 636). Moreover, the statement contained in the article FOOD, that 'gelatin is a highly nutritious principle,' requires some notice. Liebig has established it as a law that 'no nitrogenized compound, the composition of which differs from that of fibrin, albumen, or casein, is capable of supporting tho vital processes in animals.' 'The animal organism,' he observes, 'unquestionably possesses the power of forming from the constituents of its blood, the substance of its membranes, as of cellular tissue, of the nerves and brain, of the organic part of cartilage and bones. But the blood must be supplied to it ready formed in everything but its form—that is, in its chemical composition. If this be not done, a period is rapidly put to the formation of blood, and consequently to life.' For this reason gelatin, which, as we have already shown (p. 639), is not a protein-compound, cannot form blood, and therefore will not support the vital processes. The two following facts seem however to show that it has a use in the economy:—1. When in the body of a starving or sick person the fat disappears, and the muscular tissue again takes the form of blood, we find that the tendons and membranes retain their natural condition, and the limbs of the dead body retain their connexions, which depend on the gelatinous tissues.—2. On the other hand, the gelatin of bones devoured by a dog entirely disappears, whilst only the bone-earth is found in the excrements. The same is true of man when fed on food rich in gelatin; as, for example, strong soup. The gelatin is not to be found either in the urine or in the fæces, and consequently must have undergone a change, and have served some purpose in the animal economy: in other words, it must have been expelled from tho body in a form different from that in which it was introduced. From these facts Liebig inclines to the belief that gelatin is serviceable in the formation of cellular tissue, membrane, and cartilage; and that it may tend to the reproduction of such parts of those tissues as have been wasted, and for their growth. 'And when the powers of nutrition in the whole body are affected by a change of the health, then, even should the power of forming blood remain the same, the organic force by which the constituents of the blood are transformed into cellular tissue and membranes must necessarily be enfeebled by sickness. In the sick man the intensity of the vital force—its power to produce metamorphoses—must be diminished as well in the stomach as in all other parts of the body. In this condition, the uniform experience of practical physicians shows that gelatinous matters, in a dissolved state, exercise a most decided influence on the state of the health. Given in a form adapted for assimilation, they serve to husband the vital force, just as may be done in the case of the stomach, by due preparation of the food in general. Brittleness in the bones of the graminivorous animals is clearly owing to a weakness in those parts of the organism whose function it is to convert the constituents of the blood into cellular tissue and membrane; and if we can trust to the reports of physicians who have resided in the East, the Turkish women, in their diet of rice, and in the frequent use of enemata of strong soup, have united the conditions necessary for the formation both of cellular tissue and of fat.' Whether this be the mode in which gelatin acts or not, no one who has seen much medical practice will deny to it a place amongst useful nutritive substances.

We now proceed to make those additions to the chemical portion of the article BLOOD which the labours of the last ten years havo rendered necessary.

We have already (in our remarks on isolated cells) noticed the additions that have been recently made to our knowledge regarding the blood-corpuscles of various animals. Numerous observations have also been made on the changes in form which the corpuscles occasionally undergo in various diseases (Simon's 'Animal Chemistry,' translated, with additions, by Day, vol. i. p. 103, London, 1845; published by the Sydenham Society); also on the effects of various medicines and re-agents on the corpuscles ('An. Ch.,' pp. 107-112). Additional information on the acceleration or retardation of the coagulation may be found in Hamberger's Thesis on that subject, published at Berlin in 1839, and in Simon, 'An. Ch.'

With regard to the chemical composition of the blood, we may regard it as usually containing the following ingredients:—

1.	Water.
2. Protein-compounds	Fibrin. Albumen. Globulin. Binoxide and tritoxide of protein.
3. Colouring matters	Hæmatin. Hæmaphæin.
4. Fats	Cholesterin. Serolin. Red and white solid fats containing phosphorus. Margaric acid. Oleic acid.
5.	Iron. Albuminate of soda (?). Phosphates of lime, magnesia, and soda. Sulphate of potash.
6. Salts	Carbonates of lime, magnesia, and soda (?). Chlorides of sodium and potassium. Lactate of soda (?). Oleate and margarate of soda (?).
7. Gases	Oxygen. Nitrogen. Carbonic acid.
8.	Urea—a trace.
9.	Sugar—a trace (?).

It will be observed that there are notes of interrogation to several of the salts: the presence of these constituents is denied by Enderlin and Liebig's school generally. Their objection is founded on the circumstance, that if these salts were exposed to a red heat, they would become converted into carbonates; and that the ash obtained from the incineration of blood, if examined directly after the operation, does not contain those salts. As these experiments have been performed under Liebig's personal observation, and have been published in his journal, and as further they apply equally to almost all the other fluids of the animal body, we shall give the leading grounds on which the presence of alkaline carbonates in the ash is disproved, and its alkalinity is otherwiso accounted for:—

1. The ash does not effervesce on the addition of an acid.
2. Hot water poured over the ash becomes alkaline; it holds in solution alkaline phosphates and sulphates, chloride of sodium, and sometimes chloride of potassium, but no other salts.

a. On the addition of a neutral solution of nitrate of silver to this fluid, there is a yellow precipitate which is partly soluble in nitric acid; a portion however consisting of chloride of silver remains undissolved. The addition of nitric acid causes no effervescence. On neutralizing the acid filtrate with ammonia, a yellow precipitate of tribasic phosphate of silver ($3\,AgO,\,P_2O_5$) is thrown down.

b. On treating the aqueous solution of the ash with a solution of chloride of calcium, there is a copious gelatinous precipitate of phosphate of lime ($3\,CaO,\,P_2O_5$) which dissolves in nitric acid without effervescence. On treating this acid solution with nitrate of silver, and neutralizing with ammonia, the tribasic phosphate of silver is precipitated as before. The addition of the chloride of calcium neutralizes the previously alkaline fluid. From 1, we see that the alkaline reaction is not due to the presence of alkaline carbonates; and 2 shows it is not dependent on the presence of free potash or soda, for otherwise the fluid would not be neutralized by the chloride of calcium. Hence the albumen in the blood cannot exist as a soda compound (albuminate of soda); neither can there be alkaline lactates, acetates, nor fatty-acid salts in that fluid: and on the above grounds Enderlin conceives that we are justified in assuming that the alkaline reaction of the ash is dependent on the presence of tribasic phosphate of soda ($3\,NaO, P_2O_5$); and as this is the only salt that remains tribasic at a red heat, he concludes that the alkalinity of the blood, as well as of the ash, is dependent on it. The manner in which he accounts for the occurrence of carbonates in the analyses of other chemists is very plausible. On exposing $3\,NaO, P_2O_5$ to the atmosphere, it becomes converted into $2\,NaO, HO, P_2O_5$ and NaO, CO_2, or phosphate of soda in which one atom of the base is replaced by an atom of water, and carbonate of soda.

This question regarding the salts actually occurring in the blood is however far from settled, Ludwig having during the last few months positively denied Enderlin's statements. (See Day's 'Report on the Progress of Chemistry,' in Ranking's 'Half-yearly Abstract of the Medical Sciences,' vol. iii., 1846.)

Generally speaking it is only requisite in the analysis of the blood, to determine a few of the most important constituents; as, for instance, the water, fibrin, blood-corpuscles (globulin and hæmatin), and the solid residue of the serum (the organic portion and the salts). For this purpose we may adopt the following simple plan lately published by Figuier. It is based on the fact made known many years ago by Berzelius, that after the addition of a solution of a neutral salt to defibrinated blood, the globules do not (as before) pass through filtering paper. On the addition of two parts of a solution of sulphate of soda of specific gravity 1130 to one of blood, Figuier found that the whole of the corpuscles remained on the surface of the filter. The following are the steps of his analysis:—The fibrin is removed by stirring, dried, and weighed; the weight of the corpuscles is ascertained by the method indicated, and that of the albumen by coagulating by means of heat the filtered solution. The proportion of water is known by evaporating a small known weight of the blood. The filter containing the corpuscles should be dipped in boiling water, which removes any sulphate of soda that may be present, and at the same time renders the corpuscles insoluble. Separate and frequently difficult processes are requisite to detect those ingredients which occur in small quantity or only in morbid conditions.

Distinctions between Arterial and Venous Blood.—We have already (p. 642) noticed the circumstance that the external envelop of the blood-corpuscles becomes converted during the act of respiration into oxidized protein, and that the bright red colour of arterial blood is owing in part to the modifying influence of the white investing membrane. But there is yet another mode in which it acts. The buffy coat which is frequently observed on the upper part of the clot in inflammatory diseases is very apt to curl up and become concave. Now this buffy coat consists, for the most part, of the oxides of protein—of the very same matter with which the blood-corpuscles become invested. For this reason the form assumed by the two laminæ on both sides of the little flat body—the corpuscle—must resemble that of the buffy coat. The tendency to contract and become bi-concave is so strong, that the central portion of the crust becomes entirely depressed. In this form the corpuscles reflect a great deal more light than when, in consequence of the removal of the buffy coat in the capillaries, they have a less bi-concave form.

From four analyses of the blood of horses, Simon deduces the following rule regarding the chemical differences of arterial and venous blood. 'Arterial contains less solid residue generally than venous blood; it contains less fat, less albumen, less hæmatin, less extractive matter and salts, than venous blood. The blood-corpuscles of arterial blood contain less colouring matter than those of venous blood.' The arterial blood was taken from the carotids, and the venous from the jugulars.

Composition of healthy human venous Blood.—In a medical point of view the composition of venous blood is the most interesting, because it is from the veins that blood is almost always taken in disease, and because venous blood can naturally only be compared with venous blood for the purpose of ascertaining any deviations that may occur. The following table represents the mean composition of human venous blood without reference to sex:—

Water	795·278
Solid constituents	204·022
Fibrin	2·104
Fat	2·346
Albumen	76·660
Globulin	103·022
Hæmatin	6·209
Extractive matters and salts	12·012

100 parts of blood-corpuscles contained 5·7 of hæmatin.

Hence the blood contains about 20 per cent. of solid constituents, much more than 0·2 per cent. of fibrin, and about an equal quantity of fat; the blood-corpuscles considerably exceed the albumen in quantity, and contain about 5 or 6 per cent. of colouring matter.

The space within which we are limited precludes us from noticing the various modifications which the blood undergoes in different forms of disease. The extent of these variations is obvious from the following table, drawn up from Simon's 'Animal Chemistry,' vol. i., p. 246.

The water may vary from	915·0	to	725·0
The solid residue ,,	275·0	to	85·0
The fibrin ,,	10·8	to	a trace.
The fat ,,	4·3	to	0·7
The albumen ,,	131·0	to	55·1
The globulin ,,	106·6	to	30·8
The hæmatin ,,	8·7	to	1·4
The extractive matters and salts	16·5	to	7·6

Lymph and Chyle.—Closely allied to the blood are the lymph and chyle. These fluids have only recently been submitted to correct chemical examination. In Simon's 'Chemistry' the reader will find recent analyses of the former by Marchand and Colberg, l'Heretier, Rees, and Nasse; and of the latter by Simon, Rees, and Nasse.

From the consideration of the blood we naturally turn to that of the various secretions yielded by it.

The *saliva* has been analysed by Simon, L'Heretier, and Wright. The following is Dr. Wright's account of healthy saliva. It varies considerably in specific gravity, being always denser after a meal than during fasting. Healthy saliva has mostly the specific gravity of 1007·9. When above 1010 or below 1003 it may be considered morbid. Healthy saliva is either alkaline or neutral, generally the former. He believes in the existence of the principle termed *ptyalin*, although he separates it from the saliva by a new process, which is 'to pass saliva through ordinary filtering paper, and after filtration shall have been accomplished to exhaust the residue with sulphuric ether: the ethereal solution contains a fatty acid and ptyalin. It is to be allowed to evaporate spontaneously, and the residue left by evaporation is to be placed upon a filter and acted on by distilled water, which dissolves the ptyalin and leaves the fatty acid.' On evaporating this solution to dryness the ptyalin will be obtained in a pure state. In relation to the presence of sulpho-cyanogen Wright remarks that it is a constant ingredient of the saliva. 'The proportion,' he observes, 'is temporarily augmented by local stimulation of the salivary glands, as by smoking, chewing sialogogues, &c. It is also increased by the internal use of prussic acid and salts of cyanogen, and remarkably so by the use of sulphur.' The occurrence of this substance in the saliva is equally interesting in a physiological and in a medico-legal point of view. The circumstance that it forms with the per-salts of iron a beautiful cherry-red of the same colour as the meconate of iron, must not be overlooked in examining the stomach in a case of suspected poisoning by opium.

L'Heretier has recorded the mean of 10 analyses of the saliva of healthy persons made while fasting:—

Water	986·5
Organic matter	12·6
Inorganic matter	0·9

The ptyalin formed 2·5 of the 12·6 parts of organic matter.

Mialhe has recently (April, 1845) announced the discovery in the saliva of an active principle analogous in its physical and chemical characters to diastase. It is solid, white or greyish white, amorphous, insoluble in alcohol, but soluble in water and in weak spirit. The directions for obtaining it are the following: filter saliva and treat it with five or six times its weight of absolute alcohol, adding it as long as any precipitate occurs. This animal diastase falls in white flocks, which when dried constitute 0·2 per cent. of the saliva.

The Bile.—It would take up far more space than we could devote to the subject to notice all the additions that have been recently made to the chemistry of the bile. In the year 1838, Demarçay announced that bile consisted essentially of an organic acid combined with soda. He termed the acid *choleic*, and obtained it in the following manner: bile, from which the mucus had been precipitated by alcohol, was evaporated on the water-bath, and 10 parts of the dried residue were dissolved in 100 of water, to which 10 of hydrochloric acid had been added. Allowing evaporation at a moderate temperature to proceed, it was observed that a dark green oil collected on the surface, while at the same time the fluid became turbid. On removing the oil and allowing the fluid to rest for some time, it gradually became clear, with the precipitation of a green deposit. This dark green bitter precipitate is Demarçay's choleic acid, and is regarded by him as constituting nine-tenths of the solid constituents of the bile. It is still mixed with margaric acid, cholesterin, pigment, &c. After their removal it forms a yellow spongy matter, which rapidly absorbs oxygen from the atmosphere, is very bitter, slightly soluble in ether, soluble in water, and very soluble in alcohol. The *choleate of soda*, obtained by adding an alcoholic solution of soda to an alcoholic solution of choleic acid, and then passing a current of carbonic acid through it to remove the excess of soda, possesses all the characters of bile; it yields on evaporation a brown resinous mass, and is soluble in water and in alcohol.

When choleic acid is boiled with hydrochloric acid it yields ammonia, taurine (see TAURINE, P. C.), and choloidic acid; the latter being insoluble is deposited. The formulæ usually assigned to choleic acid, taurine, and choloidic acid are, $C_{42} H_{36} N O_{12}$, $C_4 H_7 N O_{10}$, and $C_{72} H_{56} O_{12}$.

But it has been recently shown by Redtenbacher that the formula for taurine should in reality be $C_4 N H_7 O_6 S_2$; since it contains no less than 25·6 per cent. of sulphur which had been previously altogether overlooked (Liebig and Wöhler's 'Annalen der Chemie und Pharm.,' Feb. 1846). Hence there can be no doubt that the formula for choleic acid also requires considerable modification. For further information on the recent history of the chemistry of the bile we must refer to Simon's 'Animal Chemistry,' vol. i., pp. 45-49, and vol. ii., pp. 17-27; Day's 'Reports on the Progress of Animal Chemistry,' in Ranking's 'Half-yearly Abstract of the Medical Sciences,' vols. ii. and iii.; and Platner's 'Ueber die Natur und den Nutzen der Galle,' Heidelberg, 1845. The following description of the microscopical and chemical character of healthy human bile is condensed from a series of papers on the subject by Frerichs (*Hannov. Annal.*, i. and ii., 1845).

In colour it is always a deep brown, but when seen in thin layers it has a brownish-yellow tint. It is very fluid, being viscid only in new-born infants. The specific gravity varies from 1032 to 1040. On examining with the microscope bile from the gall-bladder, with which, of course, a certain amount of mucus is mixed, there are observed:—1. Transparent or greyish round vesicles, about the 700th of a line in diameter; they disappear on the addition of alcohol or ether, and are removed by filtration. 2. Conical yellow bodies, about the 140th of a line in length, and about the 300th or 400th of a line in breadth, apparently devoid of nuclei; these are epithelial cells from the gall-bladder. 3. Here and there irregular dark granules, which disappear on the addition of a solution of potash, apparently pigment cells. 4. Occasionally minute crystals of cholesterin, occurring as colourless rhombic tablets.

The chemical characters are shown in the two following analyses. The bile in these cases was obtained from healthy men, killed by severe accidents:—

	1.	2.
Water	86·00	85·92
Solid constituents	14·00	14·08
Choleate of soda	10·22	9·14
Cholesterin	0·16	0·26
Margarin and olein	0·32	0·92
Mucus	2·66	2·98
Chloride of sodium	0·25	0·20
Tribasic phosphate of soda	0·20	0·25
Basic phosphate of lime / " " magnesia	0·18	0·28
Sulphate of lime	0·02	0·04
Peroxide of iron	traces	traces.

Platner has recently succeeded in obtaining choleic acid and choleate of soda in a crystallized form.

That the bile is not merely an excrementitious fluid, intended to remove effete matter from the blood, but that it is a secretion essential to the animal economy, was rendered almost certain by the experiments of Berzelius, Theyer, and Schlosser, which showed that the human fæces contained much too small a quantity of a substance resembling bile, to justify the idea that it is evacuated in this manner. A further proof that the bile is absorbed and not excreted is afforded by an examination, made by Enderlin, of the ash yielded by the contents of the different portions of the intestinal canal of a hare. He found that the ash from the contents of the duodenum *alone* effervesced on the addition of an acid, thus showing that the choleate of soda (which yields the carbonate on incineration) is absorbed before reaching the jejunum. Schwann has recently established this opinion beyond a doubt, by a series of well-devised experiments on dogs. He tied the ductus choledochus, and at the same time formed a fistulous opening in the gall-bladder, by which the bile escaped externally. His most important conclusions are, 1st, that when the bile does not get into the bowel its absence is generally perceptible in dogs about the third day, by a marked diminution in weight; and, 2ndly, that unless the channel for the conveyance of bile to the duodenum is re-established symptoms of deficient nutrition, wasting, debility, &c. ensue, and death is the ultimate consequence.

The chemistry of the *gastric juice* is still very unsettled; it has been recently made the object of especial study by Blondlot, Bernard and Barreswil, Melsens, and Dr. R. D. Thompson, who have obtained very contradictory results.

The *milk* has been recently examined by Simon, Clemm, and Dumas. The reader will find a copious account of the chemistry of this secretion in Simon's 'Animal Chemistry,' vol. iii. pp. 42-69.

The *urine* has, since the publication of the article URINE, P. C., been made an object of especial investigation by Liebig. The most important fact that has been discovered is that *hippuric acid* is, although in small quantity, a constant ingredient of this secretion. The acid reaction of this secretion depends in a great measure, according to that chemist, on the property that uric and hippuric acids possess of combining with the potash or soda of the alkaline phosphates, and thus forming an acid phosphate of soda.

The brief space necessarily allotted to this article has rendered it imperative on us to omit the consideration of many points of very high physiological importance.

For further information on the subjects contained in the preceding pages we must refer to the following works:—

On the Structure of Animal Tissues—Henle's 'Allgemeine Anatomie;' the article 'Tissue' (Gewebe) in Wagner's 'Handwörterbuch der Physiologie;' Bowman and Todd's 'Physiological Anatomy and Physiology;' the works of Dr. Carpenter; Goodsir's 'Anatomical and Physiological Observations;' the articles 'Mucous Membrane,' 'Muscle,' and 'Osseous Tissue,' in Todd's 'Cyclopædia of Anatomy and Physiology;' and Mr. Tomes's Lectures on Dental Surgery in the 'Medical Gazette' for 1845-6. The best account in the English language of vegetable tissues is given in Henfrey's 'Structural and Physiological Botany.'

On the Chemical Department of this article we must refer to Simon's 'Animal Chemistry;' to Dr. Day's Reports on the 'Progress of Physiological and Pathological Chemistry,' in Ranking's 'Half-yearly Abstract of the Medical Sciences;' to Liebig's 'Animal Chemistry,' translated by Gregory; to Mulder's 'Versuch einer Allgemeinen Physiologischen Chemie;' to Lehmann's 'Lehrbuch der Physiologischen Chemie;' and to L'Heretier's 'Traité de Chimie Pathologique.'

TLEMSEN. [ALGIERS, P. C., p. 330.]

TOD, JAMES, Lieutenant-Colonel in the service of the East India Company, was born in 1782, in England, but educated in Scotland. He went out to India in 1800, and obtained a commission in the 2nd Bengal European regiment; thence he volunteered for the Moluccas, was transferred to the marines, served as a marine on board the Mornington, and, in 1805, was attached, under his friend Mr. Græme Mercer, to the embassy sent at the close of the Mahratta war to the camp of Sindia in Mewar, where the embassy arrived in the spring of 1806. Rajpootana, of which Mewar is one of the states, thenceforward became the scene of his official labours, as well as of the geographical, historical, and antiquarian investigations by which he distinguished himself. He began to make surveys of Rajpootana soon after his arrival in the country, and the result of those surveys was the magnificent map which is given at the commencement of his 'Annals of Rajast'han.' The map was completed in 1815, and was presented to the Marquis of Hastings, then governor-general of India, and it was of great use in forming the plan of operations in 1817, the previous maps of the country having been very imperfect and erroneous. In 1817 he was appointed political agent, with the entire control of five of the states which had just then placed themselves under British protection, Mewar, Marwar, Jessulmeer, Kotah, and Boondee. The results of his investigations into the geography, history, and antiquities of Rajpootana are given in his 'Annals of Rajast'han.'

In 1822 the impaired state of his health rendered it necessary that he should return to the more congenial climate of his native country. Previously however to his departure from India, he made a circuit of nearly the whole of Rajpootana, including Gujerat, which he completed at the close of 1822, and in the beginning of 1823 he sailed from Bombay, and arrived safely in England.

After his return to England his time was chiefly devoted to literary pursuits. He officiated for a while as librarian to the Royal Asiatic Society. In 1834 he went to the Continent for the relief of a complaint in the chest, and remained abroad twelve months. He returned to England in September, 1835. While at Rome he was occupied with a work to be entitled 'Travels in Western India,' the result of the journey which he made previous to his return to England, and especially his observations in Gujerat. The last chapters of the work were written in October, 1835, while residing with his mother in Hampshire, and the MS. is said to have been left nearly fit for publication except filling up a few blanks and the completion of the engravings; but it has not yet been published. On the 16th of November, while transacting business with his bankers in London, he had an attack of apoplexy, and lay without consciousness for twenty-seven hours. He died November 17, 1835, at the age of fifty-three. He left a widow, the daughter of Dr. Clutterbuck, and a young family.

Bishop Heber, who travelled through Mewar and the adjoining Rajpoot states, in 1825, on his way to Gujerat, bears testimony to the affection and respect borne to Colonel Tod by the upper and middling classes of society in various towns through which the bishop passed. He says, 'Here and in our subsequent stages we were continually asked by the cutwals, &c. after Tod Sahib (Captain Tod), whether his health was better since he returned to England, and whether there was any chance of seeing him again. On being told it was not likely, they all expressed much regret, saying that the country had never known quiet till he came among them, and that everybody, whether rich or poor, except thieves and Pindarees, loved him. He, in fact, Dr. Smith told me, loved the people of this country, and understood their language and manners in a very unusual degree.' Bheelwara, a commercial town, which had contained 12,000 families, had been entirely ruined by the depredations of the Mahrattas at the time when Colonel Tod was appointed political agent. He set himself to restore it, and in less than a year there were seven hundred prosperous and peaceful families in it. Colonel Tod, in a letter to a friend, says, 'Regarding Bhilwarra, the work of my hands, in February, 1818, there was not a dog in it; in 1822 I left 3000 houses, of which 1200 were bankers and merchants. An entire street, arcaded, was built under my directions and with my means. The merchants from Calcutta, Jessulmér, Delhi, Surat, from every mart in India, had their correspondents, and in fact it was becoming the chief mart of Rajast'han. The affection of these people a thousand times repaid my cares.' Bishop Heber, after describing the prosperous state in which he found the town in 1825, says, 'The place had been entirely ruined by Jumsheed Khan, and deserted by all its inhabitants, when Captain Tod persuaded the Rana to adopt measures for encouraging the owners of land to return, and foreign merchants to settle. He himself drew up a code of regulations for them, and obtained them an immunity from taxes for a certain number of years, and sent them patterns of different articles of English manufacture for their imitation. He also gave money liberally to the beautifying of their town. In short, as one of the merchants who called on me said, "It ought to be called Todgunge, but there is no need, for we shall never forget him."'

The 'Annals of Rajast'han' were published in London, in 2 vols. royal 4to., vol. i. in 1829, and vol. ii. in 1832.

(*Annual Biography and Obituary*, 1836; *Gentleman's Magazine, February*, 1836; Bishop Heber's *Narrative of a Journey through the Upper Provinces of India*, 1824, 1825.)

TODD, REV. HENRY JOHN, was born in 1763, and educated at Hertford College, Oxford, where he proceeded M.A. in 1786.

He became a minor canon of Canterbury Cathedral soon after being ordained. In 1792 he was presented by the Dean and Chapter of Canterbury to the vicarage of Milton, near that city; and some years after, by the same body, to the rectory of Allhallows, Lombard Street, London, on which he fixed his residence in the metropolis. In November, 1803, he was appointed, by the Archbishop, Keeper of the Manuscripts at Lambeth. In 1820 he was withdrawn from London, by being presented by the Earl of Bridgewater to the rectory of Settrington, in Yorkshire, of the value of 1045*l.*; in 1830 he was collated by the Archbishop of York to the prebend of Husthwaite, in that cathedral church; and, finally, in 1832 he was appointed Archdeacon of Cleveland.

His first publication was 'Some Account of the Deans of Canterbury, from the new foundation of the Church by Henry VIII.,' 8vo., 1793. This was followed by an edition of Milton's 'Masque of Comus,' with notes and illustrations, from a manuscript belonging to the Duke of Bridgewater, 1798; 'The Poetical Works of John Milton,' with notes and a life, 6 vols. 8vo., 1801, for which he received 200*l.* from the booksellers, and of which there was a second edition in 1809, a third in 1826, and a fourth in 1843, and the portion of which consisting of the Life and the Verbal Index has also been published separately; 'A Catalogue of the Library of Christ Church, Canterbury,' 8vo., 1802; 'The Works of Edmund Spencer,' with notes and a Life, 8 vols. 8vo., 1805, reprinted in 1845; 'Illustrations of the Lives and Writings of John Gower and Geoffrey Chaucer,' 8vo., 1810; 'A Catalogue of the Archiepiscopal Manuscripts in the Library at Lambeth Palace,' fol., 1812 (100 copies privately printed); a new edition of 'Dr. Johnson's Dictionary of the English Language, with corrections and additions,' 4 vols. 4to., 1814, &c., and again in 3 vols. 4to., 1827; 'The History of the College of Bonhommes, at Ashridge, folio, 1823 (privately printed for the Earl of Bridgewater); 'Original Sin, Free Will, Regeneration, Faith, Good Works, and Universal Redemption, as maintained in certain Declarations of our Reformers,' &c., 8vo., 1818; 'A Vindication of our Authorized Translation and Translators of the Bible' (in reference to Bellamy's new translation), 8vo., 1819; 'Observations on the Metrical Version of the Psalms, by Sternhold, Hopkins, and others,' 8vo., 1819; 'Memoirs of the Life and Writings of the Right Rev. Brian Walton, Bishop of Chester,' 2 vols. 8vo., 1821; 'An Account of Greek Manuscripts of the late Professor Carlyle, now at Lambeth,' 8vo., 1823 (privately printed); a new edition of 'Archbishop Cranmer's Defence of the Doctrine of the Sacrament', 8vo., 1825, with a Vindication of Cranmer, reprinted in 12mo. in 1826; 'A Letter to the Archbishop of Canterbury, concerning the Authorship of Icôn Basilikè,' 8vo., 1825 (assigning the work to Bishop Gauden); 'A Reply to Dr. Lingard's Vindication of his History of England, as far as respects Archbishop Cranmer,' 8vo., 1827; 'Bishop Gauden the Author of Icôn Basilikè further shown, in answer to Dr. Wordsworth,' 8vo., 1829; 'Life of Archbishop Cranmer,' 2 vols. 8vo., 1831 (an enlargement of the 'Vindication'); 'Authentic Account of our Authorized Version of the Bible,' 12mo., Malton, 1834. We have omitted a few theological pieces of inferior importance. He was also, in the early part of his literary career, a frequent contributor to the 'Gentleman's Magazine;' and he is stated in Hasted's History of Kent, to have assisted largely in the preparation of that work.

Archdeacon Todd, who was a Chaplain in Ordinary to her Majesty, died at Settrington, on the 24th of December, 1845. From his will, an abstract of which is given in the 'Gentleman's Magazine' for June, 1846, he appears to have left several daughters.

Archdeacon Todd, though the editor of Milton and Spencer, had no pretensions to either poetical talent or poetical taste; nor was even his acquaintance with our old poetry, or with our old literature in general, very extensive or intimate. His annotations, accordingly, are rather dry. At the same time, if they do not overflow with much variety of knowledge, and rarely display any remarkable ingenuity, they do not annoy the reader by any kind of superfluous disquisition. He is certainly not a very animated narrator; but his facts may generally be depended upon. His most useful services, perhaps, have been rendered in the field of bibliography.

(Memoir in *Gentleman's Magazine* for March, 1846.)

TOFIELDIA, a genus of plants belonging to the natural order Colchicaceæ. It has a 6-parted perianth, the anthers bursting longitudinally. The three capsules, connected to above the middle, are 1-celled and many-seeded.

T. palustris, the only British species, has pedicels naked at the top, but with a 3-lobed bract at the base. The stem is from 4 to 8 inches high, the leaves sword-shaped, about 2 inches long, in 2-ranked radical tufts. The flowers are in a dense spike, at first sessile, afterwards slightly stalked with a bract at the base of the stalk, but none under the perianth.

(Babington, *Manual of British Botany*.)

TONICS. [ANALEPTICS, P. C.]

TONNAGE. [SHIP-BUILDING, P. C.]

TOPES. [AFGHANISTAN, P. C. S.]

TORDYLIUM (τορδύλιον of Dioscorides, 3. 56), a genus of plants belonging to the natural order Umbelliferæ. The calyx consists of 5 awl-shaped teeth, the petals obcordate with an inflexed lobe, the outer ones radiant. The fruit has a thick wrinkled margin, the pericarps with very slender ribs, the 3 dorsal ribs at equal distances, the 2 lateral ones contiguous to the thickened margin or covered by it. The species are herbs, with pinnate leaves and ovate leaflets deeply toothed. The flowers white.

T. maximum, Great Hart-wort, has a scabrous or hispid stem, pinnate leaves, and lanceolate leaflets deeply notched and clothed with fine bristly hairs. The flowers are reddish, the outer petal having 2 equal lobes, the two next with extremely unequal ones. It is native of the middle and south of Europe, and England, in corn-fields.

T. officinale, Officinal Hart-wort, has a branched furrowed stem, clothed with soft deflexed hairs; the leaves are pinnate, rough, and hairy; the leaflets ovate, cut, and crenate. The 2 outer petals are radiant, each with 2 very unequal lobes, which are sometimes reddish. It is the Σέσελι of Hippocrates, 'Vict. Acut.,' 387, and of Theophrastus, 'Hist. Plant.' 9. 18. The *Seseli* of Pliny, 25. 8. The seeds of these species only require to be sown in an open border in the spring; a light soil suits them best.

(Don, *Gardener's Dictionary;* Babington, *Manual of British Botany.*)

TORILIS, a genus of plants belonging to the natural order Umbelliferæ. The calyx has 5 teeth; the petals are obovate, emarginate, the outer ones radiant and bifid; the fruit slightly and laterally compressed; the carpel with bristly primary ridges, the secondary hidden by the numerous prickles which occupy the interstices; the flowers white, those in the disk of the umbellules male and sterile.

T. anthriscus has bipinnate leaves, the leaflets ovate, lanceolate, inciso-serrate; the umbels on long peduncles, the leaves of the involucre awl-shaped, the fruit covered with bristles; the flowers are small, reddish or white. It is native of Europe and Caucasus, and is plentiful in Britain.

T. infesta has an erect much-branched stem, the leaves bipinnate, the leaflets deeply cut, ovate, lanceolate. The fruit is densely prickly, the flowers small and reddish. It is found on fields and waste places in Europe and Great Britain.

T. nodosa has nearly sessile dense umbels, the outer carpels with hooked bristles, the inner often covered with dense whitish shining granulations; the lower leaves are bipinnate, the upper ones pinnate; the leaflets deeply, narrowly, and uniformly pinnated. It is native of Europe and the Levant, and is plentiful in Britain.

The seeds only require to be sown in the open ground.

(Don, *Gardener's Dictionary;* Babington, *Manual of British Botany.*)

TORTOISE-SHELL. This beautiful substance, or at least the best kind of the material which goes under the name, is procured from a marine tortoise called the Hawk's-bill turtle, or *Testudo imbricata* [TORTOISES, P. C., pp. 76, 77], the Latin name of which is derived from the mode in which the scales upon its back are arranged, overlapping one another like the tiles upon the roof of a house, one kind of which were called by the Romans *imbrices*. In most other tortoises the several scales of which their covering is composed adhere to one another by their edges, like inlaid work. Each animal furnishes thirteen principal plates, five along the centre of the back, and four on each side; and twenty-five smaller scales or plates, which constitute the margin of the shell. 'The size and thickness of the plates,' observes Mr. Aikin, in a paper on Horn and Tortoise-shell, in the 'Transactions' of the Society of Arts, vol. lii., part ii., pp. 343-347, 'depend on the magnitude and age of the animal, a fresh layer being produced every year; and at the margin of the large plates may be seen distinctly the edges of the layers as they thin off in succession.' 'Sometimes, however,' he adds, 'large plates are met with, so thin as to consist, apparently, of only a single layer;' and he observes that 'some of the dealers in this article have an opinion that these thin plates are the produce of full-grown tortoises that have been stripped of their plates the year before, either purposely or by accident.' The horny plates which constitute true tortoise-shell are separated from the bony foundation which forms the shell or covering of the animal by the application of heat; the whole shell being commonly placed over a fire until the plates begin to start from the bone, and the separation being completed by the aid of a slender knife. The shell varies much in value, being frequently injured by barnacles, limpets, and other shell-fish, adhering to the turtles while alive, and interfering with the growth of the shell where they attach themselves. Occasionally plates of a uniform yellow colour are met with, and such, Mr. Aikin states, are in great request among the Spanish ladies, who will give at least twice as much for a comb of plain tortoise-shell as for a mottled one. The belly-plates of the tortoise are yellow, and sometimes they are found sufficiently clear for use.

The mode of manufacturing tortoise-shell so nearly resembles the working of horn, described on pages 46 and 47 of this volume, as to need little further notice; but owing to the very high value of the material (about three guineas per lb. was the price of fine shell when Aikin wrote in 1832), it is economised as much as possible. Before working the shell needs to be softened or *tempered*, which is usually done by dipping it for three or four minutes, or longer if it be very thick and brittle, in boiling water, which, according to Aikin, should have a little salt mixed with it, because pure water abstracts much of the colour. Too much salt however renders the shell brittle; and too long boiling injures it by turning it nearly black, and covering the surface with an opaque white film. According to Holtzapffel, in whose work on 'Turning and Mechanical Manipulation,' vol. i. pp. 128-135, is a very full and interesting account of the manufacture of tortoise-shell into various articles of taste and utility, some manufacturers flatten and temper their shells with hot flat irons, similar to those used by laundresses; the tortoise-shell being, in the course of the operation, frequently dipped in cold water to prevent scorching. Holtzapffel remarks that generally the less the shell is heated and pulled about the better, because from its apparent want of grain or fibre it is apt to become very brittle. Being also less fusible than horn, tortoise-shell cannot be made soft enough to be moulded without some injury to the colour; and accordingly, Aikin states, 'the manufacturers, at least in England, never attempt to produce tortoise-shell combs with ornamental open work by means of dies.' Such work is produced by pasting a piece of paper over the tortoise-shell, drawing the pattern upon it, cutting it out with drills and fine saws, and, after the paper has been removed by steeping in cold water, finishing the ornaments with the graver. The cutting or *parting* of the teeth of combs by machinery is described under COMB, P. C. S., p. 398; but we may here notice another mode which is occasionally followed, and which illustrates the convenience arising from the flexibility of the material when warmed. A piece of tortoise-shell large enough to make two combs, with their teeth interlaced, is bent or bowed, in the direction of the length of the teeth, to such a degree of convexity that they may be cut with a straight bow-saw without cutting through either of the edges of the pieces of shell, which are required to form the top or back portions of the combs. The shell is then flattened and the ends or points of the teeth are separated with a narrow chisel or *pricker*, after which the combs are finished with files and scrapers, and bent to any required curvature upon wooden moulds. The same method of cutting is resorted to in making the frames for eye-glasses, which are usually formed out of narrow slips of shell in which slits are cut with a saw, the slits being subsequently, while the shell is warm, *strained* or *pulled* open, until they form circular or oval apertures, by the insertion of tapering triblets of the required shape. The same yielding or flexible property is made use of in the manufacture of boxes; a round flat disc of shell being gradually forced by means of moulds into the form of a circular box with upright sides. The union of two or more pieces of shell may be effected by carefully scraping the parts that are to overlap, so as to render them perfectly free from grease, even such as might arise from being touched by the hand, softening them in hot water, pressing them together with hot flat tongs, and then plunging the joint into cold water.

In veneering with tortoise-shell, by which very beautiful work may be produced, it is usual to apply fish-glue, mixed with lamp-black, vermillion, green, chrome, white, or other colouring matter, at the back of the shell, both to heighten its effect and to conceal the glue or cement by which it is secured to the wooden foundation. In making knife-handles and some other ornamental work metallic foils are put beneath the tortoise-shell veneer with excellent effect.

Aikin refers to the luxurious taste of the Romans of the Augustan age for couches and other articles of furniture veneered or inlaid with tortoise-shell; and in Dr. Smith's 'Dictionary of Greek and Roman Antiquities,' p. 585, it is stated that the lyre is sometimes called by Greek writers χέλυς or χελώνη, and in Latin *testudo*, because it was occasionally made of tortoise-shell.

TOWNLEY, JAMES, REVEREND, the second son of a merchant, was born in London in 1715. He was educated at Merchant Tailors' School, elected thence to St. John's College, Oxford, and took orders. After having held two lectureships in London, he was appointed, through the interest of his wife's family, to the living of St. Bennet, Gracechurch Street. Afterwards he was grammar-master in Christ's Hospital, and in 1759 was appointed head master of Merchant Tailors' School, and held that office till his death in 1778, which happened soon after he had been presented to a living in Wales. He is said to have been admired as a preacher: and some single sermons of his are in print. But he is chiefly known on account of his intimacy with Hogarth and Garrick. To the former he and Morell gave material assistance in the composition of his 'Analysis of Beauty;' and he got the credit of having much assisted the latter in his dramatic works. The popular farce of 'High Life Below Stairs,' first played in 1759, was at length owned by him. He was also the author of two other farces, which were unsuccessful; but one of them, 'False Concord,' contains both characters and dialogue which were borrowed in Garrick and Colman's comedy of 'The Clandestine Marriage.' The closeness of Townley's connexion with Garrick is further evidenced by the fact that he received from Garrick, and held for some years, the living of Hendon.

TOXOTES, a genus of Acanthopterigious fishes of the family *Squamipennes*, the species of which are remarkable for having the power of spirting out drops of water even to a height of three or four feet with such accuracy of aim as to bring down the insects upon which they feed from the aquatic plants frequented by their prey.

TRACHE'LIDES, the fourth family of heteronomous Coleoptera in Latreille's arrangement of insects. The head is more or less triangular or pedicled, and cannot be retracted. They have soft bodies, smooth flexible elytra, often short, and maxillae, which are not hooked. They mostly live on leaves and flowers. Many of them simulate death when seized. *Lagria*, *Pyrochroa*, *Mordella*, *Notoxus*, *Floria*, and *Meloe* are types of tribes in this family.

TRACHIU'RUS. [TÆNIOIDES, P. C. S.]

TRADER. [BANKRUPT, P. C.]

TRANSFER OF REAL PROPERTY. During the last few years various statutes have been passed for the purpose of facilitating the transfer of Real Property.

The first of these was one passed in the 4th & 5th of Victoria, intituled 'An Act for rendering a Release as effectual in the conveyance of Freehold Estates, as a Lease and Release by the same parties.' It enacted that every deed or instrument of release of a freehold estate executed after the 15th of May, 1841, and expressed to be made in pursuance of the Act, should operate in all respects, both in law and in equity, as if the parties thereto had also executed the usual lease for a year, providing at the same time that such release should be subject to the same stamp duty as the lease and release would have been liable to under the Acts relating to the Stamp Duties.

In consequence of the terms used in this Act, it was thought necessary that all releases made under it should recite the title in order to give them full effect. To obviate the difficulties often arising from the loss of the lease for a year, it was enacted by the second section, that the recital or mention of a lease for a year in a release executed before the passing of this act, should be evidence of the execution of such lease for a year.

The next Act on the subject was the 7th & 8th Vict., c. 76, intituled 'An Act to simplify the Transfer of Property.' This Act having been found in many respects objectionable, it was in the following year repealed by the 8th & 9th Vict., c. 106, whereby several of the provisions of the former have been re-enacted in an improved form. This Act is intituled 'An Act to amend the Law of Real Property,' and, as its provisions will have a great effect upon the Transfer as well as the Law of Real Property, it will be necessary to consider them separately.

After repealing all the clauses of the former Act from the 1st of October, 1845, except those which related to contingent remainders, which were repealed as from the commencement of the former Act, it provides: That after the 1st of October, 1845, all corporeal tenements and hereditaments shall, as regards the conveyance of the immediate freehold, be deemed to lie in grant as well as in livery, that is to say, shall pass by the delivery of the deed of conveyance, as incorporeal hereditaments and reversions and remainders of corporeal hereditaments have heretofore passed, the stamp-duty chargeable on every deed to be effectual as a grant, being the same as if the same had been a release founded on a lease for a year, and also with the stamp-duty (exclusive of progressive duty) with which such lease for a year would have been chargeable. For the conveyance of a fee simple or any less estate, the only operative word now necessary to be used is 'grant.'

By section 3, a feoffment (unless made under custom by an infant) is to be void unless evidenced by deed; and a partition and exchange, or lease required by law to be in writing, an assignment of a chattel interest, a surrender in writing of an interest which could not be made at law without writing, of or in any tenements or hereditaments not being copyhold, is to be void at law unless made by deed. The only effect of this section with respect to most of the matters comprised in it, is to assimilate the law to the practice, and with respect to others, to make a formal instrument, called a deed, necessary where by the Statute of Frauds a writing only was required. Feoffments are required to be evidenced only, while partitions, &c. are required to be made by deed. The reason of this distinction seems to be that in the feoffment the essential part is not the execution of the deed, but the delivery of the possession or seisin from the feoffer to the feoffee.

A feoffment is not to have any tortious operation, and an exchange or partition is not to imply any condition in law; and the word 'give' or 'grant' is not to imply any covenant in law beyond what it already has under any Act of Parliament, (section 4). This provision points to the old common law doctrines, that a feoffment, though made by a person having no title but possession, had the tortious effect of passing the fee, and that warranty was implied from the use of the technical words 'exchange,' 'give,' and 'grant.' A saving clause has been rendered necessary by the introduction into certain Acts of Parliament containing short forms of conveyance, and providing that, to save expense, the word 'grant' shall imply the usual covenants for title.

By sect. 5 it is enacted that under an indenture an immediate estate and the benefit of a condition or covenant may be taken, although the taker be not named a party; and a deed purporting to be an indenture is to have the same effect as an indenture, although not indented. This abolishes the distinction between an indenture and a deed-poll, whereby a person not a party to an indenture could not take under it except by means of the Statute of Uses; whereas any person might take under a deed-poll, which is addressed to all the world. The latter clause of the section merely expresses what has long been understood to be law.

By sections 6 and 7, contingent interests, possibilities coupled with an interest and rights of entry, whether immediate or future, and vested or contingent, in tenements and hereditaments of any tenure, may be disposed of by deed; but no such disposition is to defeat or enlarge an estate tail. These provisions extend to married women, who are likewise enabled to disclaim by deed, but all deeds executed by them must be made conformably to the provisions of law with respect to dispositions by married women. One object of the first of these clauses is to remedy a deficiency in the Act for the Abolition of Fines and Recoveries, which provides for the conveyance of contingent estates tail, but omits to mention any other species of contingent estate. Under this clause also the assignee of a right of entry has power to enter for a breach committed before the assignment. The second clause is also intended to remedy an omission in the Fines and Recoveries Act.

By sect. 8 a contingent remainder existing at any time after the 31st December, 1844, is to be, and if created before the passing of this act, is to be deemed to have been, capable of taking effect notwithstanding the determination by forfeiture, surrender, or merger of any preceding estate of freehold, in the same manner as if such determination had not happened. As that part of the 7 & 8 Vict. c. 76, relating to contingent remainders, was repealed as from its commencement, it was necessary to provide for those cases in which property had been limited under the provision there contained. This is effected by making the clause in question relate as well to those contingent remainders existing at any time after 31st December, 1844, as to those created before the passing this act. The force of this clause will be understood by referring to Remainder, P. C. The practical effect of this section will be the omission in settlements of the limitations to trustees to preserve contingent remainders.

By sect. 9, where the reversion on a lease shall, after the 1st October, 1845, be surrendered or merged, the estate which shall for the time being confer as against the tenant the next vested right to the possession shall, for the purpose of preserving the incidents to and obligations on the same reversion, which, but for the surrender or merger, would have subsisted, be considered the reversion expectant on the lease. The object of this section is to do away with the rule that the covenants of and remedies against a lessee, and the obligations on the lessor, being incident to the immediate reversion, cease as regards the land on the merger of that reversion in another estate.

In the 8 & 9 of Vict. two acts were passed which had for their object the reducing the length of conveyances of property and leases. The first, the 8 & 9 Vict. c. 119, is entitled 'An Act to facilitate the Conveyance of Real Property;' and the second, the 8 & 9 Vict. c. 124, 'An Act to facilitate the granting of certain Leases.' The provisions of the two acts are analogous, and their place is that of providing, that where the words in the first column of the schedule attached to the act are used in a deed, they are to have the same effect as if the words in the second column had been employed. The schedule here spoken of contains in the first column a short clause, and in the second the long covenant for which the first may be substituted. The acts also contain provisions for making slight alterations in the wording of the clauses according to the circumstances of the case. It seems doubtful whether these acts will be of much practical application.

All the acts here considered relate to England and Ireland, but not to Scotland.

TRANSIT, RAILWAY. In an article intended to be supplementary to that given under Railway, P.C., pp. 245-267, and to treat especially upon matters which have risen into importance during the six years that have elapsed since that article was written, many topics which might seem to claim attention must be passed over, or treated very briefly. Excepting in the simply historical portion of the subject, almost every page of the article referred to presents matter upon which something might be said indicative of the rapid progress of mechanical improvement, or of the results of extended experience; but our attention must be confined to a few only of the more important points relating to railway legislation, and to the construction, working, and management of railways, together with statistical notices of the progress of the railway system in the United Kingdom, whence it is rapidly extending over the whole face of Europe, and of the civilized world. To facilitate reference we shall, as far as the natural dependence of one subject upon another will allow, follow the order of arrangement adopted in the article Railway, so that the reader may readily trace the connection between the original and the supplemental matter. The principal deviations from this course are in the bringing together, under the general head of Railway Legislation, all matters relating to the obtaining of railway acts, originally noticed under Railway, pp. 251, 252, and such as relate to government control, taxation, &c., which were noticed in pp. 260, 261 of that article; and in the incidental notice in connection with the important question of gauge, of various matters relating to general principles of railway construction, working, and management.

Railway Legislation.—The growth of Railway travelling in this country has been so sudden, and its consequences, in relation to the interests of the public, were so little foreseen at its commencement, that until very recently it has advanced without control, and, it may be said, almost without the notice of the government.

There are two opposite principles of administrative policy which may be pursued in reference to undertakings of public utility. By the one all such works are executed either directly by the government or under government superintendence; by the other they are the result of private enterprise, and government has no further concern with them than to give or withhold the legal powers necessary for their execution. In countries where capital is not abundant, nor the spirit of commercial enterprise very active, the former principle is often essential for the promotion of public works, and it has accordingly been adopted by the governments of France, Belgium, and Germany; but where the speculative energy and resources of capitalists are so remarkable as in England, no encouragement is needed from the government, and its interference is required only for the protection of public interests. The circumstances of this country, therefore, would naturally have dictated the policy of permitting the employment of capital in public undertakings, with as little restraint as possible; and our free institutions, and the generally passive character of our government, have favoured politically a principle which would appear to be economically expedient. It may be doubted, indeed, whether this principle has not been carried too far; and whether capital would not have been invested more beneficially under a surer and more provident system of legislation.

The following is a sketch of the proceedings which have been necessary for carrying out a scheme of railway communication. The parties who have planned it obtain subscriptions to the undertaking, and having made the necessary surveys and satisfied themselves of the profitable character of the speculation, they determine to apply for an Act of Parliament to incorporate a company for executing the works, and to give them the powers required for that purpose. The most important power to be obtained is that of taking lands and houses without the consent of the parties interested in them; and in the early period of railway legislation, the only opposition encountered by railway companies was that of the landowners, who were either unwilling to sell their land or dissatisfied with the price which had been offered them. If this opposition was overcome or conciliated, the bill was allowed to pass. If no such opposition was offered, and if there were no competing lines, no means were taken by Parliament to inquire whether the line was the best that could have been suggested for the district through which it was intended to pass; but the evidence adduced by the promoters was held to establish the public utility of the undertaking; and it was authorised. The executive government took no part in the investigation; and Parliamentary Committees composed of members locally interested can scarcely be said to have inquired into the merits of lines except when an inquiry was forced upon them by the opposition of private parties. Little or no security was taken for the public interests, and so little was the character of railway communication understood, that in fixing the tolls and charges, parliament at first named a *maximum* for the tolls, as in the case of canals, but imposed no limit upon the charges for the conveyance of goods and passengers. As the companies undertook the entire traffic of their own lines, no tolls were payable, and thus the *maximum*, which was intended for the security of the public, was wholly inoperative. This oversight has since been rectified, and every railway act of 1845 and 1846, whether for a new line or for the amendment of acts, under which existing lines were constructed, contains a clause which reserves to Parliament the right of revising the fares and charges; and in most of the recent acts the *maximum* charges are moderate. In 1836 committees were required to give more detailed reports concerning the bills committed to them, but their proceedings were improved by this regulation in form rather than in substance. In 1839 the constitution of the committee was improved by the admixture of "selected members," who were not locally interested: and since 1844, the committees have been composed exclusively of members who have had no local interest in the lines referred to their consideration. But however these tribunals may have been improved, the same system of legislation has practically prevailed. Unopposed lines have, almost without exception, been sanctioned upon the *ex-parte* evidence of the promoters; and opposed lines have been granted or refused according to the relative wealth, influence or perseverance of the contending parties.

It is undeniable that more vigilance ought to have been exercised in investigating the merits of lines, and in securing the best terms for the public which were consistent with justice and fairness; while, on the other hand, the promoters of railways ought to have been protected against the ruinous waste of capital which has been occasioned by vexatious forms of procedure, and by ill-regulated and too often incompetent tribunals.

But notwithstanding admitted defects in the system of railway legislation, and the abuses which have arisen from it, the principle of allowing free scope to the operations of private enterprise and capital has been eminently successful, and more railways have been constructed in the last fifteen years, and more science and skill have been devoted to their improvement, than a government could have called forth in half a century. Nor have the public interests otherwise suffered so materially as might have been anticipated; for the conditions, for the public good, which might have been made the subject of express stipulation, have in great measure been secured by the operation of the same principle. The charges upon goods and passengers, for example, which might have been regulated more strictly, have shown a continual tendency to decrease. The competition of canals and steam-boats, the profits to be secured by the encouragement of increased traffic, the dread of competing lines, the example of other lines which meet with public favour, and other circumstances, have already caused a very general reduction of railway charges, and may eventually lead to still more extensive reductions.

This acknowledgment is due to the spirited and able capitalists, who, under a defective system of legislation, and without any aid or direction from the government, have done so much for the country. But it has been impossible to overlook many serious evils which have arisen from the want of a uniform administration of railway affairs:—1st. Parliamentary committees, however well conducted, are independent of one another, are guided by no uniform principle, have no peculiar experience, and are devoid of all means of obtaining any other information but that which is offered by the parties themselves. 2ndly. Great powers are required by companies for executing their works and conducting their traffic, in granting which considerable caution is necessary. 3rdly. When the acts for incorporating companies have been passed, it is desirable that some supervision should exist to prevent the law from being exceeded, or exercised injuriously. The whole traffic of the country is rapidly being absorbed in railway communication, and so enormous a public interest needs the utmost care of the government. To guard the public safety and convenience is quite compatible with a respect for the freedom of capital.

Having stated these general principles in reference to railway legislation, we may proceed to a brief analysis of the various measures which have been passed, from time to time, for the supervision of railways and for other purposes connected with the general administration of railway affairs. The objects for which they were passed are not always analogous, but it will be convenient to offer a consecutive view of them, as, however imperfect they may be, they constitute, in effect, our whole railway code.

The first step towards a control of railways by the government was taken in 1840, when an act was passed to place them under the supervision of the Board of Trade (3 & 4 Vict., s. 97). By this act it was provided, that no railway should be opened until a month's notice had been given to the Board of Trade; that returns should be made by all railway companies of their traffic, of accidents, and of their tolls, rates, and charges; that the Board of Trade should be authorised to appoint inspectors to examine railways; and that all bye-laws should be submitted to the Board, who may disallow them. These and other matters provided for by this act, at once disturbed the independence under which the railway system had hitherto grown up, and placed the affairs of all the railways under the immediate supervision, and, in some degree, under the control of government.

By the act 5 & 6 Vict., c. 55, power was given to the Board of Trade to postpone the opening of any railway not considered safe by their inspectors: notice of accidents attended with serious personal injury was required to be given to that board within forty-eight hours after their occurrence, and the Board were further empowered to direct returns to be made of all accidents, whether attended with personal injury or not. With a view to the public safety, disputes between railway companies having a common terminus, or using a portion of the same line of rails in common, were to be decided by the Board of Trade; and all powers, under existing acts, of making branch communications with railways, and of running locomotive engines upon them, were submitted to their regulation. They were also authorised to enforce the alteration of level crossings which appeared to endanger the public safety.

The same act required all railway companies to convey Her Majesty's Forces and the Police Force at such prices and upon such conditions as may be contracted for by the secretary at war.

The provisions of these acts were mainly directed to the ensuring of the public safety; but in 1844 a more important act (7 & 8 Vic. c. 85) was passed with a view to secure, as far as possible, the interests of the public from being sacrificed to the independent privileges granted by parliament, in perpetuity, to railway companies. With this object the following securities, amongst others, were provided. If after twenty-one years from the passing of the act for the construction of any new line of passenger railway the clear annual profits divisible upon the paid-up capital shall have exceeded 10 per cent. upon the average of the three preceding years, the Treasury may revise the scale of tolls and charges as they think fit, so as to reduce the profits to 10 per cent.; with a guarantee, however, that 10 per cent should be made good to the company, and that without their consent no further revision of their charges should be made for twenty-one years. And whatever may be the rate of divisible profits at the expiration of the twenty-one years, the Treasury may purchase any such railway, in the name and on behalf of her Majesty, upon giving three months' notice, and on payment of 25 years' purchase of the annual profits estimated on the average of the three preceding years; subject to arbitration however, in particular cases, and to certain exceptions. And in order to give effect to these provisions, full powers are given to examine all the books and accounts of the companies for three years preceding the time at which the tolls may be revised or the railway purchased. For reasons which are well explained in the second report of the Railway Committee of 1846, it is doubtful if these prospective securities will ever be available; but immediate advantages were also secured to travellers and to the government.

In order to provide for the poorer class of travellers the means of travelling by railway at moderate fares, and in carriages protected from the weather, it was enacted that every railway company incorporated in the session of 1844, or in any future session, or which should obtain from parliament any extension or amendment of its powers, shall provide one third-class passenger train, at the least, all along the line, on every day on which other passengers are carried, and under the following conditions:—

1. The hour of starting to be subject to the approval of the Board of Trade.
2. The speed to be, upon an average, not less than 12 miles an hour for the whole distance travelled, including stoppages.
3. The train shall, if required, take up and set down passengers at every passenger station.
4. The carriages shall be provided with seats, and protected from the weather in a manner satisfactory to the Board of Trade.
5. The fare of each passenger shall not exceed 1*d.* a mile.
6. Each passenger shall be allowed to take half a *cwt.* of luggage, not being merchandise or other articles carried for hire or profit, without extra charge; and any excess of luggage is to be charged by weight, at the lowest rate charged for passengers' luggage by other trains.
7. Children under three years of age, accompanying passengers, are to be taken without charge, and under twelve years of age, at half price.

With the exception of the fares, which are in no case to be exceeded, the Board of Trade were empowered to dispense with any of these conditions, in consideration of other arrangements made by railway companies, which may appear more beneficial and convenient for the passengers by the cheap trains. And as an encouragement to cheap trains, it was further provided that no tax shall be levied upon the receipts of any railway company, which arise from the conveyance of passengers at fares not exceeding a penny a mile.

If any passenger train shall run on Sundays on any railway, subject to the above provisions, it is required that a sufficient number of third-class carriages shall be attached to the train which stops at the greatest number of stations, and that the passengers shall be carried, as in the cheap trains, at fares not exceeding a penny a mile. By the act 5 & 6 Vict. c. 79, the duty upon passengers conveyed by railway is chargeable at the rate of 5 per cent. 'upon all sums received or charged for the hire, fare, or conveyance of all such passengers.' The amount paid by the several companies from the 1st September, 1845, to 5th July, 1846, was 154,885*l.*, and the amount not charged on account of this exception of third-class passengers, was 21,358*l.* (Parliamentary Paper, 1846, No. 656.)

By an act of the 1 & 2 Vict. c. 98 provision had been made for securing advantageous arrangements upon railways for the conveyance of the mails, and by this act additional facilities were given for that purpose.

In regard to new railways also, a further provision was introduced in respect to the conveyance of troops, requiring every commissioned officer proceeding on duty to be conveyed in a first-class carriage at fares not exceeding 2*d.* a mile, and every soldier or policeman, and their wives, widows, and children above twelve years of age, in a carriage provided with seats, and protected from the weather, at 1*d.* a mile:

children under three years being taken without charge, and under twelve at half price, as in the case of the chesp trains. And the companies are required to convey military stores, baggage and arms, at 2*d.* a ton per mile, the assistance of the military being given in loading and unloading them; and gunpowder and other combustible matters at such prices and under such conditions as may be contracted for with the secretary at war.

It was also enacted that every railway shall be bound to allow a line of electric telegraph to be laid down for her majesty's service upon lands adjoining the railway, and to give every facility for erecting and using the same, subject to such reasonable remuneration as may be agreed upon, or, in case of disagreement, as may be settled by arbitration. Such telegraphs, subject to the prior use of the government, may be used by the company for the purposes of the railway, upon terms to be agreed upon or settled by arbitration. And where an electric telegraph shall have been established by the railway company, or by any company or person, otherwise than exclusively for the public service, or exclusively for the purposes of the railway, or jointly for both, the use of it, for the purpose of receiving and sending messages, shall be open to all persons alike, without favour or precedence; but subject to priority of use by the government and the railway company, and to such equal charges and reasonable regulations as may, from time to time, be made by the company.

By the 3 & 4 Vict. c. 97, a power had been given the Board of Trade to appoint persons to inspect railways, and by this act the board were empowered to appoint permanent inspectors, not only to inspect railways, but also to enable the Board to carry into execution the provisions of the various railway acts. This enactment resulted in the nomination of the Railway Department of the Board of Trade, of whose functions and proceedings we shall presently have to speak.

Whenever it shall appear to the Board of Trade that the provisions of any acts for the regulation of railways have not been complied with, or that the companies have been acting in a manner unauthorised by such acts, or ought to be restrained from so acting, the Board of Trade shall certify the same to the Attorney-General for England or Ireland or to the Lord-Advocate of Scotland; who shall proceed against such companies at law or in equity, as the case may require.

A practice had arisen of issuing loan notes not authorised by the acts under which railway companies were empowered to borrow, and by this act the issue of such notes in future was prohibited, but validity was given to those which had been already issued, and companies were authorised to renew them for five years after the passing of the act. A register of such loan notes was, at the same time, required to be kept by the secretary of the company.

A remedy was also provided for the speedy recovery of tithe-rent charges payable upon lands which had been taken for railways.

The experience of railway companies who had applied to parliament, from time to time, for powers to make and maintain their lines had suggested various clauses which were usually adopted in all railway bills. These were very numerous, and conferred extensive powers upon each company which obtained an act to authorise its own separate undertaking. These powers, though generally very similar in all cases, were sometimes varied by the parties applying for acts, and such variations were sanctioned by parliament. In this manner not only was a want of uniformity occasioned in the powers given to parties engaged in precisely similar undertakings; but all these important provisions were contained in local acts, little known and very partially promulgated. Another inconvenience of less consequence, arising from this system of legislation, was the necessity of repeating in every railway act the same multitudinous enactments.

To remedy these inconveniences several acts were passed in the session of 1845, which are now commonly called the 'Consolidation Acts.' The first is the 'Companies' Clauses Consolidation Act' (c. 16), by which were consolidated all the provisions which had usually been inserted in acts with respect to the constitution of companies incorporated for carrying on undertakings of a public nature. This act is not peculiar to railways alone, but affects all companies which apply to parliament for incorporation, and which require the powers contained in it. It regulates the distribution of the capital into shares, the registry of shareholders, the transfer of shares, the payment of calls, the remedies against shareholders, the powers of the company to borrow money, their general meetings, the votes of the shareholders, the appointment and rotation of directors, their powers and proceedings, the appointment and duties of auditors, the accountability of the officers of the company, the form of books of accounts to be kept, the declaring of dividends, the making of by-laws, the settlement of disputes by arbitration, the service of notices upon the company and by the company upon shareholders, and the recovery of damages and penalties. By a similar act (c. 17) the provisions of a like nature are consolidated with respect to all companies incorporated for carrying on undertakings of a public nature in Scotland.

The next act is the 'Lands' Clauses Consolidation Act' (c. 18), by which are consolidated all the provisions usually inserted in acts authorising the taking of lands for undertakings of a public nature. It provides for the purchase of lands by agreement, for the compulsory purchase of lands and the assessment of their value, for the form of conveyances, the entry upon the lands of the promoters of the undertaking, and for dealing with the various interests in land, as copyholds, common lands, mortgages, rent-charges, leases, &c. A similar act for the same purposes was passed for Scotland (c. 19). These acts also are applicable not only to railways but to all other undertakings in which compulsory powers of taking land are necessary.

The last of the series is the 'Railways' Clauses Consolidation Act' (c. 20), which consolidates all the usual provisions of previous railway acts, which relate generally to the construction of the line and the works connected with it, to the drainage of lands affected by the railway, the temporary occupation of land during the progress of the works, the crossing of roads, the construction of bridges, and the works required for the protection and accommodation of adjoining lands. It regulates the traffic in goods and passengers on the line, and prescribes the use of suitable carriages and engines.

These acts did not affect the provisions of local acts which had been passed before the session of 1845; but the acts of that session and all subsequent acts have simply adopted the three consolidation acts without repeating them, and where any special powers not contained in these acts are sought for by the parties, they are contained in distinct clauses, which are obvious variations from the ordinary law.

In the same year it was observed that various railway acts of that session had given to companies general powers of granting or accepting leases, sales, or transfers, of their own or other lines of railway; and as the exercise of such powers without control was regarded with jealousy, as being liable to lead to an amalgamation of lines, for which separate acts have been passed, without the distinct authority of parliament being obtained, in each case; an Act (8 & 9 Vict., c. 96) was passed, declaring that no such sale, lease, or transfer, should be lawful, unless under the authority of a distinct provision in some act of parliament, to that effect, specifying by name the railway to be leased, sold, or transferred, and the company or party by whom such lease, &c., may be made, granted, or accepted.

Another act must here be referred to in connexion with railways. The Joint Stock Companies' Act of 1844 (7 & 8 Vict., c. 110), though applying generally to another class of companies, contains provisions which affect the laws relating to railways. Before the passing of this act, it was only necessary for railway companies to comply with the standing orders of both Houses of Parliament before they applied for a bill to authorise the undertaking: but other conditions must now be complied with. Before the promoters of a railway may publish any prospectus, handbill or advertisement, they must return to the Registrar of Joint Stock Companies, 1st, the proposed name of the company, 2nd, its business or purpose; and 3rd, the names, occupations, &c., of the promoters; and either before or after the prospectus is published, they must return their provisional place of business, the names of the committee, &c., with a written consent of each promoter to become such, and an agreement to take one or more shares; the names, residence, &c., of the officers of the company, and of the subscribers; and a copy of the prospectus itself before it is circulated or made public. When the three first particulars, at least, are complied with, the promoters are entitled to receive a certificate of provisional registration.

The promoters may then assume the name of the proposed company 'provisionally registered,' and may open subscription lists, and allot shares and receive deposits not exceeding 10*s.* for every 100*l.*, and such further deposit as may be required by the standing orders, and may perform all the acts necessary for obtaining an act of parliament.

In order to obtain a certificate of complete registration, the company must send to the registrar a copy of the 'Parliamentary Contract,' and the 'Subscribers' Agreement,' together with certificates of the deposit, at the proper offices, of the subscription contracts, plans, sections, and books of reference. When the certificate has been obtained, the promoters may use the name of the company 'registered,' may have a common seal, may sue and be sued in their registered name, and may enter into contracts, conditionally upon the passing of the act, for the execution of works, for the supply of stores, or for any other necessary purpose of the company.

Subject to these conditions the companies must comply with the standing orders of both Houses of Parliament, and apply for bills to incorporate them and authorise their undertakings.

In the session of 1846 several acts were passed affecting railways. The first (9 & 10 Vict., c. 20) introduced an improved method of effecting the deposits of moneys required by the standing orders of Parliament, to be deposited by the subscribers to undertakings; and granting the privilege of depositing Exchequer Bills and other public securities instead of money. This act was rendered necessary on account of the great inconvenience sustained by the promoters of railway bills and by the public, from large sums of money being suddenly withdrawn from the money market which were locked up unprofitably in the hands of the accountant-general of the Court of Chancery, and were not very readily invested in government securities.

The second (9 & 10 Vict. c. 28) facilitated the dissolution of railway companies which had not on the 3rd of July, 1846, obtained acts of parliament to authorise their undertakings, and prescribed the form and arrangements under which such dissolution should be effected.

The third is an act for constituting Commissioners of Railways, which transfers to the commissioners to be appointed all the powers and duties of the Railway Department of the Board of Trade. The commission is to consist of a president, with a salary of 2000*l.* a year, two paid commissioners, with salaries of 1500*l.*, and two unpaid commissioners. The president and the two unpaid commissioners will be qualified to sit in Parliament; but the two paid commissioners will be disqualified. In addition to the ordinary power of the Railway Department they are to examine and report upon any subject relating to any railway or proposed railway, which shall be specially referred to them for their opinion, by Her Majesty or by either House of Parliament. And authority is given them, for that purpose, to inspect and survey any proposed line of railway, with all the powers possessed by the officers engaged in the Ordnance Survey, and to charge the expenses to the promoters. (9 & 10 Vict. c. 105.)

Two other acts, though not directed peculiarly to railways, may here be cited. By one the ancient law of deodands was abolished (9 & 10 Vict. c. 62); and by the other a mode of recovering compensation where death is caused by accidents, is established. In such cases an action may be brought by the executor or administrator of the deceased, for the benefit of the wife, husband, parent, and child; and the damages which may be recovered from the parties by whom the accident was caused, are to be divided amongst the several parties in such shares as the jury shall direct. (9 & 10 Vict. c. 93.) This is assuredly a wise amendment of the law, as it substitutes a compensation to the relatives of the deceased for a deodand upon the engine or carriage, which is paid, as chance may determine, to the lord of the manor or to the crown.

These are the several statutes relating to railways; and a few remarks will be sufficient to explain their general operation and the proceedings which have been adopted for carrying into effect their provisions. It has already been stated that, by virtue of the act of 1844, the Railway Department of the Board of Trade was constituted. Its general object was to enforce the provisions of that and other acts, and to report to Parliament its own proceedings, the progress of railway communication, the accidents which occurred, and other matters which come within its cognizance. Its functions were originally confined therefore to the general supervision of railways already authorised by Parliament; and although railway bills were directed to be sent to the Board of Trade, the Railway Department took no active or ostensible part in reference to railway schemes about to be submitted to parliamentary investigation; but in consequence of the recommendations of a select committee of the House of Commons in 1844, the Board was instructed by the Lords of the Committee of Privy Council for Trade to undertake a preliminary examination of all railway schemes, to publish their decisions in the 'London Gazette,' and subsequently to submit detailed reports for the information of Parliament. This plan of investigating railway schemes out of Parliament was not altogether without precedent. It had been tried in the case of the four competing lines to Brighton in 1836; and in respect of the communication between London, Dublin, Edinburgh and Glasgow, and more extensively in regard to the railway communications of Ireland, in 1837; but this was the first experiment that had been made of a systematic investigation of all railway schemes by a government department, in anticipation of the judgment of parliament. The committee of 1844 had expressly declared that the reports of the railway department would in no sense be conclusive of the merits of the several schemes submitted to it, but that they would be regarded by parliament merely as aids towards the formation of its own conclusions (5th Report, p. xv.): but the publication of its decisions in the Gazette, and the authoritative character of its proceedings and reports produced a very general impression that it had been invested with much greater authority than it really possessed, and that its adjudications would be acknowledged by parliament as final. On the meeting of parliament, however, in 1845, this opinion was very soon discovered to be erroneous, and committees of the House of Commons proceeded with the investigation of the several bills very much in the same manner as if no reports had been referred to them for their guidance. In many cases their decisions may have been influenced by the reports of the Board, but the reports themselves, though ably written and often of the highest value, were not founded upon a public examination of witnesses and a full hearing of the parties, and on that account did not obtain such confidence as to be held conclusive, when interests of such magnitude were concerned. And it may be doubted whether, under any circumstances, any body whatever, less strong and irresponsible than parliament itself, could at that time have withstood the manifold influences of railway companies and speculatists. At all events this experiment of the railway department was admitted to be a failure, and by a minute of the committee of Privy Council for Trade, of the 10th of July, 1845, the Board has since directed its attention to questions affecting the public safety and to considerations of public utility, but has in no case pronounced an opinion on the actual or comparative merits of any railway schemes. During the whole of the session of 1846 there was an unprecedented pressure of railway business before parliament, but without any aid from the government it was disposed of, in the usual manner, by committees. It has been stated that all the powers of the Railway Department of the Board of Trade have been transferred, by a recent act, to the Commissioners of Railways; and it is most probable that the experiment of reporting upon the merits of railway schemes, which failed before, may now be revived; but under the act it will be confined to such cases as may be specially referred by the crown or either House of Parliament. The difficulty which existed before in regard to the degree of authority which preliminary inquiries and reports should possess will remain, it is feared, as great as ever. Unless the reports of the commissioners be regarded as conclusive of the matters referred to their consideration, the intolerable evil will exist of three distinct investigations before three tribunals, and at an enormous expense to the promoters of railways. The decisions of the commissioners may be reversed by the Commons, whose decisions again may not meet with the concurrence of the Lords; and thus after three inquiries a bill may be lost at last. The only mode of avoiding this evil, which was produced in 1845 by inconclusive preliminary inquiries, will be to refer questions of fact to the investigation of the commissioners and to hold their reports as final in reference to those facts. It will be necessary, also, that their inquiries shall be of a more public and judicial character, in order to secure public confidence.

Principles of Design and Construction.—Under that division of the article RAILWAY, pp. 249-251, which treats of the designing of a railway, it is shown that the tendency of experience was rather to lead to economy in the original cost of railway works by the admission of comparatively steep gradients, than to the sacrifice of every other consideration to the obtaining of a very level road. In the new railways for which acts have been obtained since 1840 the result of the modified opinions of engineers upon this point is apparent in the frequent adoption of gradients of 1 in 200, 1 in 150, 1 in 100, and, in several cases, of still steeper slopes, which, by allowing a nearer adherence to the natural surface, leads to considerable saving of expense in comparatively easy countries, while it allows the conducting of railways in many cases through districts which, a few years since, would have been deemed utterly impracticable. The Lancaster and Carlisle and Caledonian railways, passing through a mountainous country where, notwithstanding the introduction of gigantic engineering works to improve the gradients, several long and steep slopes occur, are cases in point. On the Caledonian line especially very formidable slopes were found inevitable, those between Beattock and the summit of the Clyde pass, a distance of nearly 14 miles, averaging 1 in 97, and comprising an ascent of 1 in 75 for 5½ miles. The Tunbridge Wells branch of the South-Eastern Railway is another example, upon a smaller scale, in which experience has proved that with engines of suitable construction, a line with an average rise of 1 in 100 for upwards of 4 miles, part of which has a slope of 1 in 80, and which, owing to the peculiarly difficult nature of the country, forms a continuous series of curves of smaller radius than is usual upon locomotive lines, may be worked in both directions with speed, safety, and regularity. In the Report of the Railway Department of the Board of Trade in 1845 upon projected railways in the Manchester and Leeds district many cases are cited in proof of the assertion 'that such gradients as were formerly thought objectionable are now adopted every day as a matter of course; and as the capabilities of the locomotive have been enlarged, gradients of a class which would have been considered a few years ago altogether impracticable, have come into general use.' Among the cases cited are the inclined planes on the London and Birmingham Railway, from the Euston Square station to Camden Town, rising in some parts at the rates of 1 in 66 and 1 in 75; that by which the Manchester and Leeds Railway is connected with the Victoria station at Manchester, rising 1 in 59 for 1000 yards and 1 in 49 for 640 yards; and that by which the Edinburgh and Glasgow Railway is conducted into Glasgow, with a slope of 1 in 42 for a distance of 1½ mile; in all of which the use of stationary engines and ropes had been either wholly or in a great measure discontinued, it being found that the trains might be worked efficiently and more conveniently by locomotive engines. The Lickey incline, on the Birmingham and Gloucester Railway, is likewise referred to as 'a conclusive proof that a gradient of 1 in 37½ for a length of 2 miles 3 chains may be worked by the aid of an engine constructed for the purpose, without serious inconvenience to an extensive traffic;' and as 'a proof that such an incline may be descended without danger by the force of gravity, regulated by the action of breaks.' In reference to curves it is observed in the same Report that practical experience has led to a similar modification of the views formerly entertained. 'The Newcastle and Carlisle Railway,' observes the Report, 'presents an instance of a line which is almost one continued succession of curves, of every degree of curvature, up to 8 chains radius, and with steep inclines, being worked with economy and safety; and, among other cases, there are upon the Manchester and Leeds Railway two curves of 10 chains (220 yards) radius, 'away from any station, and in a gradient of 1 in 82, over which their trains have been worked for upwards of four years, without the slightest accident or practical inconvenience.' Special precautions are, however, adopted to prevent danger; the engine-drivers being warned by inscribed boards at the side of the railway to shut off their steam on approaching the curves referred to.

As connected with the design of a line of railway we may further observe, that *surface-crossings* have been allowed much more extensively in recent railway acts than in those of 1836 and the years immediately following. For some years after the great period of railway speculation in 1836 and 1837 the degree of uncertainty which yet remained respecting the remunerative character of railways, combined with the enormous excess in the cost of most of the lines in progress above the parliamentary estimates, and with some other circumstances, almost put a stop to the commencement of any new schemes; and when at length, in the sessions of 1842 and 1843, symptoms of revival began to appear, the new schemes brought forward were mostly under a guarantee from some established company, and were, almost without exception, distinguished by features calculated to reduce the cost of construction; such as having only a single track, and the reduction of the earth-works by the adoption, as above explained, of comparatively steep gradients. This peculiarity, by keeping the level of the railway nearer to the natural surface of the ground, led necessarily to the more frequent use of surface-crossings; because the economy of construction aimed at would have been neutralised if, as must often have happened in a level country, the roads crossing the railway had to be raised or lowered, and passed by means of bridges. These principles of cheap construction were very closely canvassed in 1843, in a warm parliamentary contest upon the bill for the Northampton and Peterborough branch from the London and Birmingham railway; and having been sanctioned by parliament in that case, were soon applied to several other lines, for which acts were obtained in 1844 and 1845. Most of the lines thus projected for working with a single track either have been or are likely to be doubled, the increase of traffic having proved, in many cases, sufficient to render such a measure necessary; but their other peculiarities remain, and have been largely imitated in the new lines sanctioned in 1846, upon which surface-crossings are very numerous. Wherever this mode of crossing is allowed, the gates are kept shut across the road, excepting when opened by an attendant, so that the danger occasioned to trains upon the railway is exceedingly slight.

Permanent Way.—In the construction of the upper works of a railway, to which this name is given, more extended experience appears to be leading engineers to a greater uniformity of practice than prevailed when the P. C. article, which treats of this subject in pp. 254-256, was written. The plan of affording continuous support to the rails by means of longitudinal timber bearings, although still adhered to by Mr. Brunel, and employed upon lines in connexion with the Great Western railway, appears to have lost favour with some engineers; it being found that their use involves some loss of engine-power, probably from the greater yielding of the road, occasioned or favoured by the actual lightness of the rails as compared with those which are supported at intervals only, and by the comparative weakness of their form. This peculiarity has been ingeniously turned to advantage by Mr. Brunel in the descending track in the Box tunnel, upon the Great Western railway, which occurs upon a slope of 1 in 100. By substituting for the ordinary rail a comparatively thin plate of iron, the inner edge of which rests upon a considerable thickness of felt, he has produced a road in which the yielding character attributed to the longitudinal timber construction is increased to such a degree as to act as a constant, though slight, retardation to the trains running down the line. A road laid upon longitudinal timbers appears also to be more difficult to *pack* or keep to the true level than another; and the working of the trains, combined with the effect of expansion and contraction, causes the connexion between the rails and the timbers to work loose. Much evidence both for and against this construction of road was laid before the Gauge Commissioners, from which we gather that the comparative smoothness and quietness ensured by it do not, in the opinion of most engineers, afford sufficient advantages to counterbalance its defects. On the Hull and Selby (narrow gauge) line, which was partly laid upon longitudinal timbers and partly upon transverse wooden sleepers, a good opportunity was afforded for comparing the two plans; and the evidence of Mr. Gray, who was formerly locomotive superintendent upon that line, shows a decided preference for the cross-sleepers. He observes that there was a great difficulty in keeping the rail in perfect contact with the longitudinal timbers; that they require to be pressed upon the timber with a constant pressure nearly equal to that coming upon them during the passage of a train; and that in the absence of such a pressure, which is unattainable by any mode of fastening now in use, water gets in between the rail and the timber in wet weather, and is forced out with great violence during the passage of an engine; each wheel forcing it out against the opposite one. 'I have,' says Mr. Gray, 'seen the engine going out almost as clean as a new pin, and before half an hour had elapsed you could scarcely see a clean spot on it.' He further states that, having been told by an engine-driver that his wheels slipped more upon the longitudinal timbers than upon the cross-sleepers, he, though incredulous, tried it himself one frosty morning, and found that after the engine slipping so much upon a level part of the road which was laid upon longitudinal timbers as to lead him to fear that the train would be unable to ascend an incline of 16 feet per mile which it was approaching, he found, on reaching the incline, which was laid with cross-sleepers, that the slipping ceased, and the engine 'went up like an arrow.' The slipping re-commenced on reaching another portion of road laid on longitudinal timbers, and again stopped on reaching the cross-sleepers. Upon the Croydon railway, which was originally laid with longitudinal timbers, the construction has been found so unsatisfactory that, in the relaying, which is nearly completed at the time we write (November, 1846), heavy bridge rails, laid upon cross-sleepers, have been employed.

The kind of rail now most commonly employed resembles that marked *k* in the cut inserted at p. 255 of the article RAILWAY, P. C., which is variously called the I, the H, and the double-T-rail; and the weight is seldom less than 70 or 75 lbs. per yard. In some cases heavier rails have been used; the heaviest yet employed, we believe, being those laid on the Great Southern and Western (of Ireland) Railway, between Dublin and Carlow, by Sir John Macneill, which weigh 90 lbs. to the yard. These rails however are laid in a peculiar method of Macneill's invention, which was first tried on the Dublin and Drogheda Railway, and in which the use of cast-metal chairs, keys, and pins is avoided, the rails being connected with the sleepers in a more direct and simple manner, which is stated to be highly favourable to security and smoothness of motion.

While longitudinal bearings of timber have lost favour, transverse wooden sleepers, which were formerly regarded rather as temporary substitutes for stone blocks upon embankments and places where sinking might be expected, than as a permanent means of support for the rails, have been brought into very extensive use, and are considered by many to afford the best kind of foundation. The ease with which they are laid, the comparatively small depth of ballast which they require, and their efficiency in keeping the line in gauge, or preserving the parallelism of the rails, in the event of a derangement of level, favour their use; while the adoption of some one or other of the protective processes noticed under TIMBER, PRESERVATION OF, P. C. S., p. 632, removes the objections arising from the natural tendency of the material to decay. The permanent way of the South Eastern Railway, laid under the superintendence of Mr. William Cubitt, is an excellent example of the cross-sleeper construction, which has been imitated in relaying the Croydon line, and upon some other railways. A minute account of this permanent way, communicated by Mr. Pope to the Institution of Civil Engineers, was printed in the 'Civil Engineer's and Architect's Journal,' for June, 1842, pp. 200-202, which, as well as a shorter notice in the 'Railway Chronicle' for 1846, p. 899, is illustrated by engravings of the mechanical details. The most striking feature of this construction is the use of sleepers of a regular triangular section, 9 feet long, 11½ inches broad, and 7 inches deep, formed by sawing square baulks of Baltic fir diagonally into four pieces. These are laid with the broadest flat surface (the base of the triangle) uppermost, the double slope of the under side constituting a form admirably adapted for bedding itself well in the ballast. The chairs, which are of a pattern patented by Messrs. Ransome and May, of Ipswich, are of a shape well devised for ensuring sound casting, and obtaining the greatest strength from a given weight of iron, and have a single projecting rib or buttress in the centre of each cheek or jaw; and those used for the intermediate points of support are secured to the sleeper by two pins, one at each end, the holes to receive them being formed alternately on opposite sides of the medial line of the chair and sleeper, that the driving of the pins may have the least possible tendency to split the sleeper. The joint-chairs however, or those which are used at the junction of two lengths of rail, have three instead of two holes to receive the fastening pins, which are trenails of compressed oak, 6 inches long, and tapering from 1½ inch to 1¼ inch in diameter. The cavity in the chair is so contrived that the rail shall only touch it at two points, the base and the top of the cheek or jaw, in order that the true angle of obliquity of the rail, and its steadiness in the chair, may not be affected by any trifling irregularity of shape; and the rails are secured in their place by keys of compressed fir. Upon the South-Eastern line the rails weigh 70 lbs. per yard, the ordinary chairs 20 lbs. each, and the joint-chairs 28 lbs.; and the chairs and sleepers are placed at an *average* distance of 3 feet from each other, though the first chair from the joint, in each direction, is placed at a distance of 2 feet 6 inches to 2 feet 8 inches, while the intermediate space is divided into three equal parts. Upon the Croydon line rails of 75 lbs. to the yard are used, with intermediate chairs of 21 lbs., joint-chairs of 38 lbs., and six, instead of five, sleepers to the 15-feet rail.

In a communication made by Mr. W. H. Barlow to the Institution of Civil Engineers on the 14th of January, 1845, and reported in the 'Athenæum' for that year, p. 72, a kind of hollow or tubular key of wrought-iron, made to press equally against the jaw of the chair, the middle web of the rail, and its top and bottom flanches, is recommended as a substitute for the compressed wooden keys so generally used; which, from their position just above the surface of the ground, are much exposed to decay, and are also liable to shrinking, and to injury from driving up when they have shrunk. On the Midland Counties Railway the wooden keys have not been found to last more than about five years; and as they cost from 8*l.* to 10*l.* per 1000 (upwards of 7000 being used in a mile of railway with double track and sleepers 3 feet apart), the expense of renewal becomes an important item. The hollow iron keys had, Mr. Barlow states, been tried with success on the Midland Counties, South-Eastern, Warwick and Leamington, and some other railways.

In addition to the evidence before the Gauge Commissioners, already referred to, which is well worthy of diligent perusal for its information upon this and other branches of railway engineering, the reader may consult with advantage the reports given in the 'Civil Engineer's and Architect's Journal,' of Mr. Vignoles's lectures, delivered when professor of civil engineering at University College, London, two of which, reported in the number for September, 1842, pp. 312, 313, relate solely to the permanent way, or upper works of railways.

Gauge.—It has been stated under RAILWAY, p. 256, that the gauge, or width of track, upon the Liverpool and Manchester railway, which subsequently became the model for other lines, was copied from some of the colliery railways in the North of England, where a width of 4 feet 8½ inches had been found amply sufficient for mineral traffic, allowing as it does, by the projection of the body over the wheels, the use of carriages to the full as large as any employed upon common roads. That railway was in a great measure formed before it was determined by what power to work it, so that, although practical experience might have been cited in proof of the sufficiency of the width for the use of locomotive engines, the gauge appears to have been selected on other grounds, and without reference to the motive power. Soon, however, after the successful application of locomotive engines to the attainment of a high rate of speed, some inconvenience began to be felt from the want of sufficient space for cleaning and repairing the machinery as then arranged, and, as the case is pithily put by Mr. Sidney, in his 'History and Prospects of the Railway System, Illustrated by the Evidence given before the Gauge Commission,' 'it became a favourite idea with many engine-builders, that a few additional inches to the gauge would increase the power, and in every way much improve the locomotive;' while 'others, considering that all railways must eventually communicate, applied themselves to simplifying the engine and adapting it to the gauge;' and, he adds, 'even up to the present day, the question is, shall the engine be adapted to the gauge, or the gauge to the engine?'

The railways which were projected in immediate connexion with the Liverpool and Manchester adopted its gauge, and the same was at first contemplated for the Great Western railway, which, as originally projected in 1833, was to commence by a junction with the London and Birmingham line a few miles from London. As, however, it ran into an entirely new district of country, and one in which gradients of a very superior order were attainable, it was determined, upon the recommendation of Mr. Brunel, to seek for an independent entrance into London, and, by the adoption of a wider gauge, to aim at a higher degree of speed, safety, and accommodation than any other line could afford. It was then believed that each main-trunk railway would continue in a great measure independent of every other, and therefore that no serious difficulties would arise from the diversity of gauge, and Mr. Brunel conceived that by the adoption of a gauge of 7 feet instead of that of 4 feet 8½ inches, he should be able, by placing the bodies of the carriages between instead of over the wheels (a construction, we may observe, which he has not tried, and against which several important reasons might be urged), to save friction by the employment of larger wheels, without throwing the centre of gravity higher than in ordinary railway carriages; that he should thus also ensure greater stability and a more steady motion; that he should be able to convey stage-coaches and other common road carriages upon low trucks, by running them between the railway wheels; that he should obtain facilities for the adoption of larger and more powerful engines than had as yet been used upon any railway; and thus, by a combination of mechanical facilities, be able to take advantage of the superior levels of the line for the attainment of very high speed. During the progress of the works some of the shareholders became dissatisfied with the increased expenditure involved in the adoption of this greatly enlarged gauge, and at length, in 1838, Messrs. Wood and Hawkshaw, two experienced engineers, were called in to examine and report upon the works of the Great Western line, which was then completed as far as Maidenhead, especially in reference to the increased gauge. Their reports, although upon the whole unfavourable to the wide gauge, did not lead to any change in this particular, and consequently the construction of the Great Western line, with its extension to Exeter, and its first important branch, the Cheltenham and Great Western Union line, were completed upon the 7 feet gauge. In the mean time the Eastern Counties railway, another line which was then expected to continue in a great measure isolated, was, upon the recommendation of Mr. Braithwaite, who simply desired an extra width of a few inches, to accommodate the mechanism of the engines, laid with a gauge of 5 feet, which was necessarily followed in the laying of the Northern and Eastern line, after it had been determined to connect it with the Eastern Counties at Stratford. When, however, in 1844, the Eastern Counties company, with which the Northern and Eastern was then amalgamated, obtained powers for extensions which would eventually bring their lines into connexion with the existing lines towards the North of England, the evil of diversity was stopped before any practical inconvenience arose from it, by the alteration of the eighty-six miles of railway then completed to the national standard of 4 feet 8½ inches; an alteration which, though involving also the modification of all the engines and carriages, was effected without stopping the traffic for a single day, and without any accident. In the same year the Bristol and Gloucester railway, which was originally projected as a narrow-gauge line in extension of the Birmingham and Gloucester, but which, through the influence of the Great Western company, had been laid down on the broad gauge, was opened, and then, for the first time, the evils which had been predicted as likely to arise whenever a *break of gauge*, or point of meeting between two different gauges should occur, were actually felt. The necessity imposed upon travellers between Bristol and Birmingham of changing carriages at Gloucester was found to be sufficiently annoying; but the effect of the break upon goods and cattle trains, and the transhipment of horses conveyed by passenger trains, was found to be far more formidable.

In the parliamentary session of 1845 the gauge question assumed great prominence in consequence of the obstinate contest then carried on between the broad and narrow gauge interests for the privilege of constructing lines between Oxford, to which place the Great Western company had a broad-gauge branch formed under an act of 1843, and Rugby on the one hand and Worcester and Wolverhampton on the other. The Board of Trade reported against the broad-gauge lines mainly upon the ground that an extension of the broad gauge into a new district of such importance was objectionable, both from its comparative unfitness for mineral traffic, and from the belief that the break of gauge would be more injurious if carried into the interior of the commercial district than if limited to the port of Bristol (it being then proposed to reduce the Bristol and Gloucester line to the narrow gauge), and the junction at Oxford. Parliament, however, finally determined in favour of the lines promoted by the Great Western company, chiefly upon the ground of their engineering superiority, but without expressing any decided opinion upon the question of gauge, which had, by this memorable contest, assumed a national importance. Indirectly it led to a full investigation of the question in all its bearings, an address being, before the close of the session, voted in the House of Lords on the motion of Lord Dalhousie, and in the House of Commons on the motion of Mr. Cobden, for a royal commission to inquire and report 'whether in future private acts for the construction of railways provision ought to be made for securing a uniform gauge; and whether it would be expedient and practicable to take measures to bring railways already constructed, or in progress of construction, into uniformity of gauge.'

The commissioners appointed in consequence of this motion were Colonel Sir Frederick Smith, of the Royal Engineers, who had for some time held the office of Inspector-General of Railways under the Board of Trade; Professor Barlow, of the Woolwich Military Academy, who had some years before been upon the Irish Railway Commission; and Professor Airy, the Astronomer-Royal. After a careful investigation, in the course of which many experienced witnesses were examined, experiments were tried upon both gauges, and important statistical returns were obtained from the various railway companies, these gentlemen, in January, 1846, made a report in which the subject is treated under three distinct heads: the effects of break of gauge, the remedies proposed for the evils of breaking gauge, and considerations on the general policy of establishing a uniformity of gauge throughout the country. As the subject is likely to increase rather than diminish in general interest, it may be well to present a brief outline of the views of the commissioners under each head.

With reference to the evils of break of gauge, they express an opinion that they will be less felt by persons travelling in fast or express trains than by any others, such persons being seldom encumbered with much luggage, and no carriages or horses being, under ordinary circumstances, conveyed by such trains. With such therefore the evil may be limited to a comparatively trifling delay, confusion, and personal discomfort, with some risk of loss of luggage during the transfer. In the case of ordinary or mixed trains, which convey many more passengers, and a much larger quantity of luggage, the evils would be much more serious. Experience shows how greatly those trains are preferred in which, although the traveller may have to pass over the lines of different companies, passengers may be conveyed from end to end of the journey without change of carriage; and many companies meet this preference, and the desire to have luggage undisturbed, by running carriages through, even at the cost of bringing them back empty. The transfer of carriages and horses involves also much delay, and in the case of many horses, danger also. With reference to such trains the commissioners observe that 'the change of carriages, horse-boxes, and trucks, and the transference of luggage of an entire train of much extent, must even in the day-time be an inconvenience of a very serious nature; but at night it would be an intolerable evil: and we think legislative interference is called for to remove or mitigate such an evil.' With reference to goods trains also, the evidence of carriers was very decisive as to the evils attending any such disturbance and re-packing as must take place in removing goods from one set of trucks to another. Under present circumstances very little re-arrangement of goods takes place in the course of the journey, and even at the important station at Birmingham five-sixths of the goods waggons pass without re-arrangement. In the conveyance of minerals the inevitable expense of the transfer from one set of waggons to another would, without taking into account other considerations, seriously affect the cost of transmission; and 'the difficulty of shifting cattle would be so great as to present an insurmountable obstacle to such an arrangement, from the excited state of the animals after travelling by railway, and the resistance they in consequence offer when it is attempted to force them a second time into a railway waggon.' In reference also to the conveyance of troops the interruption would cause much confusion and delay, requiring, as indeed it does to meet the more ordinary contingencies of general traffic, a much larger carrying stock than is required when the carriages of one company can run over the lines of another.

With regard to the means suggested for remedying or mitigating the evils of breaking gauge, the commissioners express a very decided opinion against the safety of *telescopic axles*, or contrivances by which the wheels of one carriage, or of a whole train, might be shifted at pleasure to suit different gauges, on account of the inevitable danger, to say nothing of the increased expense attending any such mechanism. They also reject 'as entirely inapplicable to the traffic of railways,' the proposal to convey narrow-gauge carriages upon the broad-gauge lines by mounting them upon trucks; an arrangement which could only meet the difficulty as regards a certain portion of the traffic, and that by the conveyance of an enormous additional dead weight, attended by both delay and danger. The plan of using shifting bodies for passenger-carriages, capable of being removed from one carriage-frame to another, although practised to a limited extent in France in the conveyance of diligences which run partly upon a railway and partly upon a common road, is open to serious objections on the score of insecurity and inconvenience, and it is not expected that the system will be retained in France when the railways on which it has been tried shall be completed. The use of loose boxes, or shifting bodies, for goods and minerals, constructed so as to be transferred by machinery from one truck to another, was the subject of some rather contradictory evidence; but the commissioners express their belief of its inefficiency for the purpose proposed: and they sum up their conclusions upon this head by stating their belief that no method had been proposed to them 'which is calculated to remedy in any important degree the inconveniences attending a break of gauge.'

In reference to the policy of establishing uniformity of gauge throughout the country, the commissioners express their conviction that the time has arrived when, if steps cannot be taken to remove the existing evil of diversity, it appears at least imperative that the wider spread of the evil should be prevented. The question, as applied to the existing state of things in this country, involves, they observe, not only the consideration of the relative length of the lines laid on the two different systems which now remain in England, 'the comparative mechanical efficiency of each, the general superiority of one over the other, their adaptation to the wants of the country, and the possibility as well as the policy of a change, but also the pecuniary means of effecting it.' Another view of the subject relates to the expediency of laying additional rails to enable carriages suitable for both gauges to run upon the same line, a plan attended with several difficulties, but which is expected to be adopted in some places where, under present arrangements, the two gauges will intermingle. The difficulty of keeping such a double-gauge road in repair would be serious, and the complication introduced at points and crossings would be very likely to occasion accidents. If done in the cheapest way, by the addition of a third rail only, carriages of both gauges could not be safely used in one train, because the centre of traction would not be the same, while if two additional rails were used the expense would be great, and the complication would be still further increased. This point was illustrated in the evidence of Mr. Wyndham Harding, who showed by a diagram that while at a junction between two railways of ordinary construction, with two tracks each, there are only *six* crossings or intersections of the rails, the number is increased by the addition of two supplementary rails to each track, to *twenty-eight*. It was further pointed out in the evidence that great inconvenience would attend the use of carriages of different widths on the same line from the circumstance that the station-platforms made to suit the broad would be too far off from the narrow carriages.

With reference to the question, so important in connexion with the suggested enforcement of uniformity, as to what is the best gauge, the commissioners discuss first the question of comparative safety, to which we shall have occasion to advert hereafter; and respecting which they report 'that as regards the safety of the passengers no preference is due, with well-proportioned engines, to either gauge, except perhaps at very high velocities,' where they 'think a preference would be due to the broad guage.' As regards the relative accommodation and convenience for passengers and goods, they consider that the narrow-gauge carriages affording seats for three persons abreast in the first-class, and four in other carriages, are rather preferable to the broad-gauge vehicles, which contain four and six persons respectively in similar cases, because passengers usually like to sit where they can look out at the window. Privacy is provided for in some broad-gauge carriages by a partition in the middle, by which the large compartments for eight passengers each are subdivided into two for four each. 'Until lately the broad-gauge carriages were,' the report observes, 'altogether more commodious than those of the narrow-gauge; but recently carriages have been introduced on several of the narrow-gauge lines nearly as lofty as those on the broad-gauge, and equally commodious.' The evidence as to the comparative ease and smoothness of the motion, which is affected by many other circumstances than the width of gauge, was very contradictory; but upon the whole the commissioners believed, from personal observation, that at the higher velocities the motion is usually smoother on the broad gauge.' For merchandise and mineral traffic the chief bearing of the evidence is in favour of the narrow gauge, small waggons being generally preferred for meeting the contingencies of a fluctuating traffic, in which it is frequently necessary to send waggons partially laden; and also for the conveyance of goods which are liable to injury from pressure. In both kinds of traffic small vehicles (comparatively small, we should say, the ordinary narrow-gauge waggons being much larger than those used on common roads) appear to be found most convenient and economical. Witnesses from the mineral districts especially, 'state that the smaller waggon can be more easily handled and can be taken along sharper curves than would be suited to a broader waggon;' and are therefore more suitable where, as is often the case in such districts, the broken nature of the ground renders curves of large radius inconvenient and expensive. On the whole the commissioners 'consider the narrow gauge as the more convenient for the merchandise of the country.' The observations relating to comparative speed may be passed over with the remarks, that while upon the Great Western line the speed both of ordinary and express trains is somewhat greater than upon other lines, the excellence of the gradients, and some other circumstances independent of gauge, doubtless contribute to this result; and that while, looking to prospective improvements in locomotive engines, analogy would confirm the claim of the advocates of the broad gauge to the power of increasing their speed beyond its present limit, it may be questioned whether the present construction of railways would justify the attempting of a higher rate of speed than has been shown to be possible even upon the narrow gauge. In regard to the question of comparative economy the commissioners show that the cost for land, earth-works, masonry, permanent-way, turn-tables, &c., must be greater on the wide than the narrow gauge; that the cost of maintenance must also be somewhat greater; and that the first outlay for engines and carriages is affected in like way by the increase of width. How far this is compensated by the increased power of the engines and capacity of the carriages it is very difficult to ascertain; for in comparing statements of working expenses obtained from different companies, the circumstances are found to be so different as to render it impossible to deduce satisfactory information with strict reference to the economy of the gauges. By calculations based upon data furnished by the broad-gauge advocates themselves, the commissioners come to the conclusion that the traffic of the Great Western Railway might, if that line were altered to the narrow gauge, be worked at about the same expense for locomotive power as at present; and they argue that, 'if for the greater trunk-lines' of railway, such as are now in practical operation, 'a superiority were due to the broad-gauge system, that superiority would be less for lines yet to be constructed of a smaller amount of traffic;' so that 'if the preference were given to the narrow gauge for the existing lines, that system would be still more entitled to the preference for the railways of smaller traffic to which we look forward.'

After enumerating the several conclusions already quoted, the commissioners observe that, 'esteeming the importance of the highest speed of express trains for the accommodation of a comparatively small number of persons, however desirable that may be to them, as of far less moment than that of affording increased convenience to the general commercial traffic,' they consider the narrow gauge preferable for public convenience, and, were it imperative to produce uniformity, would recommend the alteration of the broad to the narrow gauge; especially taking into consideration 'that the extent of the former at present in work is only 274 miles, while that of the latter is not less than 1901 miles;* and that the alteration of the former to the latter, even if of equal length, would be the less costly, as well as the less difficult operation.' The question of an intermediate gauge is treated very briefly by the Commissioners, who felt that the evidence offered as to the efficiency of the 4 feet 8½ inches gauge, upon both English and Continental railways, was such as to counterbalance any theoretical advantage to be derived from a costly alteration to a gauge of 5 feet, 5 feet 3 inches (which, upon the recommendation of the Board of Trade, had been previously determined as the national or standard gauge for Irish railways), 5 feet 6 inches, or 6 feet, which latter is the largest dimension now advocated by any not directly interested in the 7-feet gauge. They computed that the total expense of altering the then existing broad-gauge lines to the narrow gauge, including the alteration or substitution of locomotives and carrying stock, would not much exceed 1,000,000*l.*; and though they neither recommend such an alteration at the public expense, nor conceive that the broad-gauge companies could be fairly required to make it at their own cost, they do recommend 'that the gauge of 4 feet 8½ inches be declared by the legislature to be the gauge to be used in all public railways now under construction, or hereafter to be constructed, in Great Britain;' that no subsequent alteration of such gauge be permitted without the consent of the legislature; that measures be taken to complete the general chain of narrow-gauge communication from the north of England to the southern coast; and that to avoid the evils of breaking gauge at the junctions to be formed by new lines if laid, as proposed,

* These figures are taken from a return made by the Board of Trade, and profess to be correct, to the 31st of July, 1845. If the openings which have taken place since that time were added, the case would appear much stronger.

on the narrow gauge, with the existing broad-gauge railways, some equitable means should be found of either producing entire uniformity by the reduction of the broad-gauge lines, or of adopting such measures as shall admit of the narrow-gauge carriages passing without interruption or damage along them.

The appearance of this report was speedily followed by the publication of various pamphlets upon the subject, and by the most strenuous efforts on the part of those interested in the broad gauge, to reverse or modify the recommendations of the commissioners, which, it was contended in 'Observations on the Report of the Gauge Commissioners,' issued by the broad-gauge party as a kind of counter report, would, if adopted, 'inevitably terminate all chance of future improvements in railway travelling,' by arresting the progress of that competition between the two systems to which we are undoubtedly indebted for recent achievements in speed, and from which it is pleaded much further advantage may be derived. The report was handed over to the Board of Trade for their consideration, and at a late period of the session of 1846 a bill was introduced, which subsequently became law, founded upon their suggestions. Admitting the general conclusions of the commissioners, the Board appears to have deemed the attainment of uniformity impracticable; and the act for the regulation of gauge therefore simply provides for uniformity upon such new lines as are not directly connected with the existing broad gauge, leaving it open to extend the broad gauge, under the acts of 1845, to Rugby and Wolverhampton, and into South Wales; and also in the country lying to the south and west of the Great Western and Bristol and Exeter lines, but restricting further extensions to branches of a few miles in length from the Great Western railway, and to such other cases as may be specially sanctioned by parliament. Under the operation of this act, the Birmingham and Oxford Junction line, although projected as an extension of the broad-gauge system, must be laid upon the narrow gauge, unless, as its promoters anticipate, powers for adopting the wide gauge can be obtained in a future session. It is felt by many who have deeply studied the subject, that this compromising arrangement must be regarded merely as a temporary adjustment of the difficulty, and that increased experience will convince even the proprietors of the broad-gauge lines of the necessity, for the promotion of their own interests as well as of the convenience of the public, of reducing their gauge to the national standard.

This important subject has already occupied so much of our space, that our remarks, founded upon the instructive evidence which has been brought before the public by the recent investigation, must be limited to two leading points, in both of which the public are deeply interested. The first of these is safety at high velocities. Happily the number of accidents which have already happened which can be regarded as even remotely bearing on the question of gauge, is too small to enable us to found any general conclusions upon them. Practically, the amount of safety attained on both gauges, where due care is exercised, is almost as great as can be expected. The comparative narrowness of base, which, as far as we remember, is the only definite element of danger charged upon the narrow gauge, does not appear by evidence to have proved injurious in any important degree. Probably no accident has ever occurred of which it can be regarded as the cause, and we are not aware of any in which it can be proved to have increased the damage. On the other hand, while it might be difficult to say that any particular accident which has happened upon a broad-gauge line might not have occurred had the gauge been narrower, the increased width may in many cases be seen to have an injurious effect. The greater weight of the engine and the larger amount of dead weight which, in practice, attends the use of broad-gauge carriages, increase the injurious effects of that almost irresistible momentum which so frequently leads to collisions, and which gives so fearful a character to many railway accidents. The greater length of the axles, although accompanied by increased thickness, increases the probability of fracture, or of such strains as might cause a carriage to run off the line, while, under ordinary circumstances, this evil is aggravated by the use of large wheels, which, when their flanges come in contact with the rails, act upon the axles with greater leverage than small ones would do. Adding to this the circumstance that a curve of given radius is less easily rounded by a broad than by a narrow-gauge carriage, and that the rails are more likely to be deranged by a heavy than by a light engine, we cannot avoid the conclusion that the risks of breaking down or running off the line by the failure of axles are considerably augmented by an increase of gauge. Another circumstance which materially affects this question is the effect of increased width upon the oscillatory or lateral motion of both engines and carriages. A short carriage is obviously more liable to this motion (which, at high speed, becomes dangerous from the flanges striking the rails on each side alternately, until at length the motion is sufficient to throw the carriage off) than a long one; and therefore a carriage suitable for the 7-feet gauge will, unless it be half as long again as would be used upon the 4 feet 8½ inches gauge, be less safe in this respect. Even upon some narrow-gauge lines the importance of a long proportion has led to the use of six-wheeled carriages, and such are exclusively used in the fast trains upon the Great Western line; but in order to attain an equal degree of safety in this respect, the broad-gauge carriages must be made so very large and heavy, as to be difficult to move at stations, where they must often be shifted by hand power, besides involving the conveyance of an enormous amount of dead weight when, as is often necessary in working branch lines, a carriage must be sent through for the accommodation of only two or three passengers. The ordinary second-class carriages of the Great Western line, mounted upon six wheels, accommodate *seventy-two* passengers, and are therefore only suitable for a very large and steady traffic; yet in these the length is no greater in proportion to the breadth than in the ordinary second-class carriages for *thirty-two* passengers each upon the narrow gauge. In goods waggons the same argument holds good with even greater force; while in the case of carriage-trucks and horse-boxes the length of the vehicle is absolutely regulated by the use to which they are applied. Some of the horse-boxes upon the Great Western line are, or were not long since, even shorter than they are wide, as regards the base upon the rails; the distance between the axles being only 6 feet 6 inches, while the distance between the wheels is 7 feet. Such a carriage, running as it were broadside foremost, must, at very high velocities, be productive of fearful danger to the train of which it forms a part. The same reasoning will of course apply to the engines as well as the carriages.

The second point to which we would direct attention is the bearing of the guage question upon the future prospects of the railway system, not as regards the importance of uniformity, or the comparative cost of construction and working, which points have been fully considered by the commissioners, but in reference to another feature involving the comparative merits of the gauges themselves. Admitting, for the sake of argument, that the broad gauge does offer greater facilities for conducting a very extensive traffic, which may be advantageously concentrated into heavy trains, it is well to bear in mind that the tendency of the numerous competing lines now in progress and contemplation, often promoted by the owners of the existing trunks, is to promote and render necessary the subdivision of traffic into small rather than its concentration into large trains, in order that the local traffic of such numerous lines may be developed to the utmost by very frequent dispatches, and by the lighter trains calling at numerous minor stations. All these considerations point towards the peculiar facilities of a narrow gauge as prospectively more desirable than the power of moving occasional large and heavy trains by such huge engines as are employed upon the broad gauge. Another important point is the facility offered by the use of small carriages for the extension of agricultural traffic, which has scarcely been touched by many railway companies. 'The traffic of the West of England,' observes Mr. Sidney, requires 'not huge unwieldy carrisges and trucks, but handy waggons, which may without inordinate trouble or expense be run into small road stations and sidings, to which a farmer may send his couple of fat oxen, or his score of sheep, or his load of corn, in conjunction with one or two more neighbours.' Of such local traffic, he states, there has been little upon the Great Western railway, although it runs through rich corn-growing and cattle-feeding countries, because 'the whole machinery is on too vast, costly, and magnificent a scale;' and he conceives that were it not for the inconvenience of break of gauge, a yet narrower gauge than 4 feet 8½ inches would be preferable for such districts. Mr. Robert Stephenson, in his evidence before the commissioners, referred to a line of about 60 miles laid down by M. Deroider between Ghent and Antwerp, upon a gauge of, he believed, 3 feet 9 inches, which was worked satisfactorily by locomotive engines, both for passengers and goods, and was constructed very economically, as a proof that even narrower gauges than our own may be used in some cases with advantage. In South Wales, where the broad gauge is about to be introduced through the influence of the Great Western company, its unfitness appears even more striking. The mines and iron-works in that district are usually situated in narrow valleys or gullies, in which sharp curves are unavoidable; and, to suit the peculiarities of the country, the local tramways are usually narrower than the common narrow gauge, and some of them as narrow as 2 feet 8½ inches.

Allusion was made in the course of the gauge evidence to the practice of sending passengers through from end to end of their journey without change of carriage, although they might have to pass over the lines of different companies. Those witnesses who endeavoured to mitigate the evils of variety of gauge pleaded, that as branches and connecting lines multiply, the practice of running carriages through must of necessity be in a great measure discontinued. The evidence of Messrs. Brunel and Saunders, the engineer and secretary of the Great Western railway company, was so calculated to convey an erroneous impression as to the practice of the other great companies in this matter, as to call forth an explanatory pamphlet on 'The Origin and Results of the Clearing System, which is in Operation on the Narrow-Gauge Railways; with Tables of the Through-Traffic in the year 1845,' in which it is observed that 'No sooner had the railways which extend from London to Liverpool been completed and connected in 1838, than it became evident that arrangements must be adopted to facilitate the passage of the through-traffic,' at the points where the three railways (then under different managements) joined, so that passengers might 'be permitted to perform any journey within the limits to which continuous communication by railway extended, without being required to change their carriage;' and that 'a similar principle must pervade the arrangements for working every description of through-traffic if the public were to be conciliated, and the resources of the railway-system developed to their full extent.' The importance and at the same time the difficulty of carrying out these principles became still more obvious when the lines extending from Rugby and Hampton to York were completed. For some time, however, dissensions arose between the different companies; it was difficult to obtain accurate returns of, and payment for, the use made by the several companies of one another's carriages and waggons respectively, and some of them 'came in the end to make an unacknowledged use of the carriages and waggons of others to an extent which amounted to a positive grievance.' Under these circumstances it occurred both to Mr. Robert Stephenson and to Mr. K. Morrison, the present manager of the Railway Clearing-house, that a remedy might be found in the establishment of a central office on the principle of the Clearing-house by which the business of the London bankers is so materially facilitated. [BANK, P.C., p. 385.] After some difficulties the proposed system was, on the 2nd of January, 1842, brought into operation on the railways extending from London to Darlington in one direction, and from Manchester to Hull in another, and it has been since adopted by the companies whose lines extend from Darlington to Carlisle, Sunderland, Hartlepool, and Scarborough; and from Birmingham to Gloucester, Birkenhead, Liverpool, Fleetwood, Lancaster, and Manchester. 'In a few months,' according to the pamphlet above quoted, which does not allude to the probable further extension to the north of Scotland, to which recent events leave no doubt that it will soon be extended, 'it will be in force on all the railways included in the area defined by a line passing from London through Gloucester, Liverpool, Fleetwood, and Glasgow, to Edinburgh, and returning by Berwick, Newcastle, Scarborough, Hull, Yarmouth, and Cambridge, to the metropolis; or, in other words, on all the narrow-gauge railways in Great Britain lying north of the Thames, with the exception of the few short lines which are beyond the limits of the area just described; an area which, it is hardly necessary to observe, is only prevented from extending to the southern parts of England by the intervention of a differential gauge.'

The fundamental principles of the Clearing-house system, the regulations founded upon which are very rarely departed from, are, that passengers shall be booked through at all principal stations, and conveyed to their destination without change of carriage; that horses and cattle be in like way carried through without change of conveyance, and goods without being shifted or re-assorted; that the companies respectively shall pay a fixed rate per mile for such carriages and waggons, not their own property, as they may use, and a further sum per day by way of fine or demurrage for detention, if kept beyond a prescribed length of time; and that all traffic accounts between the several companies shall pass through the Clearing-house. Without entering into the details of the method by which these objects are attained, or the advantages which either have been or are expected to be derived from the establishment of this system, the ultimate result of which will be to give to all the connected railways of Great Britain, as far as regards the working of the through-traffic, the character of one concern, conducted on a uniform system, we may state that the tables appended to the pamphlet show that in the year 1845, 517,888 passengers were conveyed an average distance of 146 miles each; while the average length of the railways upon which the system is in operation being only 41 miles, each travelled on an average over nearly four different railways, and passed three junctions or points of convergence; and that to accommodate these passengers, 59,765 railway carriages and 5813 trucks with private carriages were sent through. The tables further show that, in addition to the very large number of waggons used for the conveyance of coke, coal, and other minerals, of which no record is kept at the Clearing-house, 180,606 waggons loaded with merchandise were sent through in a similar manner.

Junctions, Station Conveniences, and Signals. Many ingenious contrivances of the switch kind are in use, which may appear to render accidents almost impossible, so far as the action of the moveable rails is concerned; but one of the most important precautions attending their use is that now generally adhered to, of making all sidings and crossings join the main line in such a way that trains must proceed backwards in order to enter them. By turning to the diagram, *Fig.* 18, p. 257, of the article RAILWAY, P. C., and reversing the position of the arrows in the crossing marked *e f*, the reasons for this precaution will be readily understood. As the diagram now stands, a train running upon either line *meets* the switches, and is therefore liable, if they should be accidentally misplaced, to be turned into the wrong track, with imminent danger; but if, by reversing the position of the arrows, the upper track in the diagram be appropriated to traffic running from *e* to *f*, and the lower to traffic running from *f* to *e*, it will be seen that (assuming the switches to be, as they usually are in such situations, of a self-acting kind, on the principle of that represented at *Fig.* 16, upon the same page), instead of being turned into the wrong line, the flanges of the train would open the switch, and it would continue its journey without danger. In order to enter a siding or crossing so laid, the train must run on past the switches, must then be brought to a stand, and be propelled backwards, by reversing the motion of the engine, when the switches are properly adjusted; but the trifling inconvenience and delay occasioned by this manœuvre is amply compensated by the greater security afforded by the arrangement to the transit of the ordinary trains, and all such as may have to pass the junction at considerable speed. The last few months have produced two or three alarming accidents, illustrative of the danger of laying sidings into the main line so as to meet the traffic, upon the Brighton, Lewes, and Hastings railway, where, as there was at first but a single track for the greater part of the distance, such an arrangement was of course inevitable; while the increasing use of fast or express trains renders it highly important to adopt every precaution which may lessen the risk of running at full speed through stations where the use of switches and sidings is necessary. Accidents have occurred through the rolling of carriages from a siding on to the main line by the action of wind, or from some other cause, and thereby exposing passing trains to danger; to guard against which *self-acting chocks* have been introduced in some situations. These consist of pieces of bent rail or other iron bar so mounted that, while they may be turned aside out of the way by the wheels of a carriage which is being pushed into the siding, they rise up as soon as the carriage has passed, and prevent it from rolling back towards the main line, excepting while they are held back or clear of the rails by an attendant, by means of a lever handle similar to those used for working switches.

Another contrivance, which is sometimes adopted with similar intention to the above, affords the power of laying such tracks as are often required at stations to cross the main line for the conveyance of carriages and waggons from one siding to another, without in any way interfering with the rails of the main line. It consists in laying the rails which constitute the cross track about an inch above the level of the main line, cutting them off, of course, a little short of the points of intersection. By this arrangement the flanges of a carriage being pushed along the cross track, mount upon and roll over the rails of the main line, supporting the weight of the carriage until the wheels again reach the elevated rails of the cross track. The necessity for breaking the continuity of the main rails by grooves or nntches for the passage of the flanges is thus avnided, and the smoothness of the transit upon the main line is undisturbed.

Some important improvements in *turn-tables*, tending to diminish the risk attending their use, and the concussion and noise occasioned by passing nver them, deserve a passing nntice. Some are laid with elevated cross tracks of the kind just described, so as to leavn the rails of nne track smooth and unbroken; and others are distinguished by contrivances to ensure firmness and stability during the passage of trains nver them. Dunn's patent turn-table, the details of which are illustrated in the 'Railway Chronicle' for 1846, p. 347, provides for the safe passage of trains even in case of the turntable being accidentally left in a wrong positinn. In this contrivance the central portion nf the tracks, both of the main and cross lines, is fixed or statinnary, the only portion that actually turns being an annular platform, the surface of which is so adjusted to the level of the rails, that a carriage coming upon it when turned into a wrong positinn would roll nver it upon its flanges, coming upon the fixed track in the centre soon enough to avoid any risk of being turned out of its proper course, and, crossing the second half of the annulus again upon its flanges, would reach the fixed track beynnd it without being thrown off the line. Some ingenious features of this turn-table, designed to ensure steadiness during the passage of a train, are the subject of dispute between Mr. Dunn and Mr. Ellis, the patentee nf another improved turn-table.

In the use of efficient *signals* great prngress has been made within the last few years; but of the numerous inventions of this character we shall nnly advert to the admirable system of signals on the semaphnre principle, introduced by Mr. C. H. Gregory upon the Londnn and Croydnn railway, and which, with varinus improvements suggested by experience, have been adopted nn the lines of the Snuth-Eastern, Brighton, and some other railway companies. The ordinary apparatus mnunted at every station, and at each approach to stations of the more important class, consists of an elevated post with two mnveable arms mounted upon a commnn pivot near its upper extremity, either nf which is capable of being mnved independently of the nther by means nf a handle near the bottom of the post; so as either to hang vertically, in which position it falls into a slit in the post so as to be invisible; to prnject from it in a horizontal directinn, or at an angle nf 90°; nr to assume a position intermediate between the vertical and the horizontal, projecting dnwnwards at an angle nf 45°. Each arm, whatever be its positinn, refers to its own particular track; that projecting tnwards the right referring to the right-hand track, and that prnjecting towards the left to the left-hand track; and when dropped within the post the arm indicates that the line to which it refers is clear, so that trains may pass on safely; when prnjected hnrizontally, that a train is a short distance ahead, that there is some obstructinn on the line, or that, for some other reasnn, any approaching train must stnp; or when projected at an angle of 45° that, owing to a train being ahead, though at a safe distance, or owing to snme other circumstance, any approaching train shnuld slacken its speed, and proceed cautiously until again reaching a signal of safety, or 'all right.' As these semaphore signals can only be seen in the day-time, signal lamps, with powerful parabolic reflectors, and capable, by the turning nf handles at the bottom nf the post, of being shifted so as to throw their light through either a white or colnurless, a red, nr a green glass, according tn whether the signal required be to indicate safety, danger, nr the necessity of cautinn, are also mounted near the tnp of each post; nne lamp directing its light up, and the nther down the railway, and each being visible nnly in its own proper direction, for the guidance nf approaching trains. At the junctinn nf twn lines nf railway similar signals are used, but twn posts are emplnyed, one for each line, each having twn arms, one for the down and the nther for the up track of its particular line. The arms and lamps in this case have but two positions each; the danger or stop signal, which is always displayed excepting while the switch-man is at his post and actually hnlding the switches in the required position; and the cautinn signal, which is shown when the track to which it refers is prnperly adjusted for the passage of a train; and the wnrking nf the switches and the signals for bnth lines is effected simultaneously by the hands and feet nf one attendant. The engine-driver of every train, on approaching the junction, indicates by whistling and holding out his hand nr a signal light in what directinn he wishes to proceed. In addition to these fixed signals, the mechanical details of which are fully illustrated in the 'Railway Chronicle' of 1846, pp. 423 and 615 (from which we learn that the nrdinary station signal apparatus, for night and day signals, costs about 30*l*), hand signals are made by the attendants and wnrkmen upon the line either with the arms alone, with white, red, and green flags, nr, at night, with hand-lamps; and at night, nr even in the day-time when tunnels are tn be passed through, white lamps attached to the front of the engine, and red lamps behind the last carriage nf the train, are used as signals with every train, their number and relative positions serving to distinguish the trains destined for nne line from those nf annther, wherever, as in the case of the Croydon, Brightnn, and South-Eastern lines, the junctinn nf different railways renders snch distinction necessary. An extra red lamp, nr an oval board painted red, hung at the tail of the last carriage nf a train, serves to indicate that it is tn be followed by a special nr express train; and a similar signal attached to the front of the engine nf an express train acts as a special warning to keep the line clear nn its approach.

In cases where the foggy state of the atmnsphere might prevent the signals from being seen, and in other cases of emergency at night, the *fog signals* invented by Mr. E. A. Cowper are very useful. These are flat circular boxes of about two inches in diameter, filled with an explosive mixture, and furnished with a narrow slip of sheet lead, by which they may be readily fixed upon the tnp of the rail, in such a positinn that, when run nver by the wheel nf the engine, they will produce a loud detonation which warns him to stop. Such signals, with printed directinns for their use, are deposited in every station, and carried with every train, upon the lines where they are adopted; and in case of an accident happening at night, several are fixed at intervals behind the point of obstruction, so as to give repeated warnings tn an approaching train. When the line is clear they may be taken up again and kept for future use. Such signals are used to stop all trains approaching a junctinn during a fog, until, by the snunding of the engine whistle and of a bell mnunted for the purpose at the junctinn, the switchman ascertains the destination of the train, and indicates that the line is clear for it.

Carriages. Snme remarks having been made nn the advantages of increased length in carriages in treating on the gauge question (see p. 667), we need only observe on that point that six-wheeled carriages are nnw used with advantage upon many narrow-gange lines, and that still lnnger vehicles, having eight wheels, and snme provision for adapting their axles to a curved track, have been tried, though on a limited scale. In the 'Railway Times' of 1843, pp. 992, 993, are some extracts frnm a report emanating from the carriage factory of the Leipzig and Dresden railway cnmpany, upon carriages of extraordinary dimensions, constructed there for the German railways, illustrated by an engraving of an eight-wheeled carriage, 47 feet long, and containing seats fnr 112 passengers. From this paper it appears that bow-springs, which, owing perhaps to the comparative shnrtness nf English railway carriages, had not been hrought intn use so extensively in this country as was anticipated, were greatly preferred in Germany. This kind of spring is described under SPRING-CARRIAGE, P. C., pp. 387, 388. The inconveniences attending the use of very capacious vehicles for a fluctuating traffic may be met in some measure by extending the plan, which is gaining ground in this country even with carriages of the ordinary dimensinns, of combining accommodation for different classes of passengers in different compartments of the same vehicle; a plan which is especially desirable where many branch and cnnnecting lines have to be provided for, to enable the railway companies to send passengers through withnut a change nf carriage, and withnut involving the conveyance of more dead weight than is absnlutely necessary. As a general remark we may say that while the most modern English railway carriages are mnrn elegant in appearance than those of older build, they are both mnre roomy and strnnger in the frame-work, which, in some of the most recently cnnstructed, is made of wrought-iron; experience having shnwn that light carriages would not bear the strains to which they are exposed.

Locomotive Engines. Amnng the results consequent upon the use of cnmparatively steep gradients, coupled with the great increase of railway traffic, and the growing demand for increased speed, is a general enlargement of the locomotive engine, usually combined with some deviations from the construction most commonly preferred when the remarks in P. C., pp. 259, 260, were written. Coupled wheels, which were formerly used almost exclusively for goods trains, are now largely and increasingly employed for passenger traffic, it being found practicable to work them at very high velocities. To this change we are inclined to attach considerable importance as a matter of safety, since, independently of the injury done to the road by throwing an enormous weight upon a single pair of driving-wheels, in order to increase their adhesion, the tendency of the engine to a dangerous rocking motion at high speeds is undoubtedly often increased by that circumstance; for if a disproportionate share of the weight of the machine be thrown upon the central axle, the two ends will have a degree of play upon their bearing springs which may allow the motion we refer to to increase until the engine is thrown off the line, as there is some reason to believe has been the case in one or two accidents in which no obvious cause could be discovered for the engine leaving the rails. There can be no doubt that, with an equal amount of adhesion, a firmer and steadier bearing upon the rails may be obtained when the principal weight is divided between two axles than when it is thrown upon one. The necessity for increased power, calling for the use of larger boilers and cylinders, is leading to the very general abandonment of that construction of engine in which the cylinders are placed at the bottom of the smoke-box, and the machinery is under the boiler; and a growing preference for those in which the cylinders are fixed outside the framing, and the power is conveyed to the wheels by external cranks and connecting-rods. Engines in which the machinery is thus arranged may be greatly enlarged in all their parts without raising the centre of gravity, the depth required for working the cranks and eccentrics under the boiler being saved; and they have the further advantages of far greater strength in the axle, and of the whole of the machinery being easy of access for the purpose of examination and repair. The most important parts of the mechanism, indeed, may be examined and attended to while the engine is running; iron foot-plates, with hand-rails, being constructed along the sides of the frame of the engine. In some narrow-gauge engines boilers are used of 3 feet 9 inches diameter, being the largest dimension that the gauge will allow, and the sectional form has in a few instances been made slightly elliptical, the longer axis of the ellipsis being placed vertically, in order to save room; but more generally increased power of generating steam is sought by lengthening rather than enlarging the diameter of the boiler. The occurrence, in December, 1845, of a fatal accident on the Norfolk railway, with an engine on the recent long-boiler construction of Mr. Robert Stephenson, led to much discussion on the merits of this kind of engine; General Pasley having given evidence against their safety, which called forth a reply from Mr. Stephenson, in which he denies the assertion that the additional length of boiler was inefficient on account of the distance of the farther end from the fire-box, and states that 'even with the longest tube yet introduced in locomotive engines, the temperature at the chimney end has been found sufficient to melt lead, which is upwards of 200 degrees above the temperature of the water in the boiler;' a fact which indicates that locomotive-engine builders have not even yet attained the length desirable so far as the economy of fuel is concerned, although, perhaps, looking to the difficulties occasioned by the expansion and contraction of the metal, they may have reached the utmost attainable length with the present construction of boiler. Mr. Stephenson does not state the precise length to which he has extended the boiler; but General Pasley observed that in his long engines it is four or five feet longer than in those formerly used. The distance between the hind and fore axles of the engine to which the accident happened (a six-wheeled one), is 10 feet 6 inches; and from that to 12 feet 9 inches (which, in his evidence before the Gauge Commissioners, Mr. Stephenson stated was, in his opinion, too long) is the length of bearing of most recently constructed engines for the narrow gauge; while 5 feet 6 inches was the length of bearing formerly employed on the London and Birmingham railway, with four-wheeled engines, though it has been extended of late to about 7 feet. Notwithstanding the great length of bearing, the fire-boxes of the long-boiler engines referred to project beyond and overhang the hinder axle, so that the whole length of the engine is about as much beyond the length of bearing upon the rails as in the original four-wheeled engines of the Birmingham line, with a bearing of only 5 feet 6 inches. Such large and powerful engines, by which it is anticipated that a speed rivalling that obtained on the broad-gauge lines may be safely attained, are necessarily much heavier than those of the older construction, though, perhaps, not so in proportion to their increased base. The Great Western company, however, are constructing engines of considerably greater magnitude. The first of these, called the 'Great Western,' accomplished an experimental trip from London to Bristol, in June, 1846, in 2 hours and 26 minutes, including two stoppages, being at the average rate of 50 miles per hour, with a train of ten carriages, weighing 100 tons. The run from Paddington to Didcot, a distance of 51 miles, with a rise of 118 feet, was accomplished at the rate of more than 56 miles per hour; and two miles on another part of the road, with a fall of 8 feet per mile, at the rate of 69 miles per hour. This engine has about 1750 square feet of heating surface in the boiler; has cylinders of 18 inches diameter and 24 inches stroke; driving-wheels of 8 feet diameter; and two pair of bearing-wheels of 4 feet 6 inches diameter. The total length is 24 feet; the distance between the supporting wheels 16 feet; the weight of the engine alone, without fuel or water, 28½ tons, and of the tender, 10 tons; and the total weight of engine and tender, when loaded, about 56 tons. Whether the railway will be able, without ruinous expense in repairs, to bear the rapid action of so enormous a weight, remains to be seen; but if unofficial reports may be trusted, both road and engine have proved already very costly to keep in order. It is worthy of remark, though we have no means of testing the absolute truth of the statement, that about the time when the above-mentioned feat of speed was accomplished, the newspapers announced the turning out from the establishment of Messrs. Sharp and Roberts, eminent engine-builders of Manchester, of a narrow-gauge engine called the 'Atlas,' which, after being tested on the Birmingham and Gloucester railway for two months, had been found capable of maintaining a speed of 58 miles an hour with a train of ten carriages, over undulating gradients, and which, with its tender, weighed only 25 tons. Allowing largely for exaggeration, this statement suggests the necessity of pausing before the astonishing speed of the 'Great Western' engine is set down to the credit of the broad gauge.

The revival, by Mr. Parsey, within the last few months, of the often attempted scheme of employing compressed air as a motive power in locomotive engines, perhaps only deserves notice here to call attention to the fact that, supposing the mechanical difficulties to be overcome, which, from the action of Mr. Parsey's beautiful models, may be supposed to be the case, it remains a question whether the power required for the condensation of air into the reservoirs from which the proposed locomotives were to be supplied, might not be as well or better employed in propelling the trains in some other way; and to remark, that many of the assertions made respecting the superiority of the proposed air-locomotives to steam-engines in locomotive and tractive power, are too absurd for serious refutation.

Atmospheric Railway System. To what has been already said on this subject under Railway, P. C., p. 260, and Atmospheric Railway, P. C. S., pp. 149-152, very little need be added. Of the proposed atmospheric line alongside of the London and Croydon railway, alluded to in the last-mentioned article, a portion of about 5 miles, between Croydon and the Forest Hill station, was so far completed in 1845 as to admit of the running of experimental trains, and has been employed for working the regular traffic, in conjunction with locomotive engines from London to Forest Hill, for several months. This railway is constructed upon the eastern side of the locomotive line, and therefore, to avoid interference with the Brighton line at the point where it diverges from the Croydon, it is conducted over that railway by a timber viaduct, to which it rises on each side by a slope of 1 in 50. The first experiments were highly satisfactory, a speed of from 60 to 75 miles per hour, with considerable loads, having been attained, and the formidable slopes of 1 in 50 ascended without difficulty, even when the train was deprived of momentum by being brought to a stand at its foot. It was also found, by stopping the action of the stationary engine near the middle of the 5-mile length, and leaving the whole 5 miles to be worked by one engine at its extremity, that trains might be propelled through the whole distance at the rate of 60 miles per hour. The working of the ordinary traffic, however, has not proved so satisfactory; although in several cases the defect appears to lie rather with the stationary engines, the construction of the air-pumps, or some other matter capable of easy remedy, than with the system of propulsion itself. In several cases the power has, from some cause or other, proved insufficient, especially at the inclined planes of 1 in 50 above referred to; and during the very hot summer of 1846 an unexpected difficulty arose by the iron tube becoming so heated as to melt the composition by which the valve is sealed;

by the failure of which the vacuum was destroyed, and it became necessary again to transfer the traffic to the locomotive line until a harder composition could be prepared, and a new, and, it is anticipated, a better valve fixed. In the mean time the continuation of the atmospheric line from Forest Hill to New Cross has been nearly completed, and arrangements have been made for its further extension to London Bridge. While however the Croydon and Epsom line has been constructed, and is expected to be ready for traffic about Christmas, 1846, the atmospheric apparatus has not been laid upon it, and it is intended to work it in the first instance with locomotive power; the engineer-in-chief, Mr. William Cubitt, having recommended that course on the ground that the atmospheric system, as now at work and in progress towards completion, is 'too important a matter either to be hastily extended or hastily thrown aside.' In the session of 1846 the act for the projected Direct London and Portsmouth railway (which was deferred from the session of 1845 for want of time to pass through the House of Lords) was passed; but the arrangements which have been entered into between its promoters and the London and Brighton and London and South-Western railway companies render it almost certain that it will be constructed as a locomotive line. Under these circumstances, which render the anticipated extension of the atmospheric system for the present doubtful, it is unnecessary to enter upon the consideration of the various topics suggested by a comparison between it and the locomotive system, or to notice the arguments which have been adduced in favour of atmospheric traction on the ground of its superior safety, economy, and power of adaptation to purposes for which locomotive engines are unsuitable. To what has been said under ATMOSPHERIC RAILWAY on the history of schemes for atmospheric propulsion we may add that since that article was written many new contrivances have been propounded, of which perhaps the most deserving of notice is that of the late M. Hallette, in which the connexion between the carriages and the piston is effected by a thin flat bar or coulter, passing vertically through a slit in the upper part of the atmospheric tube, which slit is closed excepting during the passage of the coulter by the contact of two continuous air-bags, or air-tight and highly elastic hose or pipes of caoutchouc covered with cotton and leather, which are inserted, in a collapsed state, in grooves or cavities formed on the top of the pipe to receive them, and are then inflated with air so as to press against one another with considerable force. The action of this, the most simple of all the proposed valves, is illustrated by the passing of a paper-knife between the closed lips; the valve itself consisting, as it were, of a pair of continuous lips, capable of being pressed together with any required force by inflation with compressed air. Many of the other proposed plans are more remarkable for their complication than anything else. We may refer to the 'Mechanic's Magazine' for January 24, 1846, for a brief notice of one which does not bear that character, although we need further information in order to judge of its practical value. The invention to which we allude is the magneto-atmospheric railway, patented by Messrs. Conder and Taylor, in which the necessity for a valve is avoided by the employment of electro-magnetic force to connect the carriage with the piston in the tube. From a letter in the following number of the magazine it would appear that the patentees are not alone in their claim to this ingenious idea.

Railway Labourers and Railway Accidents. The condition of the labourers employed on railways, the state of wretchedness and demoralization in which they are often compelled to live, and the loss of life, injuries of person, and deterioration of health, to which they are subjected by the careless management of contractors, have become matters of anxious investigation to all those who are interested in the welfare of the labouring classes. 'A Report of the Select Committee of the House of Commons, appointed to enquire into the Condition of the Labourers employed in the construction of Railways and other public works, and into the Remedies which may be calculated to lessen the peculiar evils, if any, of that condition,' has been published (1846). The Statistical Society of Manchester have also published (1846) the following Papers, which had been read before the Society:—'A Return of the Fatal Accidents, Wounds, and Injuries, sustained by Workmen engaged in the construction of the Summit Level Tunnel of the Sheffield and Manchester Railway; and a Description of the Demoralization which prevailed amongst them, with Observations; being a Letter of John Roberton, Esq., Surgeon. President of the Society. 'Statements on Railway Contracts and Railway Labourers, by Robert Rawlinson, Esq., Engineer of the Bridgwater Trust.' 'Observations as to some of the Effects produced in this Country by the past expenditure of Capital on Labour in the construction of Railways; together with Observations on the Principles of Legislation and Jurisprudence applicable to the Public Protection, by Prevention of Fatal Accidents, and the better Regulation of Labourers employed in dangerous works; by Edwin Chadwick, Esq., Barrister-at-Law,' &c.

It is abundantly proved, by the evidence adduced in these papers, that large bodies of workmen are hastily collected, and crowded into hovels, without any provision being made for comfort or decency; that they are not only hard worked, but exposed to great and frequently unnecessary risk of life and limb; that they are cheated of a considerable part of their hard-earned wages, by being compelled to deal at tally-shops by means of tickets, while payments are only made once a month or even two months, thus, by a system of credit, exposing the men to the temptation of spending carelessly, and of drunkenness, by receiving the balances due to them in an accumulated sum; that no provision is made for instruction, religious or merely educational, for the men or their children; and that there is, in consequence of all this want of care and want of principle on the part of the contractors, great wretchedness, discontent, disorder, drunkenness, and debauchery, on the part of the labourers. The Directors of the Liverpool and Bury Railway are stated to have voted 1000*l.* a year for the special purpose of the care of the workmen, to obtain good lodgings and rooms for living in, and other comforts and conveniences.

As many millions of pounds must be spent, and many thousands of men be employed in the construction of the railways which have already received the sanction of Parliament, it is deemed fit that the Legislature should interfere to protect the labourers, by suitable legislative measures, from the neglect and cupidity of those who employ them.

With respect to accidents which occasion loss of life or injury of limb, either to workmen in the construction of railways, or to passengers in transit, Mr. Chadwick was examined by the Committee of the House of Commons before mentioned as to the provisions of the French law in such cases. Mr. Chadwick adduced the following provisions of the 'Code Civil':—

'Art. 1382. Every act whatsoever of the man who occasions a damage to another, obliges him by whose fault it happens to repair it.

'Art. 1383. Every one is responsible for the damage he has caused, not only by his act, but by his negligence or by his imprudence.

'Art. 1384. A man is responsible not only for the damage occasioned by his own act, but also for that which is occasioned by the act of persons for whom he should answer, or of things which he has in his charge.'

These provisions of the French law, Mr. Chadwick states, were understood to extend to companies, as well as to individuals; yet, by a law of July 15, 1845, on the general management of railways, a chapter was introduced to provide for the greater safety of railway passengers. The 22nd clause makes all owners or lessees of railroads responsible to individuals and the state, for injury caused by managers, directors, or any people employed in any capacity whatever in the working of them. Other clauses, from 16 to 21, enact penalties against those through whom accidents may be brought about, and for the mere violation of the regulations established by the king or prefects for the management of railways, even when no accident resulted therefrom.

BRITISH RAILWAYS.

In the following tabular view of railway acts passed since 1840, supplementary to that given in P. C., p. 261, a large proportion of those described as for new lines are merely for constructing branches from or extensions of lines previously authorised; while among the amendment acts are several which authorise deviations or alterations of lines previously sanctioned. The figures which follow, indicative of the aggregate number of miles of railway sanctioned in each year, must be taken only as an approximation to the truth, as various circumstances combine to render perfect accuracy unattainable. The aggregate length also needs some reduction to account for the cases in which an act passed in one session authorises works to supersede wholly or in part those sanctioned by a previous act; and for those in which two different companies have received powers for making the same line.

Such cases however would not require any serious deduction from the figures given:—

Year.	New lines.	Amendments.	Total.	Length.
1801-1840	135	164	299	(See P. C., p. 261.)
1841	2	17	19	14½ miles
1842	5	17	22	67½ ,,
1843	10	14	24	91½ ,,
1844	33	15	48	797 ,,
1845	104	16	120	2883 ,,
1846	227	43	270	4790 ,,
	516	286	802	8643½ ,,

By adding the above computation of mileage to those given in P. C., it will be seen that, in round numbers, without any deduction for abandoned schemes, about 11,600 miles of railway have been sanctioned by 516 acts of parliament between 1801 and the close of the session of 1846, of which upwards of 10,000 miles have been designed for working by locomotive engines for passenger and general traffic. Of this latter class about 1100 miles were open down to the close of 1840, while the length opened since that time down to the close of 1846, as reported year by year in the 'Companion to the Almanac,' where accounts of the more important lines are given, is about 1550 miles, making a total of at least 2650 miles in operation, besides many hundred miles in progress and on the eve of completion. Of the vast addition of 4790 miles (without deductions for a few lines to be made for joint use, although the acts give powers for their construction to two distinct companies) sanctioned in 1846, it is probable that several lines may, owing to changes in the financial state of the country, be abandoned for a time; but numerous other schemes, several of them of considerable importance, are announced to be preparing for the session of 1847. Great however as is the number of railway acts passed in the session of 1846, the schemes sanctioned by them form but a small proportion of the projects which were in agitation about the close of 1845. In such a matter it is difficult to arrive at even a tolerably correct estimate; but it was stated in a great tabular statement compiled by Mr. Spackman, and published in the 'Times' newspaper of November 17, 1845, that the capital then invested in completed railways amounted to 70,680,877*l.*; that that already laid out, and yet remaining to be expended, upon lines then under construction, amounted to 67,359,355*l.*; and that the capital which would be required to carry out 620 schemes, of which the estimates were then before the public, would be about 563,203,000*l.*; in addition to which mention is made of 643 projected companies, of which, as they had not yet registered their prospectuses, the proposed capital could not be estimated. These figures sufficiently indicate the extent of the railway mania of 1845. In compiling the following tables of English, Scotch, and Irish railways, we have inserted none but those for which acts have been passed, excepting a very few which have been constructed without parliamentary powers, and, to economise space, we have made no reference to the amount of capital which each company is empowered to raise. Though compiled with the utmost care these tables cannot be presented as absolutely to be depended upon, especially as regards the acts of 1846, because the alterations and curtailments sometimes made in a railway bill after it has passed the Select Committee by whom its details are reported to the House of Commons, and a variety of other contingencies, render it more difficult than could be conceived by any who have not made the attempt, to obtain authentic and correct materials for such a compilation; but from the precautions which have been adopted the compiler believes his statements to present the fullest and most accurate record yet issued of the railways completed, in progress, or sanctioned by act of parliament, in each division of the United Kingdom. Where nothing is said to the contrary, it may be presumed that all lines sanctioned prior to 1846, if not marked as opened, are in progress; and even of those of 1846 several have been already (November, 1846) commenced. As the capital is not mentioned in each particular case, it may be well to state that the aggregate share-capital authorised to be raised under acts of 1844 for the construction of about 797 miles of railway was 11,121,000*l.*, indicating an average estimated cost of somewhat less than 14,000*l.* per mile; in addition to which each company had the usual power to borrow to the amount of one-third of the capital. A similar calculation in reference to the acts of 1845, including some new capital to be raised for completing former undertakings, and also the estimated cost of such new lines as were granted to existing companies without any fresh powers for raising money, shows an aggregate estimate of 43,844,907*l.* for the construction of about 2883 miles of railway, indicating an average of rather over 15,000*l.* per mile; while the like computation for the acts of 1846, including several large sums for the completion or improvement of existing works and the construction of costly stations, but exclusive of money to be raised for the purchase of existing railways, gives a total capital of 91,165,550*l.*, which, for about 4790 miles of railway, amounts to rather over 19,000*l.* per mile. These computations are, like that for 1844, exclusive of the usual power of borrowing one-third in addition to the capital. It will be observed, in reference especially to the new lines of 1846, how many of the recent projects are either promoted by, or are by agreement to be absorbed in or united with, established companies; although in this point we cannot pretend to perfect accuracy, as the connexion of new projects with existing undertakings is not always mentioned in the acts themselves; while in many cases, where it is of a permissive character, circumstances may lead to its being broken off. In some cases also parliament has refused to ratify agreements for amalgamation which had been formally concluded by the companies interested, and such may be the case with some of the agreements here indicated. It was stated in the 'Railway Chronicle' of June 6, 1846, that out of 210 bills of which a classified list is there given, only 61 were for new or independent companies, all the rest being for lines promoted by existing corporations as branches or extensions of, or auxiliaries to, their own lines; and several lines which were granted as independent undertakings have since that time been purchased by established companies.

Railways of England and Wales.

Aberdare.—From the Taff Vale Railway, near Ynys Meyrick, to Aberdare; length, with a branch, 8½ m.; act passed 1845; opened August, 1846.

Ambergate, Nottingham, and Boston and Eastern Junction.—From the Ambergate station of the Midland Railway, through Nottingham, to Spalding and Boston, with branches. Main line to Spalding, exclusive of portions of the Midland and Nottingham and Lincoln lines which are to be used, 59½ m.; Boston extension 19½ m.; Sleaford branch 9 m.; canal branch 1 m.; Boston harbour branch ½ m.; total length 89½ m.; act passed 1846. Sold to the *Great Northern* Railway Company. The act confers powers to purchase the Nottingham and Grantham canals.

Ashburton, Newton, and South Devon.—A broad gauge branch from the South Devon Railway, near Newton Abbott; length 10½ m.; act passed 1846. The *South Devon* Company has an interest in this line.

Ashford and Hastings.—See *Brighton, Lewes, and Hastings; Rye and Ashford Extension.*

Ashton Branches.—See *Manchester and Birmingham,* and *Sheffield, Ashton-under-Lyne, and Manchester.*

Ashton, Stalybridge, and Liverpool Junction.—Sold to the *Manchester and Leeds* Railway Company, from whose line it branches out. Length 6¼ m.; act passed 1844; opened to Ashton in April, and to Stalybridge in September, 1846. An act of 1845 authorises a branch of 1¾ m. to join the Manchester and Birmingham line in Ardwick, Manchester.

Avon and Gloucestershire. [P. C., p. 262.]

Aylesbury [P. C., p. 262].—Sold to the London and Birmingham, now *London and North-Western* Railway Company.

Basingstoke and Salisbury.—See *London and South-Western.*

Bedford and London and Birmingham.—Worked by the *London and North-Western* Railway Company, whose line it joins at Bletchley. Length 16 m.; act passed 1845; opened November, 1846.

Berks and Hants.—A broad gauge line from the Great Western Railway at Reading to Newbury and Hungerford, 25½ m., with a branch of 13½ m. to join the London and South-Western Railway at Basingstoke. Total length 39 m.; act passed 1845; sold to the *Great Western* Railway Company.

Birkenhead, Lancashire, and Cheshire Junction.—From the Chester and Birkenhead Railway at Hooton to the Manchester and Birmingham Railway at Stockport, 38½ m., with branches amounting to 7½ m.; total length 46 m; act passed 1846. The Company has agreed to amalgamate with the *Chester and Birkenhead.*

Birmingham, Bristol, and Thames Junction.—See *West London.*

Birmingham and Derby Junction [P. C., p. 262].—Final opening February, 1842. Merged in the *Midland* Railway.

Birmingham and Gloucester [P. C., p. 262].—Main line, from the London and Birmingham Railway, at Birmingham, to Gloucester, 53 m.; branch to Tewkesbury 2 m; branch to Berkeley Canal at Gloucester 1 m.; completed 1841. Amalgamated with the Bristol and Gloucester Railway, and the united lines leased in perpetuity to the *Midland* Railway Company. An act of 1845 authorised extensions at both ends of the line, and a branch at Stoke Prior, amounting together to 1¾ m.; and in 1846 the

Midland Company obtained an act for a branch from King's Norton to Hales Owen, length $5\frac{1}{2}$ m.

Birmingham, Lichfield, and Manchester.—From the Grand Junction Railway at Aston, near Birmingham, to the Trent Valley Railway at Lichfield; length $14\frac{1}{2}$ m.; act passed 1846. Sold to the *London and North-Western* Railway Company.

Birmingham and Oxford Junction.—Main line from Birmingham to join the Oxford and Rugby and Oxford, Worcester, and Wolverhampton Railways, $32\frac{1}{2}$ m.; Stratford branch, $10\frac{1}{2}$ m.; extension into Birmingham (under a separate act) nearly $1\frac{1}{2}$ m.; total length about 44 m.; acts passed 1846. This undertaking was projected in connexion with the Great Western Railway, to continue the broad gauge from Oxford to Birmingham and the surrounding districts, and thus to compete with the London and Birmingham Railway. Under the Gauge Regulation Act of 1846, however, both this line and the *Birmingham, Wolverhampton, and Dudley*, with which it is intended to amalgamate, must be laid upon the narrow gauge; but as the break of gauge thereby occasioned at Fenny Compton, where the Birmingham and Oxford Junction line joins the Oxford and Rugby, would impair the value of this competing route, it is intended in next session to seek again for power to adopt the broad gauge. The Stratford-on-Avon Canal is to be purchased by the Oxford, Worcester, and Wolverhampton Railway Company, and made over to this company. Both this and the *Birmingham, Wolverhampton, and Dudley* lines are to be sold to the *Great Western* Railway Company.

Birmingham, Wolverhampton, and Dudley.—Main line, from Birmingham to the Oxford, Worcester, and Wolverhampton (broad gauge) line at Wolverhampton, 11 m.; branch to Dudley, $3\frac{1}{2}$ m.; total length, $14\frac{1}{2}$ m.; act passed 1846. See *Birmingham and Oxford Junction.* Part of this line is to be used in common by this and the *South Staffordshire Junction* Railway Companies.

Birmingham, Wolverhampton, and Stour Valley.—From Birmingham to Wolverhampton, and to the Grand Junction Railway, in the parish of Bushbury, by a main line of $15\frac{1}{2}$ m., with a branch of $3\frac{1}{2}$ m. to Dudley; total length $18\frac{1}{2}$ m.; act passed 1846. Promoted by, and under the powers of the act may be sold to, the *London and North-Western* and *Shrewsbury and Birmingham* Railway Companies, and the Birmingham Canal Company.

Bishop's Auckland and Weardale [P. C., p. 262].—Length, $8\frac{1}{2}$ m.; opened November, 1843. See *Wear Valley.*

Bishopstoke and Salisbury.—See *London and South-Western.*

Blackburn, Burnley, Accrington, and Colne.—From the Manchester, Bury, and Rossendale (now East Lancashire) Railway, to Blackburn, Burnley, Accrington, and Colne; length 24 m.; act passed 1844. Amalgamated with the *East Lancashire.*

Blackburn, Clitheroe, and North-Western Junction.—Main line from Blackburn, by Clitheroe, to the North-Western Railway at Long Preston, near Settle, 23 m.; branch to join the Leeds and Bradford Extension Railway, nearly 9 m.; branch to old Banks Lime-works, $\frac{1}{2}$ m.; total $32\frac{1}{2}$ m.; act passed 1846, and gives power to lease the line to, or amalgamate it with, the *Blackburn, Darwen, and Bolton.*

Blackburn, Darwen, and Bolton.—From Blackburn to Bolton; length 14 m. Original act passed 1845, but a second act, obtained in 1846, provides for a shorter junction with other lines at Bolton. See also *Blackburn, Clitheroe, and North-Western Junction.*

Blackburn and Preston.—Original line, for which the act was obtained in 1844, from Blackburn to the North Union Railway at Farrington, about 3 m. south of Preston, $9\frac{1}{2}$ m. This line, after being somewhat modified by a deviation act of 1845, was opened in June, 1846; and a third act was obtained in 1846, for a branch of about $1\frac{3}{4}$ m. to the North Union line at Bamber Bridge, to shorten the approach to Preston, and for two short branches at Blackburn, making altogether about $2\frac{1}{2}$ m. Another act of the same session confirms the amalgamation of the whole undertaking with the *East Lancashire* Railway.

Blaydon, Gateshead, and Hebburn. [P. C., p. 262.]

Bodmin and Wadebridge [P. C., p. 262].—Main line, 12 m.; branch to Bodmin, $1\frac{3}{4}$ m.; branch to Ruthern Bridge, about 1 m. Total, with branches and sidings, about 17 m. The *Cornwall* Railway Company have taken powers to purchase or lease this line.

Bolton and Leigh [P. C., p. 262].—Purchased by the *Liverpool and Manchester* Railway Company.

Bolton and Preston [P. C., p. 262].—Completed 1843. Amalgamated with the *North Union.*

Boston, Stamford, and Birmingham.—From the Syston and Peterborough line of the Midland Railway, near Stamford, to the Wisbech Branch of the Lynn and Ely (or East Anglian) Railway, near Wisbech; length, 22 m.; act passed 1846. Sold to the *Great Northern* Railway Company.

Brandling Junction [P. C., p. 262].—Purchased by the *Newcastle and Darlington Junction* Railway Company.

Brandon and Peterborough Extension.—See *Eastern Counties.*

Bricklayer's Arms Branch and Station.—From the London and Croydon Railway to the Kent Road, London. Length, $1\frac{3}{4}$ m.; act passed 1843; opened May, 1844. This branch and station was made by the *South-Eastern* and *London and Croydon* Railway Companies jointly, as a goods' station, a terminus for West-end traffic, and a means of escaping the high tolls of the London and Greenwich line; but the Croydon Company's share was subsequently sold to the South-Eastern, who, in November, 1846, discontinued the running of passenger-trains to the Bricklayer's Arms terminus, retaining it only for goods and cattle traffic.

Bridgend. [P. C., p. 262.]

Bridgewater Navigation and Railway.—A short line of $\frac{3}{4}$ m. to connect the quays at Bridgewater with the Bristol and Exeter Railway; act passed 1845.

Bridgewater and Taunton Canal, Railway, and Harbour.—The act for this line, passed in 1846, is to enable the Bridgewater and Taunton Canal Company to make a railway from Bridgewater to the Bristol Channel at or near Stolford, about $9\frac{1}{2}$ m., with three short branches, increasing the total length to nearly 11 m.; and to make a harbour at Stolford. This and the *Chard Canal* Railway are intended to form portions of a projected line to connect the Bristol and English Channels.

Bridlington Branches.—See *Hull and Selby*, and *York and North Midland.*

Brighton and Chichester.—An extension of the Shoreham Branch of the London and Brighton Railway, by Worthing, and between Littlehampton and Arundel, to Chichester. Length, $22\frac{3}{4}$ m.; act passed 1844; opened June, 1846. Purchased by the London and Brighton, now *London, Brighton, and South Coast* Railway Company. Acts were obtained in 1846 for branches of $1\frac{1}{4}$ m. to Littlehampton, and $4\frac{1}{2}$ m. to Steyning.

Brighton and Chichester; Portsmouth Extension.—Main line, from Chichester to Portsmouth, 16 m.; branch to the Gosport line of the London and South-Western Company at Fareham, 6 m.; total length, 22 m.; act passed 1845. To be transferred when completed to the *London, Brighton, and South Coast* Company.

Brighton, Lewes, and Hastings.—The original act, passed in 1844, was for a line of $32\frac{1}{2}$ m. from Brighton, by Lewes (superseding the branch included in the original act of the London and Brighton Company) to near Hastings, with a branch of about $\frac{1}{2}$ m. to the river Ouse at Lewes. Under an act of 1845, a branch of 9 m. from Lewes to the London and Brighton Railway at Keymer, to shorten the distance to London, was added; and under that for the line next following in this table the original line was deviated from at the Hastings end. The main line was opened in June, 1846, from Brighton to Bulverhythe, $32\frac{1}{2}$ m. from Brighton and about 2 m. from Hastings, whence an extension to the permanent Hastings and St. Leonard's terminus at Bopeep was opened in November, 1846. An act of 1846 sanctions some deviations in the Keymer branch, and branches to Eastbourne, nearly $4\frac{1}{2}$ m.; to Hailsham, nearly 3 m.; and to Seaford and Newhaven (the Newhaven branch of the London and Brighton Company not having been made) $8\frac{1}{2}$ m.; total, 16 m. Sold in 1845 to the London and Brighton, now the *London, Brighton, and South Coast* Railway Company, by whom the above branches are to be made.

Brighton, Lewes, and Hastings; Rye and Ashford Extension.—Length 29 m.; act obtained in 1845, by the London and Brighton Railway Company, but its powers transferred to the *South-Eastern* Railway Company, who will make the line.

Bristol and Birmingham.—Formed by the amalgamation of the *Bristol and Gloucester* and *Birmingham and Gloucester* lines, which, immediately after the agreement, were leased by the *Midland* Railway Company. Their consolidation with one another and with the Midland is sanctioned by an act of 1846.

Bristol and Exeter [P. C., p. 262].—Completed May, 1844. An act of 1845 sanctions a new branch of $\frac{1}{2}$ m. at Bristol, one of $3\frac{3}{4}$ m. to Clevedon, one of 20 m. to Yeovil, and one of $4\frac{3}{4}$ m. to Tiverton, total 29 m.; and one of 1846 authorises a branch of $8\frac{1}{2}$ m. to Crewkerne. See also *Bridgewater Navigation and Railway; Cornwall* Railway; *Exeter and Crediton* Railway; *Portbury Pier and Railway;* and *South Devon* Railway. Leased to the *Great Western* Railway Company until May, 1849.

Bristol and Gloucester [P. C., p. 262].—An act of 1843 authorised a junction line of about 1000 yards at Bristol. The line was completed, on the 7 feet gauge, in July, 1844. Including the portion of the Cheltenham and Great Western Union line used, between Standish and Gloucester, the length is $37\frac{1}{2}$ m. Amalgamated with the Birmingham and Gloucester, as the *Bristol and Birmingham* Railway, and leased in perpetuity to the *Midland* Railway Company. See *South Devon.*

Bristol and Gloucestershire. [P. C., p. 262.]

Bristol and South Wales Junction and Ferry.—Length, from Bristol to the New Passage, $11\frac{1}{2}$ m.; branch from the tenth mile to the Old Passage or Aust. $2\frac{1}{2}$ m.; from the opposite side of the ferry to the South Wales Railway, including a branch towards Chepstow, nearly 1 m.; total, nearly 15 m. To be laid on the broad gauge. Act passed 1846.

Buckingham and Brackley.—See *Buckinghamshire.*

Buckinghamshire.—This undertaking consists of two distinct lines, sanctioned by separate acts of 1846; one, called the Oxford and Bletchley Junction, from Oxford to the London and Birmingham Railway at Bletchley, length, $29\frac{1}{2}$ m.; and the other, which is only part of a projected line from Tring to Banbury, from the first-mentioned line to Buckingham and Brackley, about $10\frac{1}{2}$ m.; total length, 40 m. The acts confer power to sell or lease the lines to the London and Birmingham, now *London and North-Western* Railway Company.

Bullo Pill.—See *Forest of Dean.*

Burnley Branch.—See *Manchester and Leeds.*

Caermarthenshire. [P. C., p. 262.]

Cambridge and Huntingdon.—See *Eastern Counties.*

Cambridge and Oxford.—See *Royston and Hitchin.*

Cameron's Coalbrook Steam Coal and Swansea and Loughor.—From Maln-y-Manach to Rhydydefydd, in the county of Glamorgan; length, 5 m; act passed 1846. Joins the Oystermouth tramway at Rhydydefydd.

Canterbury, Ramsgate, and Margate Branch.—See *South-Eastern.*

Canterbury and Whitstable [P. C., p. 262].—Purchased by the *South-Eastern* Railway Company, and now worked wholly by locomotives.

Chard Canal.—An act of 1846 authorises the Chard Canal Company to convert into a railroad the portion of their canal between Creech Saint Michael and Ilminster; length, 8¾ m. See *Bridgewater and Taunton Canal, Railway, and Harbour.*

Cheltenham and Great Western Union [P. C., p. 262].—Opened to Cirencester, May, 1841; to Gloucester, May, 1845. The remainder of the line to Cheltenham forms part of the Birmingham and Gloucester Railway. Purchased by the *Great Western* Railway Company.

Chester and Birkenhead [P. C., p. 262].—An act of 1845 authorises an extension of 7 furlongs at Birkenhead. See *Birkenhead, Lancashire, and Cheshire Junction.*

Chester and Crewe. [P. C., p. 262.]

Chester and Holyhead.—Length, about 84¾ m. The original act, passed in 1844, deferred the portion near the Menai Strait, which it was then proposed to cross by the existing suspension-bridge. A second act, obtained in 1845, supplies the deficiency, providing for a new bridge, which is to be made in the form of a wrought-iron tube or hollow beam, of about 460 feet span, so elevated that ships may sail under it. See *North Wales;* and *Shropshire Union.*

Chester and Wolverhampton.—See *Shropshire Union.*

Churnet Valley.—See *North Staffordshire.*

Clarence. [P. C., p. 262.]

Clay-Cross and Newark.—See *Midland.*

Cockermouth and Workington.—Length, 8¾ m.; act passed 1845.

Cockermouth and Workington Extension.—From Cockermonth to Keswick; length, nearly 14½ m.; act passed 1846.

Colchester, Stour Valley, Sudbury, and Halstead.—From the Eastern Counties Railway at Marks Tey, near Colchester, to Sudbury, nearly 12 m.; line to Halstead, 5¾ m.; branch from the Eastern Union Railway to the Hythe, at Colchester, and short junctions, 1½ m.; total, 19½ m.; act passed 1846. The company has bought most of the shares in the Stour Navigation; and the whole undertaking is to be leased to the *Eastern Union* and *Ipswich and Bury St. Edmund's* Railway Companies.

Coleorton. [P. C., p. 262.]

Commercial.—See *London and Blackwall.*

Cornwall.—Main line, from Falmouth to Eldad, near Plymouth, 63½ m.; branch to Padstow, 15¾ m.; branches to the Liskeard and Caradon Railway, and to the quays at Truro and Penryn, about 1¾ m.; total length, about 71 m. Promoted by the Great Western, Bristol and Exeter, and South Devon Railway Companies, and to be laid on the broad gauge. The act, passed in 1846, authorises the purchase or leasing, if desired, of the *Bodmin and Wadebridge* and *Liskeard and Caradon* Railways, and the Liskeard and Looe Canal.

Coventry, Nuneaton, Birmingham, and Leicester.—From the Trent Valley Railway near Nuneaton to the Midland Railway at Wigston Magna, Leicestershire; length, 15 m.; act passed 1846. The continuation from Nuneaton to Coventry, struck out of this bill, is provided for by a line granted in 1846 to the London and Birmingham, now *London and North-Western* Railway Company, who have purchased this undertaking.

Cromford and High Peak. [P. C., p. 262.]

Croydon and Epsom.—Length 8 m.; act passed 1844; sold to the *London and Croydon* Railway Company. Projected as an atmospheric railway, but is to be worked for the present by locomotives. See *Direct London and Portsmouth.*

Croydon, Merstham, and Godstone. [P. C., p. 262.]

Delabole and Rock.—From Mellorn, in the parish of Minster, to Black Rock, in the parish of St. Michael, St. Minver Lowlands, Cornwall; length, 16¾ m.; act passed 1844. To be worked by horses, though some passenger-traffic is expected.

Deptford Pier Junction [P. C., p. 262].—Abandoned.

Devonport, Bristol, and Dover Junction.—See *Reading, Guildford, and Reigate.*

Direct London and Portsmouth.—From the Croydon and Epsom Railway at Epsom to Portsmouth; length 60½ m.; act passed 1846. This line was projected by the London and Croydon Railway Company, as an atmospheric railway; but it now (November, 1846) appears probable that locomotive power may be adopted. The line is to be sold to the *London, Brighton, and South Coast* and *London and South-Western* Railway Companies jointly. See *Reading, Guildford, and Reigate.*

Duffryn-Llynvi and Porth Cawl [P. C., p. 262].—Amalgamated in 1846 with the *Llynvi Valley* Railway; and may probably be converted into a locomotive line.

Dunstable and London and Birmingham.—From the London and Birmingham line near Leighton Buzzard; length, 7 m.; act passed 1845. To be leased or sold to the *London and North Western* Railway Company.

Durham Junction [P. C., p. 263].—Length, from the Seaham Railway to the Stanhope and Tyne Railway (both of which were made without acts of parliament), nearly 5 m. Purchased by the *Newcastle and Darlington Junction* Railway Company.

Durham and Sunderland [P. C., p. 263].—Purchased by the *Newcastle and Darlington Junction* Railway Company, and to be adapted to locomotive engines.

East and West India Docks and Birmingham Junction.—From the East and West India Docks to the London and Birmingham railway at Camden Town; length, 8 m.; act passed 1846. Promoted by the *London and Birmingham* Railway Company.

East and West Yorkshire Junction.—From Knaresborough to the Great North of England Railway about 1½ m. from York; length, barely 15½ m.; act passed 1846.

East Anglian.—Under this title it is proposed to amalgamate the *Lynn and Ely, Lynn and Dereham,* and *Ely and Huntingdon* Railways, and to lease them to the *Eastern Counties* Railway Company.

East Lancashire (originally *Manchester, Bury, and Rossendale*).—From the Manchester and Bolton Railway at Clifton Hall, about 4 m. from Manchester, by Bury, to Rawstenstall; length 14 m.; original act passed 1844; amendment act, in which the name was altered, 1845; opened September, 1846. Amalgamations have been arranged with the *Blackburn, Burnley, Accrington, and Colne,* the *Blackburn and Preston,* and the *Liverpool, Ormskirk, and Preston* lines. An act of 1846 authorises the Bacup branch, of 4½ m., and the Crawshaw Booth branches, of 1½ m; and deviations to the extent of 8½ m. on the extension line.

East Lincolnshire.—From Great Grimsby, by Louth and Alford, to Boston; length 48 m.; act passed 1846. Sold to the *Great Northern* Railway Company.

Eastern Counties [P. C., p. 263].—Opened from London to Colchester, 51½ m, in March, 1843, and the remainder of the original parliamentary line abandoned; the *Eastern Union; Ipswich, Bury, and Norwich;* and *Yarmouth and Norwich* lines taking its place. In 1843 the Eastern Counties Company made terms of amalgamation with the *Northern and Eastern* Company, and became possessors of their finished line of about 29 miles from the Eastern Counties line at Stratford to Bishop's Stortford, with its Hertford and Ware branch, and of the unfinished extension of about 10 m. from Bishop's Stortford to Newport. In 1844 the Eastern Counties Company obtained an act for extending this northern line by Cambridge to Ely, and thence eastward to Brandon, and westward to Peterborough, making altogether 72 m. of new line, of which the portion from Bishop's Stortford to Cambridge, Ely, and Brandon, was completed in July, 1845. The course of the Ely and Peterborough line was altered for a length of 23¾ m. under an act of 1845, in order to pass through March. It is (November, 1846) nearly completed. Another act of the same session authorised a line of 17½ m. from Cambridge to Huntingdon. In 1846 the Eastern Counties Company obtained acts for enlarging their London and Stratford stations; making a line from Ilford to Epping, 10½ m. long; and two branches, amounting together to little more than ½ m., from the *Eastern Counties and Thames Junction* line, which, as well as the *North Woolwich,* they have purchased. See also *East Anglian; Enfield and Edmonton; London and Blackwall Extension; Maldon, Witham, and Braintree; Midland; Newmarket and Chesterford;* and *Wisbech, St. Ives, and Cambridge Junction.* The gauge of the Colchester and Northern and Eastern lines was altered in 1844 to 4 f. 8½ in.

Eastern Counties and Thames Junction.—From Stratford to the mouth of the river Lea; length, 2½ m.; act passed 1844; opened April, 1846. Sold to the *Eastern Counties,* which see. See also *North Woolwich.*

Eastern Union.—From Colchester to Ipswich; length, 17 m.; act passed 1844; opened June, 1846. For 2½ m. from Colchester the line was made by the Eastern Counties Company, the land being theirs; but this portion has been sold to the Eastern Union Company. See *Colchester, Stour Valley, Sudbury, and Halstead Eastern Union and Hadleigh Junction;* and *Ipswich and Bury St. Edmunds.*

Eastern Union and Hadleigh Junction.—Length, with two junctions with the Eastern Union line, 6½ m.; act passed 1846. Sold to the *Eastern Union* Railway Company.

Ely and Huntingdon.—Length, under the original act of 1845, 22 m.; but subsequently shortened by an arrangement for using the Eastern Counties line about 1 m. from Ely. See *East Anglian.*

Enfield and Edmonton.—From the Northern and Eastern Railway at Edmonton; length, 3 m.; act passed 1846. Power given to sell the line to the *Eastern Counties* Company.

Epping.—See *London and Blackwall Extension;* and *Eastern Counties.*

Erewash Valley.—From the Midland Railway at Sawley to the Mansfield and Pinxton Railway; length, 13¾ m.; act passed 1845; sold to the Midland Railway Company. For extension and branches see *Midland.*

Exeter and Crediton.—Length 5¾ m.; act passed 1845. Leased to the *Bristol and Exeter*. To open December, 1846. An act for a similar line was passed in 1832, but not carried into effect.

Exeter and Exmouth.—Length, with a very short branch at Topsham, 10½ m.; act passed 1846.

Festiniog. [P. C., p. 263.]

Fleetwood, Preston, and West Riding Junction.—From Preston to Clitheroe; length, nearly 16 m.; act passed 1846. See *Preston and Longridge.*

Forest of Dean (formerly *Bullo Pill*). [P. C., p. 263.]

Furness.—Original line, under an act of 1844, intended to connect iron-mines near Dalton Lindale, and slate-quarries at Kirkby-Ireleth, with the coast at Barrow and Rampside; length, 15½ m. Opened in June, 1846, and passenger-traffic worked in connexion with steamers from Piel harbour to Fleetwood. An act of 1846 authorises an extension of 3½ m. from Sandside to Broughton, one of 4 m. from Dalton to Ulverstone, and branches to the Whitriggs and Butts iron-mines, making a total of 9 m.

Gloucester and Cheltenham. [P. C., p. 263.]

Gloucester and Dean Forest.—From Gloucester to the Monmouth and Hereford Railway, and to the South Wales Railway at Awre; main line, 15¼ m.; branches, 2½ m.; act passed 1846. To be laid on the broad gauge, and leased or sold to the *Great Western* Railway Company.

Gosport Branch [P. C., p. 263].—Opened February, 1842.

Grand Junction [P. C., p. 263].—Besides the amalgamations mentioned in P. C. the Grand Junction Company has since, by various arrangements, become possessed of the *Liverpool and Manchester* and (jointly with the Manchester and Leeds Railway Company) the *North Union* lines, with their several branches and connexions; and by an act of 1846 the Grand Junction itself, with these additions, has been amalgamated with the *London and Birmingham* and *Manchester and Birmingham*, with their associated lines, under the new title of the *London and North-Western* Railway. Other acts of the same session authorise the Huyton and Warrington branch, of 12 m.; the Huyton and Aston branch, of 12 m., with a subsidiary branch of 1 m. to Runcorn; the Huyton, Preston, and St. Helen's branch, of 5½ m.; the Warrington and Kenyon branch, of nearly 5 m.; the Warrington and Parkside branch, of 4½ m.; and the Edgehill and Huyton branch, of 4½ m.; making a total of about 44½ m.

Gravesend and Rochester.—Made in anticipation of an act of parliament, by the Thames and Medway Canal Company, alongside of the canal, and opened in February, 1845. An act was obtained in 1845. Length, 6½ m. Sold to the *South-Eastern* Railway Company, who will close the canal and double the line.

Great Grimsby and Sheffield Junction.—From near Gainsborough to Great Grimsby, with branches to New Holland and Market Rasen; total length 59½ m. These lines were included in the original act of 1845; others, passed in 1846, sanction deviations to the extent of 4½ m.; the establishment of a steam-ferry across the Humber; an extension from Bole to Newark-upon-Trent, 20½ m.; an extension of 16 m. from the Market Rasen branch to Lincoln; a branch of nearly 4 m. to Barton-upon-Humber; and a branch of 2¾ m. to Caistor; making about 43½ m. of new lines. Under another act this, the Sheffield, Ashton-under-Lyne, and Manchester, and other companies, are united as the *Manchester, Sheffield, and Lincolnshire* Railway Company.

Great North of England [P. C., p. 263].—Opened from York to Darlington, 44¾ m. March, 1841; and the remainder of the parliamentary line abandoned, the *Newcastle and Darlington Junction* being substituted for it. The completed line has been sold to the Newcastle and Darlington Junction Company, the name of which, under an act of 1846, which sanctions the purchase, is changed to the *York and Newcastle* Railway Company. Under an act of 1845, a branch of 9¾ m. has been formed from a few miles south of Darlington to Richmond, which was opened in September, 1846; and under acts of 1846 the York and Newcastle Railway Company have power to make branches to Bedale, 7 m.; to Boroughbridge, 5¾ m.; and from Thirsk to Malton, 20½ m., with subsidiary branches of 5 m. to Helmsley, ¾ m. to New Malton, and 2¾ m. to Sessay.

Great North of England, Clarence, and Hartlepool Junction [P. C. p. 263].—Acts of 1843 and 1845 authorised new branches of ½ m. and ½ m. respectively. The whole undertaking has been sold to the *Hartlepool* Dock and Railway Company, and has merged with it in the *York and Newcastle*. Opened October, 1846, in connexion with a re-opening of the Hartlepool line as a branch of the York and Newcastle.

Great North of England and Richmond—See *Great North of England.*

Great Northern (originally *London and York*).—Main line from King's Cross, London, by Hitchin, Biggleswade, Huntingdon, Peterborough, Grantham, Newark, East Retford, Bawtry, Doncaster, and Selby, to the Great North of England Railway at or near the York station, nearly 186 m.; loop or diverging line from near Peterborough, by Spalding, Boston, Lincoln, and Gainsborough, rejoining the main line at Bawtry, 86 m.; branch to Bedford, nearly 8 m.; minor branches and junctions, about 5½ m.; total length, 285½ m. The *Stamford and Spalding* line, though the subject of a separate act, is a branch of the Great Northern, and several others are projected. The company also proposes to deviate in some places from the parliamentary line, including an extension at the London end to a point between the Gray's Inn and Bagnigge Wells roads, north of the Middlesex House of Correction. The proprietary is formed by amalgamating with the London and York the rival direct Northern Company. See *Ambergate, Nottingham, and Boston and Eastern Junction; Boston, Stamford and Birmingham; East Lincolnshire; Royston and Hitchin;* and *Sheffield and Lincolnshire Extension.*

Great Western [P. C., p. 263].—Completed June, 1841. The company have purchased the *Berks and Hunts*, the *Cheltenham and Great Western*, the *Monmouth and Hereford*, and the *Oxford and Rugby* lines; lease the *Bristol and Exeter;* and possess the *Oxford Branch*, which see. See also, for further connexions, *Birmingham and Oxford Junction; Birmingham, Wolverhampton, and Dudley; Bristol and South Wales Junction; Cornwall; Gloucester and Dean Forest; Great Western and Uxbridge; Great Western and Wycombe; Oxford, Worcester, and Wolverhampton; Portbury; South Devon; South Wales; West Cornwall; West London;* and *Wilts, Somerset, and Weymouth.*

Great Western and Uxbridge.—Joins the Great Western line at West Drayton; length rather over 2½ m.; act passed 1846. To be sold to the *Great Western* Railway Company

Great Western and Wycombe.—From the Great Western line at Maidenhead to High Wycombe; length over. 9½ m.; act passed 1846. To be sold to the *Great Western* Railway Company.

Greenwich and Gravesend—See *South-Eastern.*

Grosmont. [P. C., p. 263.]

Guildford Extension, Portsmouth, and Fareham.—Projected as the Guildford, Chichester, Portsmouth, and Fareham Railway; but the greater part of the line being superseded by the *Direct London and Portsmouth*, the act, passed in 1846, sanctions only a line of about 4 m. from Guildford to the Direct London and Portsmouth at Fareham, and one of about 8 m. to connect Fareham with Portsmouth. The power to make these has been sold to the *London and South-Western* Railway Company.

Guildford Junction.—From Woking, on the London and South-Western Railway; length 6 m.; act passed 1844; opened May, 1845. Sold to the *London and South-Western* Railway Company. See *Guildford Extension, Portsmouth, and Fareham.*

Harecastle and Sandbach.—See *North Staffordshire.*

Hartlepool [P. C, p. 263].—Sold, together with the Hartlepool Dock, and the *Great North of England, Clarence, and Hartlepool Junction* line (which see), to the Newcastle and Darlington Junction, now *York and Newcastle* Railway Company.

Hay. [P. C., p. 263.]

Hayle [P. C., p. 263].—Adapted to passenger-traffic in 1843. See *West Cornwall.*

Heckbridge and Wentbridge. [P. C., p. 263.]

Hereford. [P. C., p. 263.]

Hertford and Ware Branch.—See *Northern and Eastern.*

Huddersfield and Manchester Railway and Canal.—A railway from the Sheffield, Ashton-under-Lyne, and Manchester line at Stalybridge to the Manchester and Leeds line at Kirkheaton, 21½ m., with a branch of 1½ m. to Delph; act passed 1845. The Company to purchase the Huddersfield and Sir John Ramsden's canals. Acts of 1846 authorise a deviation at Huddersfield; a branch of 1½ m. from Cooper Bridge; and a branch of 4½ m. to Oldham. The undertaking is to be leased or sold to the *London and North-Western* Railway Company.

Huddersfield and Sheffield Junction.—From Huddersfield to the Sheffield, Ashton-under-Lyne, and Manchester Railway at Penistone, 13½ m., with branch to Holmfirth, 2 m.; act passed 1845. An act of 1846 sanctions the amalgamation of this company with the *Manchester and Leeds.*

Hull and Selby [P. C., p. 263].—An act of 1845 sanctioned a branch of 31 m. from Hull to Bridlington, the greater part of which was opened in October, 1846; another of 1846 authorises the lessing or sale of the whole undertaking to the *York and North Midland* and *Manchester and Leeds* Railway Companies.

Ipswich and Bury St. Edmunds.—An extension of the Eastern Union line; length, 26¾ m.; act passed 1845. A second act of 1846 allows an extension of 31 m. to Norwich, with a branch of 1 m., and changes the name to the *Ipswich, Bury, and Norwich.* The original line is (November, 1846) nearly completed; and the company proposes to amalgamate with the *Eastern Union.*

Ipswich, Bury, and Norwich.—See *Ipswich and Bury St. Edmunds.*

Kendal and Windermere.—Length 10½ m.; act passed 1845.

Kenyon and Leigh [P. C., p. 263].—Merged, with the adjacent lines, in the *London and North-Western.*

Kington. [P. C., p. 263.]

Lancashire and North Yorkshire.—See *Liverpool, Manchester and Newcastle-upon-Tyne Junction.*

Lancashire and Yorkshire North-Eastern.—See *Wharfedale.*

Lancaster and Carlisle.—Length 69¾ m.; act passed 1844. An act of 1845 authorises a deviation and branch, amounting to 4½ m.; and one of 1846, an extension of ½ m. to a joint station at Carlisle. A proposed amalgamation with the Lancaster and Preston Junction has been broken off. Opened November, 1846. See *Scottish Central.*

Lancaster and Preston Junction. [P. C., p. 263.]

Launceston and Victoria [P. C., p. 263].—Abandoned.

Leeds and Bradford.—Original line, under an act of 1844, from Leeds, along the valley of the Aire, and by Shipley, to Bradford, 13½ m., with a branch of 1¼ m. to the North Midland Railway at Leeds; opened July, 1846. An act of 1845 authorises an extension from Shipley to Colne, with a branch to Haworth, together 30½ m.; and acts of 1846 provide for an alteration of that extension, and a line of 1 m. to join the West Riding Union Railway, at Bradford. After agreeing to amalgamate with the *Manchester and Leeds*, an arrangement was made in 1846, to supersede it by a perpetual lease of the whole undertaking to the *Midland* Railway Company.

Leeds, Dewsbury, and Manchester Junction.—From the Leeds and Bradford line, near Leeds, to the Manchester and Leeds Railway at Kirkheaton, and thence to Huddersfield, being a main line of 16m. with branches amounting to 4 m. The line from Kirkheaton to Huddersfield, however, is only to be made if the *Huddersfield and Manchester* Company fail to complete theirs. Act passed 1845. A second act of 1846 provides for deviations at Dewsbury and Leeds; the Holden Clough branch of 2 m.; and the Birstall branch, nearly 3 m. To be leased to the *London and North-Western* Railway Company.

Leeds and Selby [P. C., p. 263].—Purchased by the *York and North Midland*.

Leeds and Thirsk.—Main line 39½ m.; branches to Knaresborough and Harrogate, and to the Leeds and Bradford and Great North of England Railways, amounting together to 6½ m. These are under the original act of 1845; others, passed in 1846, provide for the extension of the Knaresborough branch, for ½ m. across the river Nidd; for a line (the only part sanctioned of a proposed line from the Leeds and Thirsk Railway at Wath to Hartlepool) from the Great North of England Railway at Northallerton, to the Stockton and Hartlepool Railway at Billingham, near Stockton, nearly 20¼ m., with short branches, amounting to about 1½ m. to the Stockton and Darlington Railway, to the Yarm branch of the same, and to the Clarence Railway; and for a deviation or new branch of over 2 m. between the Leeds and Thirsk line, near Horseforth Woodhouse, and the Leeds and Bradford line near Calverley Bridge. This last-mentioned line is called the St. Helen's branch. See also *Wharfedale*.

Leicester and Swannington [P. C., p. 263].—Acts of 1846 confirm the purchase of this line by the *Midland* Railway Company, and confer on the purchasers power to alter 1½ m. of the line, and to make new branches to Leicester, 2¾ m.; to Burton-upon-Trent, 14 m.; and to Swadlincote colliery, nearly 2½ m.

Liskeard and Caradon.—Length, main line, 6½ m.; branch to the Cheesewring, 2½ m.; act passed 1843; partly opened 1844. For mineral traffic. Worked by gravity and horse-power. See *Cornwall*.

Liverpool and Bury.—Original line, under an act of 1845, from Liverpool to Wigan, Bolton, and Bury, 34 m. Acts of 1846 authorise an extension of ½ m. to Tythe Barn Street, Liverpool; a branch of nearly 1 m. from the New Springs branch to the North Union Railway at Whalley; a branch of over ½ m. to Westhoughton; and an amalgamation with the *Manchester and Leeds*.

Liverpool and Manchester [P. C., p. 263].—The junction line referred to in note (*c*) of the above page was completed in May, 1844. An act of 1845 authorises a new entrance into Liverpool, and a branch to join the Manchester, Bury, and Rossendale line at Clifton, making together 7¾ m. of new line. Another act of the same session ratified the amalgamation of the Liverpool and Manchester, with its connexions, the Bolton and Leigh and Kenyon and Leigh, with the *Grand Junction*, with which it is now merged in the *London and North-Western*.

Liverpool, Manchester, and Newcastle-upon-Tyne Junction.—Main line, from the Leeds and Bradford Railway at Elslack, to the Richmond branch of the Great North of England Railway at Scorton, 47½ m.; branch to Hawes, over 9 m.; act passed 1846. This undertaking comprises the main line of the *Lancashire and North Yorkshire* Railway, and, in the Hawes branch, a portion of that projected by the Liverpool, Manchester, and Newcastle-upon-Tyne Junction Company, the two schemes having been consolidated while before parliament. The Hawes branch, being identical with part of the *Yorkshire and Glasgow Union* projected line, is not to be made if that line be, as intended, constructed by the *Northern Counties Union* Railway Company, which see. The capital is partly subscribed by the *Manchester and Leeds* Railway Company.

Liverpool, Ormskirk, and Preston.—Main line, from the Liverpool and Bury Railway at Walton-on-the-Hill to the North Union Railway at Penwortham, 22½ m.; branch to the Blackburn and Preston Railway, nearly 2½ m.; branch to Blague-Gate Collieries, 3 m.; branch to near the junction of Walter Street and Regent Road, Liverpool, nearly 1 m.; total 29 m. Amalgamated with the *East Lancashire* Railway.

Llanelly [P. C., p. 264].—The total length of this line and its branches, according to evidence before the Gauge Commissioners (Q. 6044), is 45 m.

Llanvihangel [P. C., p. 264].—See *Newport, Abergavenny, and Hereford*.

Llynvi Valley.—From Llangynwyd to Margam; length 15 m.; act passed 1846. As it joins the South Wales Railway, this line is to be laid on the broad gauge. The company has amalgamated with the *Duffryn-Llynvi and Porth-Cawl* Rlaiway Company.

London and Birmingham [P. C., p. 264].—Under an act of 1843 this company has made a branch of 47½ m. from Blisworth, by Northampton, to Peterborough, which was opened in June, 1845. It has also purchased the *Aylesbury*, the (unfinished) *Trent Valley*, and the *Warwick and Leamington Union* Railways; and under an act of 1846, has amalgamated with the *Grand Junction* and *Manchester and Birmingham* Railway Companies, incorporating the numerous lines and connexions of the three companies under the comprehensive title of the *London and North-Western* Railway, which see. Other acts of 1846 confirm certain arrangements with the Birmingham Canal Company, and confer powers for making an extension of nearly 1 m. at Birmingham, to near Navigation Street; a branch of 10½ m. from the London and Birmingham line near Coventry, to the Trent Valley Railway at Nuneaton; an extension of ¾ m. at Leamington; and a line of nearly 6 m. from their main line at Weedon to the Northampton and Peterborough line at Northampton; and to enlarge their stations at London, Rugby, and Coventry. For other connexions and arrangements (enumerated here, rather than under the title of London and North-Western, because they have for the most part been made by the London and Birmingham Railway Company as such) see *Bedford and London and Birmingham*; *Birmingham, Lichfield, and Manchester*; *Birmingham, Wolverhampton, and Stour Valley*; *Buckinghamshire*; *Coventry, Nuneaton, Birmingham, and Leicester*; *Dunstable and London and Birmingham*; *East and West India Docks and Birmingham Junction*; *Rugby and Leamington*; *Rugby and Stamford*; *Shrewsbury and Birmingham*; *Shrewsbury and Hereford*; *Shropshire Union*; *South Staffordshire*; and *West London*.

London and Blackwall (formerly *Commercial*) [P. C., p. 264].—Extension line of ½ m. to near Fenchurch Street opened in August, 1841. An act of 1846 gives power to widen the line from Stepney to Fenchurch Street, to accommodate the traffic expected from the *Eastern Counties* Railway by the *London and Blackwall Extension* line (which see), which has been purchased by the London and Blackwall Company. The *East and West India Docks and Birmingham Junction* line will join the London and Blackwall near the West India Dock station.

London and Blackwall Extension.—Projected as the *Epping* Railway, but by agreement with the Eastern Counties Company, who have since obtained an act for a line to Epping, limited to a junction line of 1¾ m. between the London and Blackwall Railway at Stepney and the Eastern Counties Railway at Bow. Act passed 1845, since which the line has been sold to the *London and Blackwall* Railway Company, which see.

London and Brighton [P. C., p. 264].—The main line, of 41½ m., from near Croydon to Brighton, was completed in September, 1841; the Shoreham branch, of 5½ m., in May, 1840. The other branches mentioned in P. C. were abandoned, but are replaced by branches granted in 1846 in connexion with the Brighton, Lewes, and Hastings line. The 12 m. between the Croydon Railway and Reigate or Redhill, is worked over by the Brighton and South-Eastern Companies jointly, one-half of its cost having been repaid by the South-Eastern Company, who possess and maintain the southern half of that portion of the line. The London and Brighton Railway Company have purchased the *Brighton and Chichester* Railway, with its *Portsmouth Extension*, and the *Brighton, Lewes, and Hastings* Railway, which see for new branches authorised in connexion with them. In 1845 they obtained an act for a branch of 8½ m. from their main line to Horsham; and in 1846 they obtained others for a branch of 6¾ m. from the main line to East Grinstead, and a branch or extension of 6½ m., partly following the course of the abandoned *Surrey Iron Railway*, from Croydon to the London and South-Western Railway at Wandsworth, and for confirming an amalgamation with the *London and Croydon* under the name of the *London, Brighton, and South Coast* Railway Company, which see.

London, Brighton, and South Coast.—This is the new name of the *London and Brighton* Railway Company, with its branches to Hastings, Chichester, and Portsmouth, as above mentioned, conferred by the act which amalgamates it with the *London and Croydon*. See also *Direct London and Portsmouth*.

London and Croydon [P. C., p. 264].—The Company have purchased the *Croydon and Epsom* Railway (which see), and are (1846) laying down in connexion with it an atmospheric line alongside of their original works, under the authority of an act of 1845. Acts of 1846 authorise the construction of a branch of nearly 1 m. to Deptford, called the Thames Junction branch, and the amalgamation of the Company with the *London and Brighton*, under the name of the *London, Brighton, and South Coast*. See also *Direct London and Portsmouth*.

London Grand Junction [P. C., p. 264].—Abandoned.

London and Greenwich [P. C., p. 264].—The line was widened from London to the Croydon junction, by the London and Greenwich Company, the new portion being brought into use in May, 1842. Since that time a lease for 999 years has been granted to the *South-Eastern* Railway Company, who obtained powers in 1845 for a further widening, and in 1846 for a line from the

Greenwich Railway to Gravesend. The London Bridge station was formed at the expense of the London and Brighton, London and Croydon, and South-Eastern Railway Companies.

London and North-Western.—Under this new title, by an act of 1846, the *London and Birmingham, Grand Junction,* and *Manchester and Birmiugham* Railway Companies, with their respective connections, are amalgamated. The aggregate share-capital of the united company, according to the amalgamation act, is 17,242,310*l.*; and the amount of loans, 5,747,000*l.*; making a grand total of 22,989,310*l.*; which, however, will be greatly extended when the capital for the various new lines granted in 1846 to the amalgamating companies shall be raised, and when the numerous additional purchases and amalgamations proposed shall be carried into effect. Besides the lines referred to as connections of the several companies now nnited under this title, the London and North-Western Company possess shares, or bave some other interest in the *Chester and Holyhead, Lancaster and Carlisle,* and *Caledonian* Railways; and in October, 1846, an arrangement was concluded for leasing the *Scottish Central* Railway jointly to the London and North-Western, Lancaster and Carlisle, and Caledonian Companies. See also *Huddersfield and Manchester;* and *Leeds, Dewsbury, and Manchester.*

London and Portsmouth.—See *Direct London and Portsmouth.*

London and South-Western (formerly *London and Southampton*) [P. C., p. 264].—Acts of 1844 anthorise a branch of 21½ m. from Bishopstoke to Salisbnry, which is (November, 1846) nearly completed, and a short extension from the Nine Elms station, which has not been carried into effect. An act of 1845 anthorises an extension of about 2 m. from Nine Elms to a point near Waterloo and Hungerford bridges; and acts of 1846 sanction a further extension of nearly 1¾ m. to the Thames near London Bridge; a branch of nearly 32½ m. from Basingstoke, by Whitchnrch and Andover, to the Wilts, Somerset, and Weymouth Railway at Salisbnry, with a subsidiary branch of 1½ m. to join the Bishopstoke and Salisbnry branch; a branch of 6¼ m. from the Weybridge station to Chertsey and Egham; a branch of 19 m. from the Guildford Junction line, near Guildford, to Fareham and Alton; and a branch of 1¾ m. to Hampton Court bridge. The *Gosport Branch,* opened in February, 1842, is incorporated witb this undertaking. See also *Direct London and Portsmouth; Guildford Junction; Guildford Extension, Fareham, and Portsmouth; Richmond;* and *Southampton and Dorchester.*

London and York.—See *Great Northern.*

Lowestoft Railway and Harbour.—From Lowestoft to the Yarmonth and Norwicb Railway at Reedham; length 11¼ m.; act passed 1845. Under an act of 1846 this line is to be leased or sold to the *Norfolk* Railway Company.

Lydney and Lidbrook.—See *Severn and Wye.*

Lynn and Dercham.—Lengtb 26½ m.; act passed 1845; part opened October, 1846. Agreed to amalgamate with the *Lynn and Ely* and *Ely and Huntingdon* lines, under the name of the *East Anglian* Railway, wbicb see.

Lynn and Ely.—Main line, from the Lynn and Dereham Railway at Lynn, to the Eastern Counties Railway at Ely, 26½ m.; branch to Wisbecb 10 m.; branch to the harbour of King's Lynn, nearly 1 m.; act passed 1845; part opened October, 1846. Agreed to amalgamate with the *Lynn and Dereham* and *Ely and Huntingdon* lines, as the *East Anglian* Railway, wbich see.

Macclesfield Branch.—See *Manchester and Birmingham.*

Maidstone Branch.—See *South-Eastern.*

Maldon, Witham, and Braintree.—Length, 12 m.; act passed 1846; sold to the *Eastern Counties* Railway Company.

Malton and Driffield Junction.—From tbe Scarborongh branch of the York and North Midland Railway at Norton, near Malton, to the Bridlington brancb of the Hull and Selby Railway at Great Driffield, nearly 19 m.; brancb from Great Driffield to Frodingbam Bridge, 5 m.; total 24 m. Act passed 1846. Will probably be leased or sold to the *York and North Midland.*

Manchester and Birmingham [P. C. p. 264].—By the abandonment of the Parliamentary main line through the Potteries, the original undertaking was reduced to a line of 30½ m., from, Mancbester to the Grand Jnnction Railway at Crewe, which was completed in Angust, 1842, and the Macclesfield branch. The powers for making the latter were snffered to expire; but a new act was obtained in 1844, for an improved line of nearly 11 m. from near Cheadle-Hulme, abont 3 m. sonth of Stockport, to Macclesfield; and also for a short brancb from it to Poynton collieries. The Macclesfield branch was opened iu November, 1845. An act of 1845 authorises a line of 5 m., called the Ashton branch, to connect the main line with the Sheffield, Ashton-under-Lyne, and Mancbester Railway, near Guide Bridge; and an act of 1846 sanctions a branch of 2 m. from the Macclesfield branch to Bollington. The Mancbester and Birmingham Railway Company possessed some interest in the *Manchester, Buxton, Mutlock, and Midlands Junction,* and the *Manchester South Junction and Altrincham* Railways; and, by virtue of an arrangement with the Loudon and Birmingbam Company, it is, with its connexions, merged in the *London and North-Western* Railway Company.

Manchester and Bolton [P. C., p. 264].—The *Manchester, Bolton, and Bury Canal Navigation and Railway* Company, by whom this line was made, is amalgamated, under an act of 1846, with the *Manchester and Leeds* Railway Company. Part of the line is used by the *East Lancashire* Railway Company.

Manchester, Bury, and Rossendale.—See *East Lancashire.*

Manchester, Buxton, Matlock, and Midlands Junction.—Main line, from the Manchester and Birmingbam Railway, at Cheadle, to the North Midland line near Ambergate, 42½ m.; Norbury Collieries branch, 1¼ m.; Chapel-en-le-Frith branch, nearly 1¼ m.; total 45½ m. The Company intend to purchase the Cromford Canal, and to divert part of their line for a better route through Chatsworth Park. The *Manchester and Birmingham* and *Sheffield, Ashton-under-Lyne, and Manchester* Railway Companies have an interest in this undertaking.

Manchester and Leeds [P. C., p. 264].—Main line completed in March, 1841; Heywood branch of 1½ m. (made without parliamentary powers, bnt sanctioned by an act of 1844), opened April, 1841; Oldham branch, 3 m., opened March, 1842; Manchester Extension, to join, at the Victoria station, an extension from the Liverpool and Manchester line, about 1 m., opened January, 1844; Halifax branch 1½ m., opened July, 1844. An act of 1845 sanctions a branch of between 8 and 9 m. from Todmorden to Bnrnley; the extension of the Heywood branch for 4 m., to Bury; and the extension of the Oldham branch for 1 m., to Mumps. Acts of 1846 anthorise new branches to the extent of abont 14¾ m., these being the Bacup branch, 8¼ m.; Middleton branch, nearly 1½ m.; Thornhill branch, nearly 3 m., with a snbsidiary branch of ½ m. from it to Whitley; and the Crigglestone branch, 1¾ m.; and also the amalgamation with the Manchester and Leeds of the *Liverpool and Bury* Railway, the *Manchester, Bolton, and Bury Canal Navigation and Railway,* and the *Preston and Wyre Railway, Harbour, and Dock* Companies. The company has agreed to purchase the Rochdale Canal. For other railway connections see *Ashton, Stalybridge, and Liverpool Junction; Huddersfield and Sheffield Junction; Hull and Selby; Liverpool, Manchester, and Newcastle-upon-Tyne Junction; North Union; Sheffield, Rotherham, Barnsley, Wakefield, Huddersfield,* and *Goole; Wakefield, Pontefract, and Goole;* and *West Riding Union.*

Manchester and Lincoln Union Railway, and Chesterfield and Gainsborough Canal. The act, passed in 1846, authorises a railway of nearly 13½ m. from the Midland railway at Staveley to Worksop, and the consolidating into one undertaking the proposed railway and the canal from Chesterfield to the river Trent. This is part of a more extensive scheme, the remainder of which is superseded by the *Sheffield and Lincolnshire Junction* line, with which it is intended to amalgamate this undertaking.

Manchester, Sheffield, and Lincolnshire.—Under this title the *Sheffield, Ashton-under-Lyne, and Manchester,* the *Sheffield and Lincolnshire Junction,* the *Sheffield and Lincolnshire Extension,* and the *Great Grimsby and Sheffield Junction* Railway Companies, together with the Grimsby Dock Company, are amalgamated by an act of 1846.

Manchester South Junction and Altrincham.—Connects the Manchester and Birmingham, and Liverpool and Manchester lines south of the town of Manchester; total length 9¼ m.; act passed 1845. Projected in connection with the *Manchester and Birmingham* Railway Company, wbose interest in it is transferred to the *London and North-Western* Company.

Mansfield and Pinxton. [P. C. p. 264.]

Maryport and Carlisle [P. C., p. 264].—Completed February, 1845. An act of 1844 added some very short brancbes at Carlisle to the original line.

Middlesborough and Redcar.—Length 7½ m.; act passed 1845 opened Jnne, 1846. Joins the *Stockton and Darlington* Railway at Middlesborough.

Midland.—This company was formed in 1844 by the amalgamation of the *Midland Counties, North Midland,* and *Birmingham and Derby Junction* Railway Companies. Acts were obtained in 1845 for a line of 47¼ m. from the Midland Connties line at Syston to Peterborough, and of 33½ m. from Nottingham to Lincoln. The latter was opened throughout in August, 1846; and of the former about 11 m., from Syston to Melton, was brought into use in September, 1846, and abont 12 m., from Peterborougb to Stamford, in October, 1846; the last-mentioned portion being for the present leased to the *Eastern Counties* Railway Company. The intermediate portion will be altered under the powers of an act of 1846, which also anthorises a branch of 6½ m. from Barnack to Elton, and one of less than ½ m. at Syston. Other acts of 1846 empower the Midland Company to make an extension of 1¼ m. at Birmingham, forming a new junction with the London and Birmingham Railway, and avoiding the lift at the junction with the Birmingham and Gloucester line; to form a brancb to Hales Owen, noticed under *Birmingham and Gloucester;* to make a railway of 23½ m. from Barton-npon-Trent to Nuneaton, with the Swadlincote and Wooden Box branches of abont 2½ m. each, making a total of 28½ m., and to purchase the Ashby-de-la-Zouch canal; to make a railway of 26½ m., called the Clay Cross and Newark line, from the North Midland line at Clay Cross to the Nottingham and Lincoln line at Rolleston, with a branch of less than ½ m. to the Mansfield and Pinxton Railway, and one of nearly 1¾ m. to the proposed Nottingham and Mansfield line, making nearly 28½ m. in the whole; to make several short branches, amounting to about 9½ m. from the *Erewash Valley* Railway, which they have purchased; to make a line, called the Erewash Valley Extension Railway, of nearly 8½ m. from Pye Bridge to the North Midland line at Clay Cross, with a branch of 1¼ m. at Crich; to purchase the *Leicester and Swannington* Railway, and to construct the several branches elsewhere described in connection with it; to make a railway of 16¾ m. from Nottingham to Mansfield; and to purchase and close the Oakham Canal, the traffic of which will be diverted by the Syston and Peterborough line. In addition to the above lines the company have purchased or leased the *Bristol and Birmingham, Leeds and Bradford*, and *Sheffield and Rotherham* Railways, which see.

Midland Counties [P. C., p. 264].—Merged in the *Midland* Railway, which see.

Monmouth. [P. C., p. 264.]

Monmouth Branch.—See *South Wales.*

Monmouth and Hereford.—Main line 22 m.; branch to Westbury 10 m.; branch to the Forest of Dean 4½ m.: total 36½; act passed 1845. Projected as an extension, upon the broad gauge, from the Cheltenham and Great Western line at Standish, but (see *South Wales*) the works necessary for crossing the Severn have not been sanctioned by Parliament in 1845 or 1846. The line has been purchased by the *Great Western* Railway Company.

Monmouthshire.—The act, passed in 1846, is for making branch railways, to the extent of 6½ m., in connection with the *Newport and Pontypool* Railway, and for incorporating a new company to carry on the Monmouthshire Canal navigation. Portions of the original scheme having been abandoned when before parliament, the only lines authorised are one of nearly 5 m. to Blaenaven, and three very short ones to Pontnewynydd, Pontrhydyrun, and Hanson's brick-works.

Morecambe; Harbour and Railway.—The act, passed in 1846, is for making a harbour and docks at Heysham, on Morecambe Bay, with a railway of 4½ m. and branch of 2 m. to connect the harbour with Lancaster and the North-Western and Lancaster and Carlisle Railways. The line is to be transferred to the *North-Western* Railway Company.

Nantlle. [P. C., p. 264.]

Newark Extension.—See *Great Grimsby and Sheffield Junction.*

Newcastle and Berwick.—Total length, under the original act of 1845, 95½ m., including 8½ m. of branches for local traffic. An act of 1846 authorises an additional branch of nearly 5 m. to Warkworth harbour. The company has, jointly with the *Newcastle and Darlington Junction*, now *York and Newcastle* Railway Company, leased the *Newcastle-upon-Tyne and North Shields* Railway.

Newcastle upon-Tyne and Carlisle [P. C., p. 264].—The length of the main line is 61¾ m.; that of the branch from Blaydon to Redheugh (for which the company purchased part of the *Blaydon, Gateshead, and Hebburn* line), 3¾ m.; total 65½ m. An act of 1846 sanctions an extension of nearly ½ m. to Neville Street, Newcastle, and a branch of 17 m. from Haltwhistle to Alston.

Newcastle and Darlington Junction (originally *Northern Union*).—Acts passed 1842, 1843, and 1845. Main line of 23 m. from Great North of England Railway at Darlington to the Durham Junction Railway, with a branch of 2½ m. to Durham, opened in 1844. The further course of the trains is over the *Durham Junction* and *Brandling Junction* lines, both of which have been purchased by the company; and under the act of 1845 a new approach to Newcastle, with other branches, amounting to 6 m., are in progress. Other acts, passed in 1846, sanction the construction of a branch of nearly 7 m. to the Durham and Sunderland Railway, one of 12½ m. to the Bishop's Auckland and Weardale Railway, and two shorter branches amounting to nearly 2 m., making together about 21½ m.; and confer powers for making the branches described under the *Great North of England* Railway, in connection with that line, and for sanctioning the purchase of the *Pontop and South Shields* Railway, the *Durham and Sunderland* Railway, and the Wearmouth Dock; and for the leasing and purchase of the *Great North of England* Railway, by virtue of the possession of which the name of this company is changed to the *York and Newcastle* Railway Company. See also *Great North of England, Clarence, and Hartlepool Junction; Hartlepool;* and *Newcastle-upon-Tyne and North Shields.*

Newcastle-upon-Tyne and North Shields [P.C., p. 264].—Leased to the *Newcastle and Darlington Junction* and *Newcastle and Berwick* companies. An act of 1845 authorises an extension to Tynemouth, opened in October, 1846; and a branch to the quay adjoining the river Tyne at Newcastle, amounting to about 1 m. additional.

Newmarket and Chesterford.—Main, line from the Eastern Counties Cambridge Extension line at Chesterford to Newmarket, 16¾ m.; branch to Cambridge nearly 6½ m. Act passed 1846. Leased to the *Eastern Counties* Railway Company.

Newport, Abergavenny, and Hereford.—Main line 32 m.; Usk branch, 4¾ m.; Ragland branch, 6½ m. Four other short branches, two of which are to Pontypool and Portfield, swell the total length to rather over 45 m. The act, passed in 1846, confers power to purchase the *Llanvihangel* Railway.

Newport and Pontypool.—To be made by the Monmouthshire Canal Company; length, 13 m.; act passed 1845. See *Monmouthshire.*

Newtown and Crewe.—See *Shropshire Union.*

Norfolk.—Formed by the amalgamation of the *Norwich and Brandon* and *Yarmouth and Norwich*, which see. An act of 1846 authorises an extension of 22½ m. from the Dereham branch (see *Norwich and Brandon*) near Dereham to Wells, with a branch of nearly 6½ m. to Blakeney; total, 29½ m.; and another sanctions the purchase or lease of the *Lowestoft* Railway, Harbour, and Navigation.

North Midland [P. C., p. 264].—Merged in the *Midland* Railway.

North Staffordshire.—The company incorporated under this title in 1846, which is in friendly relation with the *London and North-Western*, and may probably be united with it, obtained three distinct acts, authorising, respectively, the Churnet Valley line, of nearly 45 m., from the Macclesfield branch of the Manchester and Birmingham line at Macclesfield to the Birmingham and Derby line at Willington, with the Burton-upon-Trent termination, nearly 4 m., and a branch of 16½ m. from Uttoxeter to the Potteries line near Stoke-upon-Trent, making together nearly 65½ m.; the Potteries line, of 38½ m., from the same point at Macclesfield to the Trent Valley Railway at Colwich, with the Crewe branch, 8½ m., the Newcastle-under-Lyme branch, under 4½ m., and the branch to join the Grand Junction line at Norton Bridge, rather more than 3½ m.; making together about 54¾ m.; and a line from the Potteries line at Harecastle to the Manchester and Birmingham Railway at Sandbach, about 8 m.: making an aggregate length of about 128½ m. The Company is empowered to purchase the Trent and Mersey Canal.

North Union.—Formed by the consolidation of the *Preston and Wigan* and *Wigan Branch* Railways. [P. C., pp. 264, 265.] An act of 1844 confirms the amalgamation of the *Blackburn and Preston* with this undertaking; and one of 1846 sanctions an arrangement for leasing the whole in perpetuity to the *Grand Junction* (now merged in the *London and North-Western*) and the *Manchester and Leeds* Railway Companies jointly.

North Union and Ribble Navigation.—From the North Union Railway to the Victoria Quay, Preston, ¾ m.; act passed 1845. To be made by the *North Union* Railway and Ribble Navigation Companies.

North Wales.—From Porth Dynllaen to Bangor, length 28½ m.; act passed 1845. An amendment act of 1846 authorises a deviation or loop line of 1½ m. at Carnarvon, and a branch of ½ m. to join the Chester and Holyhead line at Bangor; and gives power to lease or sell the line to the *Chester and Holyhead* Railway Company.

North Wales Mineral.—Under the original act of 1844 this was to consist of a line of 10½ m. from the Chester and Holyhead Railway, near Chester, to Wrexham, with a junction line or branch of ½ m. to the river Dee. An act of 1845 authorised an extension of rather more than 6 m. from Wrexham, past Ruabon, to join the Shrewsbury, Oswestry, and Chester Junction line at Cefn Mawr, and a branch of about 6 m. from Rhos Robin to Minera, to accommodate iron and coal mines; and one of 1846 sanctions a deviation of 2½ m., and two branches, the Ffrwd branch, of nearly 1½ m., and the Bryn Mally branch, of ½ m. Another act of 1846 consolidates this undertaking with the *Shrewsbury, Oswestry, and Chester Junction*, under the title of the *Shrewsbury and Chester* Railway. The main line, from the junction with the Chester and Holyhead Railway, at Saltney, near Chester, to Ruabon, was opened in November, 1846.

North Western.—From the Leeds and Bradford Extension Railway to the Lancaster and Carlisle Railway, 42¾ m., with a branch or diverging line of nearly 18½ m. to Lancaster; total length, 61 m.; act passed 1846. See *Morecambe.*

North Woolwich.—From the Eastern Counties and Thames Junction Railway near the mouth of the river Lea to the bank of the Thames opposite Woolwich; length 2¾ m.; act passed 1845; nearly completed November, 1846. Sold to the *Eastern Counties* Railway Company.

Northampton and Peterborough.—See *London and Birmingham.*

Northern and Eastern [P. C., p. 264].—The reduced line to Bishop's Stortford was opened in May, 1842. The Hertford and Ware branch, from Broxbourne, 5¾ m. long, formed under an act of 1841, was opened in October, 1843. In 1843 an act was obtained for extending the main line from Bishop's Stortford to Newport, about 10 m., and subsequently the company amalgamated with the *Eastern Counties*, which see. The gauge has been altered to 4 ft. 8½ in.

Northern Counties Union.—From the Great North of England Railway at Thirsk to the Lancaster and Carlisle Railway at Clifton, 69 m., and from Bishop's Auckland to the Lancaster and Carlisle Railway at Tebay, 50½ m., making, with the Wath branch of 7 m., and the Auckland branch of ¾ m., a total of 127 m. A portion of this, however, is coincident with the Hawes branch of the *Liverpool, Manchester, and Newcastle-upon-Tyne Junction* Railway, and is to be constructed by agreement for joint use. Act passed 1846. This undertaking is formed by the consolidation of the York and Carlisle and Yorkshire and Glasgow projected lines, adopting the course of the latter from Thirsk to Clifton and a portion of the former from Bishop's Auckland to Tebay.

Northern Union.—See *Newcastle and Darlington Junction.*

Norwich and Brandon.—By the original act of 1844 this was to be a main line of 35 m., with a branch of 3 m. to Thetford; but under an act of 1845 the main line was diverted to pass through Thetford, making the length about 36¾ m. Opened July, 1845. Amalgamated with the *Yarmouth and Norwich* as the *Norfolk* Railway, which see. The act of 1845 allows a branch of 11¾ m. from Wymondham to East Dereham.

Nottingham and Lincoln.—See *Midland.*

Nottingham and Mansfield.—See *Midland.*

Oldham Branches.—See *Huddersfield and Manchester*, and *Manchester and Leeds.*

Oxford and Bletchley Junction.—See *Buckinghamshire.*

Oxford Branch.—From the Great Western Railway at Didcot to Oxford, 9½ m.; act passed 1843; opened June, 1844. Made by the *Great Western* Railway Company. Gauge 7 feet.

Oxford and Rugby.—From the Oxford branch of the Great Western Railway at Oxford to the London and Birmingham and Midland Railways at Rugby; length 50½ m; act passed 1845. Sold to the *Great Western* Railway Company, who are constructing it as a broad-gauge line. See *Birmingham and Oxford Junction* Railway, and also the account of the gauge controversy, p. 665.

Oxford, Worcester, and Wolverhampton.—The original act, passed in 1845, was for a main line of 92½ m. in extension of the Oxford branch of the Great Western Railway, with the Worcester branch, 1½ m., the Stoke branch, 4 m., the Stourbridge branch, 1 m., and the Kingswinford branch, 2½ m., making a total of 101½ m. An act of 1846 provides for some alterations in the line, and a branch of 8¾ m. to Stratford-on-Avon, one of 4½ m to Witney, and a connecting line of ½ m. at Droitwich, making together 13½ m. of new line. The line is being constructed for the broad gauge, and under a guarantee from the *Great Western* Railway Company; but provision is made in the original act for laying additional rails where the connection with narrow-gauge lines may render it necessary in order to avoid a break of gauge. (See remarks on the gauge question, p. 665.) The company have leased the *Stratford and Moreton* Railway; and the act of 1846 gives power to purchase the Stratford-on-Avon and Stourbridge Extension Canals, the former of which they will transfer to the Birmingham and Oxford Junction Railway Company.

Oystermouth. [P. C., p. 264.]

Plymouth and Dartmoor. [P. C., 264.] See *South Devon.*

Pontop and South Shields.—A private company, formed about 1831 or 1832, constructed, without the authority of an act of parliament, an extensive line called the *Stanhope and Tyne* Railway, running for about 34 m. from South Shields, through the northern part of the county of Durham, to Stanhope, which was worked, at least partially, by locomotive engines, and used principally for coal traffic. It proved an unsuccessful speculation; and in 1842 a new company was incorporated by act of Parliament for working a portion of the line, the old company being dissolved. In 1844 the new company, which took the name of the Pontop and South Shields Railway Company, obtained an act for widening a part of their line, and making a new branch of ½ m. to the Brandling Junction Railway; and under an act of 1846 the whole undertaking has been consolidated with the *Newcastle and Darlington Junction*, now the *York and Newcastle* Railway.

Portland. [P. C. p. 264.]

Portbury Pier and Railway.—The act, passed in 1846, is for making a pier at Portbury, and a railway of nearly 8½ m., with a branch of nearly 1 m., to connect it with the Bristol and Exeter line near Bristol; to be laid on the broad gauge, and may be leased to the *Great Western* or *Bristol and Exeter* Railway Company.

Portsmouth.—See *Brighton and Chichester, Portsmouth Extension; Direct London and Portsmouth;* and *Guildford Extension, Portsmouth, and Fareham.*

Potteries Line.—See *North Staffordshire.*

Preston and Longridge [P. C. p. 264]. To be leased or sold to the *Fleetwood, Preston, and West Riding Junction* Railway Company.

Preston and Wigan.—See *North Union.*

Preston and Wyre [P. C., p. 265]. An act of 1845 authorises branches to Blackpool, 3½ m.; to Lytham, about 4¾ m.; and to Lytham Dock, under ½ m.; total 8½ m. These were opened in April, 1846. An act of 1846 sanctions the amalgamation of the Preston and Wyre Railway, Harbour, and Dock Company with the *Manchester and Leeds* Railway Company.

Reading, Guildford, and Reigate.—Length, main line 45¾ m., and two branches at Farnborough, where the line joins the London and South-Western, rather over ½ m. each; total nearly 46½ m. This line, which is part of the projected Devonport, Bristol, and Dover Junction Railway, is to be leased to the *South-Eastern* Railway Company, whose line it joins at Reigate, and who have the option of purchasing the portion between Reigate and Dorking. By a proposed arrangement with the *Direct London and Portsmouth* Railway Company for the use of part of their line, the construction of about 11 m. of this line may be avoided.

Redruth and Chasewater (or *Deveron*). [P. C., p. 265.]

Richmond (Yorkshire). See *Great North of England.*

Richmond (Surrey).—From the London and South-Western Railway at Battersea, through Waodsworth and Putney, to Richmond, length 6 m.; act passed 1845; opened July, 1846. Sold to the *London and South-Western* Railway Company.

Royston and Hitchin.—Length, about 12 m.; act passed 1846. This is the only part yet sanctioned by parliament of the *Cambridge and Oxford* Railway, a far more extensive project. It is proposed to extend the line from Royston to Cambridge, and to lease or sell it to the *Great Northern* Railway Company.

Rugby and Leamington.—Length 14½ m.; act passed 1846. This line, which was projected to extend to Warwick, has been sold to the *London and North-Western* Railway Company, from whose station at Rugby it commences.

Rugby and Stamford.—From the Rugby station of the London and Birmingham Railway to the Syston and Peterborough line of the Midland Railway near Stamford; length nearly 35 m. The act, which was passed in 1846, was obtained by the *London and Birmingham*, now *London and North-Western*, Railway Company.

Rumney. [P. C., p. 265.]

Rye and Ashford Extension.—See *Brighton, Lewes, and Hastings, Rye and Ashford Extension.* See also *South-Eastern.*

St. Helen's and Runcorn Gap [P. C., p. 265].—The company was amalgamated in 1845 with the Sankey Canal Company under the name of the *St. Helen's Canal and Railway* Company; and in 1846 they obtained an act for making an extension railway from the township of Eccleston to the township of Garston, amounting, with branches, to nearly 7½ m., and docks at its extremity at Garston.

Salisbury Branches.—See *London and South-Western.*

Saundersfoot [P. C., p. 265].—In 1842 the company obtained an act for an extension and two new branches, amounting together to 4½ m., for mineral traffic and horse-power. See *Tenby, Saundersfoot, and South Wales.*

Selby and Market Weighton.—See *York and North Midland.*

Severn and Wye (originally *Lydney and Lidbrook*). [P. C., p. 265.]

Sheffield, Ashton-under-Lyne, and Manchester [P. C., p. 265].—The main line, and a branch of 2½ m. to Ashton, made nuder an act of 1844, were completed in December, 1845. Acts of 1846 sanction branches of nearly 1 m. to Dukinfield; of 1 m. 132 yards to Glossop (this branch having been made without parliamentary powers, and opened in 1845); of 12½ m. to Whaley Bridge, and of 2¾ m. to Hayfield; the purchase of the Peak Forest and Macclesfield Canals; and the amalgamation, under the name of the *Manchester, Sheffield, and Lincolnshire* Railway Company, of this with the *Sheffield and Lincolnshire Junction*, the *Sheffield and Lincolnshire Extension*, and the *Great Grimsby and Sheffield Junction* Railway, and the Grimsby Dock companies. The company have also agreed to purchase the Manchester, Ashton-under-Lyne, Oldham, and Stockport Canal; and they possess an interest in the *Manchester, Buxton, Matlock, and Midlands Junction* Railway. See *Sheffield and Rotherham.*

Sheffield and Lincolnshire Extension.—From the Sheffield and Lincolnshire Junction Railway, near Retford, to Lincoln, 15¾ m.; act passed 1846. About 6 m. of this line, between Saxelby and Lincoln, being common to this and the *Great Northern* (late London and York) Railway, that portion is to be constructed for joint use by the Great Northern Railway Company. Merged in the *Manchester, Sheffield, and Lincolnshire* Railway.

Sheffield and Lincolnshire Junction.—Main line, from Sheffield to Gainsborough, 33½ m.; Woodhouse Mill branch, under 1½ m.; Beighton branch, nearly 1¾ m.; total about 36½ m. Act passed 1846. See also *Sheffield and Lincolnshire Extension;* and *Manchester and Lincoln Union Railway, and Chesterfield and Gainsborough Canal.* The undertaking is merged in the *Manchester, Sheffield, and Lincolnshire* Railway.

Sheffield and Rotherham.—[P. C., p. 265.]—An act of 1845 confirms the consolidation of this undertaking with the *Midland* Railway Company, and authorises a branch of about ½ m., which was completed in 1846, to connect the line with the Sheffield, Ashton-under-Lyne, and Manchester Railway.

Sheffield, Rotherham, Barnsley, Wakefield, Huddersfield, and Goole.—Main line, rather over 21 m.; Silkstone branch, nearly 2 m.; Dodworth branch, 3 m.; total 26 m.: act passed 1846. The portion north of Barnsley is to be leased to the *Manchester and Leeds* Railway Company, and the remainder to the *South Yorkshire Coal, Railway, and Canal* Company, who, having failed to obtain their act in 1846, are to apply for one to sanction this arrangement in 1847.

Shildon Tunnel.—See *Wear Valley.*

Shipley and Colne.—See *Leeds and Bradford.*

Shrewsbury and Birmingham.—The act obtained by the Shrewsbury and Birmingham Railway Company in 1846, was for a main line of 22½ m. from Shrewsbury to Wolverhampton, with a branch or fork of 7½ m. to the Abbey Foregate, Shrewsbury, and a branch of 4½ m. to Coalbrook Dale, making a total of 34 m. These lines form part of a much more extensive scheme, the objects of which are to be attained by means of complicated arrangements with the *Shrewsbury, Wolverhampton, and South Staffordshire Junction* Railway Company (with which this company is amalgamated or united for the purpose of making the line granted to this company betweeen Shrewsbury and Wolverhampton, and so much of the line granted to the other company, as lies between Tettenhall and Wolverhampton), the *Birmingham, Wolverhampton, and Stour Valley* Railway Company, and the *Shropshire Union Railways and Canal* Company. All of the lines granted to these companies may be regarded as parts of a system of communication connected with the *London and North-Western* Railway.

Shrewsbury and Chester.—This is the title given by an act of 1846 to the amalgamated *Shrewsbury, Oswestry, and Chester Junction* and the *North Wales Mineral* Railways, which see.

Shrewsbury and Hereford.—Length, 50½ m.; act passed 1846. Projected by parties interested in the *London and North-Western* in opposition to a similar line promoted by the Great Western Railway Company.

Shrewsbury, Oswestry, and Chester Junction.—From Shrewsbury to the North Wales Mineral Railway at Cefn Mawr, with branch to Oswestry; length 23½ m.; act passed 1845. Acts of 1846 sanction an extension of less than one furlong into Shrewsbury, and deviations at Shrewsbury and other places amounting to 8½ m.; branches of 6½ m. to Crickheath, and of nearly 7 m. to Wem; and the amalgamation of the whole undertaking with the *North Wales Mineral* Railway, under the name of the *Shrewsbury and Chester* Railway.

Shrewsbury and Stafford.—See *Shropshire Union.*

Shrewsbury, Wolverhampton, and South Staffordshire Junction. Length, main line from Shrewsbury to Wolverhampton, rather over 29½ m.; branch at Shrewsbury, nearly ¾ m.; act passed 1846. Under an arrangement referred to under *Shrewsbury and Birmingham*, a considerable portion of this line will be abandoned, the two companies uniting to execute certain portions of the works projected by each.

Shropshire Union Railways and Canal.—Three acts were obtained in 1846 by a company with the above title, authorising, respectively, the formation of a railway of nearly 46 m., from the Chester and Crewe branch of the Grand Junction Railway, at Calveley, to Wolverhampton, called the Chester and Wolverhampton line, including power to purchase the Ellesmere Canal, and to convert part of it into a railway; the formation of a main line of railway of nearly 60 m. from Newtown, in the county of Montgomery, to Crewe, with branches to Ellesmere, Wem, and Whitchurch, and one at Crewe, amounting to 9½ m.; and the formation of a main line of railway of rather over 29 m. from Shrewsbury to Stafford, with a branch of 11½ m. to Stone, including power to purchase the Shrewsbury Canal. The aggregate length of the above lines is rather over 155 m.; but the company are restricted from making that portion of the last-mentioned line which lies between Shrewsbury and Wellington, in case either the Shrewsbury and Birmingham or the Shrewsbury, Wolverhampton, and South Staffordshire Railway Company should obtain their act, which both did, although, as explained under *Shrewsbury and Birmingham*, only part of the scheme of each is to be carried into effect. Arrangements are (November, 1846) pending for the leasing of the whole of the above undertakings to, or the amalgamation of the company with, the *London and North-Western* Railway Company. The *Chester and Holyhead* Railway Company possess an interest in the Shropshire Union.

Sirhowey. [P. C., p. 265.]

South Devon.—From the Bristol and Exeter Railway at Exeter to Plymouth; length, about 51¾ m., exclusive of a branch of about ¾ m. to Mill Bay, and an alteration of about ½ m. of the *Plymouth and Dartmoor* Railway, which the company are empowered to lease or purchase; act passed 1844; gauge 7 feet. Intended for working by atmospheric power; but 15 m., from Exeter to Teignmouth, opened in May, 1846, with locomotive engines. An act of 1846 sanctions a branch of 5 m. from Aller, near Newton, to Torquay; a deviation of the main line near Newton; and several alterations in connection with the towns of Plymouth and Devonport. Part of the capital for this line was subscribed by the *Great Western, Bristol and Exeter,* and *Bristol and Gloucester* Railway Companies, which are empowered to lease it; and the South Devon Company possesses an interest in the *Ashburton, Newton, and South Devon* and the *Cornwall* lines.

South-Eastern [P. C., p. 265].—The main line, which was extended about ½ m. at the Dover end under an act of 1843, was opened throughout in February, 1844. A branch of 10 m. from Paddock Wood to Maidstone, made under an act of 1843, was opened in September, 1844. In 1844 the company obtained acts for a branch of ¾ m. to Folkestone Harbour (which they had purchased), which has since been completed; and for a branch of 32¾ m. from Ashford to Canterbury, Ramsgate, and Margate, which was completed in 1846. In September, 1845, they opened the greater part of the Tunbridge Wells branch, from near Tunbridge station, which was made in anticipation of an act of parliament and completed in 1846. In 1845 they obtained acts to sanction the last-mentioned branch; to enable them to alter and extend the Canterbury, Ramsgate, and Margate branch, and to make a branch of 9½ m. from it near Minster to Deal; to enable them to purchase the *Canterbury and Whitstable* Railway; and to widen the *London and Greenwich* Railway, which they had leased for 999 years. In 1846 they obtained acts for enlarging the station at Ashford, as a central locomotive depot; for making a railway of 22½ m. from the London and Greenwich Railway, about 2½ m. from London Bridge, by Blackheath, to Woolwich and Gravesend, being part only of a proposed line to Chilham, near Canterbury, which, but for the objections of the Admiralty, would have taken a more direct course under Greenwich Park; for a line of 25¾ m. from their Tunbridge Wells branch to join the Rye and Ashford extension of the Brighton, Lewes, and Hastings Railway near Hastings, with a diverging line of 5¾ m. towards Rye; for a branch of 1¾ m. from Rye to Rye Harbour; and for authorising the purchase of the *Gravesend and Rochester* Railway and Canal. See also *Bricklayer's Arms Branch; Brighton, Lewes, and Hastings, Rye and Ashford Extension;* and *Reading, Guildford, and Reigate.*

South Staffordshire.—Formed by the amalgamation of the *South Staffordshire Junction* and *Trent Valley, Midlands, and Grand Junction* Railways, which see. The united company is on terms of friendly alliance with the *London and North-Western* Railway Company.

South Staffordshire Junction.—Main line, from the Oxford, Worcester, and Wolverhampton Railway at Dudley, to the *Trent Valley, Midlands, and Grand Junction* Railway (with which it is amalgamated, as the *South Staffordshire* Railway), near Walsall, 8½ m.; Darlaston branch, 1½ m.; Birmingham branch, nearly 1 m.; Wyrley and Daw-End branches, under ¾ m. each; total, about 12¼ m.; act passed 1846. See *Birmingham, Wolverhampton, and Dudley.*

South Wales.—Projected as a broad-gauge line in connection with the Great Western Railway, to commence by a junction with the Cheltenham and Great Western Union Railway at Standish; but owing to objections to the proposed crossing of the Severn, the original act of 1845 was limited to a main line of 160¾ m. from Chepstow to Fishguard Bay and Pembroke Dock, with a branch of 22½ m. to Monmouth. An act of 1846 provides for an extension of 12 m. from Chepstow to join the Gloucester and Forest of Dean Railway at Haglow Farm; a branch of rather over 1½ m. to Swansea, and one of nearly 5½ m. to Haverfordwest, making in the whole 18¾ m. of new line; and also sanctions several deviations, amounting to 23¾ m., on the original main line and branch; but the company were again unsuccessful in their efforts to obtain a direct connection with the Great Western line by means of a bridge or tunnel at Hock Crib. The undertaking is leased to the *Great Western* Railway Company, with provision for a future amalgamation. See also *Bristol and South Wales Junction; Llynvi Valley; Tenby, Saundersfoot, and South Wales;* and *Vale of Neath.*

South-Western.—See *London and South-Western.*

South Yorkshire.—See *Sheffield, Rotherham, Barnsley, Wakefield, Huddersfield, and Goole.*

Southampton and Dorchester.—Length, 60 m.; branch to Poole, 2 m.; act passed 1845. Gauge, 4 ft. 8½ in.; and to be leased to the *London and South-Western* Railway Company; but provision made for interchange of traffic with the Wilts, Somerset, and Weymouth broad-gauge line, at Dorchester.

Stamford and Spalding.—From the main line of the Great Northern Railway in the parish of Ufford, Northamptonshire, to the loop-line of the same railway in the parish of Crowland, Lincolnshire; length, 6¾ m.; act passed 1846. Sold to the *Great Northern* (late London and York) Railway Company.

Stanhope and Tyne.—See *Pontop and South Shields.*

Stockton and Darlington. [P. C., p. 265.]

Stockton and Hartlepool.—This line, 8½ m. long, from the Clarence Railway about 4 m. north-east of Stockton to Hartlepool, was made without an act of parliament and opened in 1840; but in 1842 the company obtained an act of incorporation.

Stratford-on-Avon Branches.—See *Birmingham and Oxford Junction;* and *Oxford, Worcester, and Wolverhampton.*

Stratford and Moreton [P. C., p. 265].—Leased or sold to the *Oxford, Worcester, and Wolverhampton* Railway Company.

Stratford and Thames Junction.—See *Eastern Counties and Thames Junction.*

Surrey Iron [P. C., p. 265].—Company dissolved by an act of 1846. See *London and Brighton.*

Swansea and Loughor.—See *Cameron's Steam Coal, &c.*

Syston and Peterborough.—See *Midland.*

Taff Vale [P. C., p. 265].—Main line opened throughout, April, 1841. Some of the branches have been abandoned, but the total length made in 1845 appears, by the evidence before the Gauge Commissioners, to have been about 34 m.; in addition to which an act of 1846 provides for new branches amounting to rather more than 17 m., of which the principal are the Rhondda Fawr branch of upwards of 9 m., the Rhondda Fach branch of 5 m., the Acrw branch of rather over 1 m., and the Dinas branch of less than ½ m. The gauge of the line is 4 ft. 8½ in. See *Aberdare*.

Taw Vale [P. C., p. 265].—An amendment act passed in 1845; and in 1846 the company obtained powers for extending their line from Barnstaple to the Exeter and Crediton Railway at Crediton, a distance of nearly 31 m. An arrangement for leasing the line to the Bristol and Exeter Railway Company has been broken off.

Tenby, Saundersfoot, and South Wales.—The act, passed in 1846, is 'for making a Railway to connect the Saundersfoot Railway with the South Wales Railway, with the Harbour of Saundersfoot, and with the Town of Tenby.' Main line, from the South Wales Railway at Reynalton to Tenby, nearly 6½ m.; branch from St. Issell's to Saundersfoot, over 1 m.; total, 7½ m. The act gives power to purchase the *Saundersfoot* Railway and Harbour.

Thames Haven Dock and Railway [P. C., p. 265].—This project has not been carried into effect; but in 1846 the company obtained an act for continuing their powers for a further period of five years, a similar act having been obtained in 1842.

Trent Valley.—From the Grand Junction Railway near Stafford to the London and Birmingham Railway at Rugby; length, 49½ m.; act passed 1845. Sold to the *London and Birmingham* Railway Company, and merged in the *London and North-Western* Railway.

Trent Valley, Midlands, and Grand Junction.—Main line, from Walsall to the Midland Railway at Wichnor Forge, in Tatenhill, 16½ m.; branch to join the Trent Valley Railway at Lichfield, ¼ m.; act passed 1846. This line, which is part of a more extensive project, portions of which will be superseded by other lines, is amalgamated with the *South Staffordshire Junction*, under the name of the *South Staffordshire* Railway.

Tunbridge Wells, Hastings, and Rye.—See *South-Eastern*.

Vale of Neath.—Main line, from the South Wales Railway, near Neath, to Merthyr Tydvil, nearly 22¾ m.; four branches, one of which joins the Aberdare Railway, about 5½ m.; total 28¼ m. Act passed 1846. To be laid on the 7-feet gauge, as a branch of the *South Wales* Railway, to the proprietors of which it may be leased or sold.

Wakefield, Pontefract, and Goole.—The original act, passed in 1845, is for a line from the Manchester and Leeds Railway at Wakefield to Pontefract and Goole, with some short branches, amounting altogether to 28¾ m. Others, obtained in 1846, sanction the construction of a jetty and other works at the port of Goole, and the construction of branches amounting to about 19 m.; consisting of the Methley branch, of nearly 4¾ m.; the Askern branch, 10¼ m.; and the Oakenshaw branch, of rather over 4 m. The whole undertaking is to be amalgamated with the *Manchester and Leeds* Railway.

Warrington and Newton [P. C., p. 265].—See *Grand Junction*.

Warwick and Leamington Union.—From the London and Birmingham Railway at Coventry to a point about midway between Warwick and Leamington; length rather under 9 m.; act passed 1842; opened December, 1844. Sold to, and made by, the *London and Birmingham* Railway Company.

Wear and Derwent.—See *Wear Valley*.

Wear Valley.—From the Bishop's Auckland and Weardale Railway to Frosterley, with a branch to Bishopley Crag; total length 11¾ m.; act passed 1845. The company have agreed to lease or purchase the *Bishop's Auckland and Weardale* Railway, with its short connected lines for mineral traffic, the *Wear and Derwent* and *Weardale Extension* Railways. and the *Shildon Tunnel*, which was formed to establish a more direct connexion between the Bishop's Auckland and Weardale and the Stockton and Darlington railways than that afforded by the Black Boy branch. The three last-mentioned undertakings have been executed without parliamentary powers.

Weardale Extension.—See *Wear Valley*.

Weedon and Northampton.—See *London and Birmingham*.

West Cornwall.—Main line, from the parish of Kenwyn to Penzance, nearly 26 m.; branch from near Redruth to the Cornwall Railway near Ponsanooth, to complete the communication between Falmouth and Penzance, 5½ m.; total, about 31½ m. To be laid on the broad gauge. The act, passed in 1846, gives power to purchase the *Hayle* Railway.

West Durham [P. C., p. 265].—Opened June, 1841.

West London (formerly *Birmingham, Bristol, and Thames Junction*) [P. C., p. 265].—Opened May, 1844, with a single track, but three rails, forming a double gauge, and worked by locomotive engines. Leased for 999 years to the *London and Birmingham* and *Great Western* Railway Companies, who obtained an act jointly in 1846 for altering about 1 m. of the line, and extending it nearly 2 m. to the river Thames at Chelsea.

West Riding Union.—This undertaking consists of a series of lines to connect Leeds, Bradford, Halifax, Huddersfield, Brighouse, Dewsbury, Cleckheaton, Heckmondwike, Stanningley, Pudsey, Lowmoor, &c., with one another, and with the main line of the Manchester and Leeds Railway; aggregate length about 45¾ m., act passed 1846. Amalgamated with the *Manchester and Leeds* Railway.

Wharfdale.—From Skipton to the Leeds and Thirsk Railway at Arthington, 21 m.; and two short branches, one at Skipton and one to form a second junction with the Leeds and Thirsk line, about 1 m.; total 22 m.; act passed 1846. It was proposed to lease this line, which was originally called the *Lancashire and Yorkshire North-Eastern* Railway, and intended to extend to York, to the *Leeds and Thirsk* Railway Company; but (November, 1846) the terms proposed have been rejected.

Whitby and Pickering [P. C., p. 265].—Purchased by the *York and North Midland* Railway Company, who obtained an act in 1845 for adapting it to locomotive engines, and another in 1846 for an extension of about 10½ m. to near Castleton.

Whitehaven and Furness Junction.—Crosses the Duddon sands; length, with two junctions with the Furness Railway, 32½ m.; act passed 1845. An act of 1846 allows a deviation of nearly 2 m. at Kirksanton; an extension of ¾ m. at Whitehaven, to join the Whitehaven Junction line; and the leasing of the undertaking to the *Whitehaven Junction* Railway Company.

Whitehaven Junction.—From the Maryport and Carlisle Railway at Maryport, along the coast, to Whitehaven; length 12 m.; act passed 1844; part opened 1846. See *Whitehaven and Furness Junction*.

Wigan Branch [P. C., p. 265].—See *North Union*.

Wilts, Somerset, and Weymouth.—Under the original act of 1845 this railway is to extend from Corsham, on the Great Western Railway, to Salisbury and Weymouth by two main branches, amounting to about 96 m., with smaller branches to Devizes, 7 m.; Bradford, 1¾ m.; Radstock, 9 m.; Sherborne, 4 m.; and Bridport, 11¾ m.; total 129½ m.; but an act of 1846 authorises several new branches and deviations, amounting in the whole to nearly 36½ m., of which length about two-thirds is to replace parts of the original scheme which have been abandoned. These additions and alterations are, the Bath branch, 7½ m.; the Weymouth extension, nearly 1 m.; the Salisbury extension, 2½ m.; the Devizes branch (substituted for that of 1845), 8½ m.; the Laycock deviation and Corsham extension, 2¼ m.; the Westbury deviation, 3 m.; the Frome deviation, 6¾ m.; the Radstock branch deviation, ¾ m.; and the Herringstone deviation, 4 m. The undertaking was projected in connexion with the *Great Western* Railway Company, whose gauge is to be adopted.

Wisbeck, St. Ives, and Cambridge Junction.—Main line, from Wisbech to St. Ives, 27½ m.; branch from St. Ives to the Cambridge and Huntingdon line of the Eastern Counties Railway at Fenny-Drayton, 1¾ m.; total 29 m.; act passed 1846. Sold to the *Eastern Counties* Railway Company.

Yarmouth and Norwich.—Act passed 1842; opened May, 1844. Length 20½ m. Amalgamated with the *Norwich and Brandon*, under the name of the *Norfolk* Railway, which see. See also *Lowestoft*. The amalgamation act of 1845 sanctioned an extension of about ½ m. at Norwich. The connexion with the Brandon line near that city by a moveable bridge over the Wensum was completed in December, 1845.

Yeovil Branch.—See *Bristol and Exeter*.

York and Beverley.—See *York and North Midland*.

York and Carlisle.—See *Northern Counties Union*.

York and Leeds.—See *York and North Midland*.

York and Newcastle.—This is the new title given by an act of 1846 to the *Newcastle and Darlington Junction* Railway, with the *Great North of England*, and other lines now associated with it. According to a statement made at a meeting of the company in October, 1846, the aggregate length of the lines belonging to this company, or which they have power to construct, is about 225 m.

York and North Midland [P. C., p. 265].—By an act of 1844, this company was empowered to make a line of about 42 m. from York to Scarborough, with a branch of 6½ m. to Pickering. The Scarborough line, an alteration of which for 3 m. near York was sanctioned by an act of 1845, was opened in July of that year. Other acts of 1845 authorise a branch of 19¾ m. from the York and Scarborough line to Bridlington, which was opened as far as Filey, about 6 m., in October, 1846; and a branch of 18¼ m. from their main line to Harrogate. Acts of 1846 authorise the York and Beverley branch of rather over 31 m., with the East Dock branch of 4 m., making together 35 m.; the Selby and Market Weighton branch of 16 m., with the Hornsea branch of 10½ m.; together 26½ m.; a new line of 17 m. for more direct communication between York and Leeds; the widening and enlargement of about 13¾ m. of the original York and North Midland line; and the extension to Castleton noticed under *Whitby and Pickering*. The company have purchased the *Leeds and Selby* and *Whitby and Pickering* lines, and also the *Hull and Selby*, with its Bridlington branch, although the act for leasing and selling the last-mentioned undertaking provides for the Manchester and Leeds Railway Company taking a share in it, which it is probable they will do. From a statement made by the chairman at a meeting of the York and North Midland Railway Company in October, 1846, it appears that the total length of railway under their management, or authorised to be made by them, is about 306 m. See also *Malton and Driffield Junction*.

York and Scarborough.—See *York and North Midland*.

Yorkshire and Glasgow Union.—See *Northern Counties Union*

Railways of Scotland.*

Aberdeen.—From Aberdeen to the Arbroath and Forfar line at Friockheim, $49\frac{1}{4}$ m.; branch to form a second junction at Guthrie, 2 m.; Montrose branch 3 m.; Brechin branch, $3\frac{1}{2}$ m.; total 58 m.; act passed 1845. To lease the *Arbroath and Forfar* Railway. See also *Deeside.*

Airdrie and Bathgate Junction.—From Airdrie to Bathgate, nearly $14\frac{1}{2}$ m.: branch to Whitburn, $3\frac{1}{4}$ m.; Branch to Blackburn nearly $2\frac{1}{4}$ m.; total, 20 m. Act passed 1846, and gives power to lease or sell the line to the *Edinburgh and Glasgow* Railway Company.

Alford Valley.—From Kintore to Alford; length nearly 16 m.; act passed 1846.

Arbroath and Forfar. [P. C., p. 265.]—An act of 1846 sanctions the leasing of the line to the *Aberdeen* Railway Company, in consequence of which the gauge will bealtered to 4 f. $8\frac{1}{2}$ in.; and a second track will be laid.

Ardrossan (formerly *Johnstone and Ardrossan*). [P. C., p. 265.]—Gauge originally 4 f. 6 in., but altered to 4 f. $8\frac{1}{2}$ in. The railway, together with the harbour of Ardrossan, has been sold to the *Glasgow, Kilmarnock, and Ardrossan* Railway Company.

Ayrshire and Bridge of Weir.—From the Glasgow, Paisley, Kilmarnock, and Ayr Railway at Johnstone to the Bridge of Weir, 3 m.; eastern branch or fork at Johnstone, 1 m.; branch to Kilbarchan, 1 m.; total length, 5 m.; act passed 1846. Sold to the *Glasgow, Paisley, Kilmarnock, and Ayr* Railway Company.

Ballochney. [P. C., p. 266.]—Gauge originally 4 f. 6 in., but to be altered to 4 f. $8\frac{1}{2}$ in., under an act of 1845. See *Monkland Mineral.*

Caledonian.—Main line, from Carlisle to Carnwath, $72\frac{3}{4}$ m.; thence to Edinburgh by a branch of $27\frac{1}{2}$ m.; and by another branch of 12 m. to the Wishaw and Coltness Railway, by which and the Clydesdale Junction line it approaches Glasgow. The original act, passed in 1845, also sanctions branches to the Scottish Central Railway at Castlecary and to Dumfries, and some minor junctions, making in the whole $137\frac{1}{2}$ m. Under several acts of 1846 the amalgamation of the *Clydesdale Junction* and *Polloc and Govan* Railways with the Caledonian, and the purchase of the *Glasgow, Garnkirk, and Coatbridge* line, are sanctioned; and the Caledonian Company are empowered to deviate their line for $1\frac{1}{2}$ m. near Carlisle; to deviate about 3 m. of the Clydesdale Junction line; to form short branch and terminal railways at Glasgow, amounting to about 2 m.; and to make branches amounting to $1\frac{1}{2}$ m. from their Castlecary branch to the Glasgow, Garnkirk, and Coatbridge Railway. See also *Glasgow, Barrhead, and Neilston Direct; Glasgow, Kilmarnock, and Ardrossan; Glasgow Southern Terminal;* and *Scottish Central.* The company also propose to amalgamate with the *Glasgow, Paisley, and Greenock.*

Caledonian and Dumbartonshire Junction.—According to the title of the act, which was passed in 1846, this is a railway 'from Glasgow to Dumbarton and Lochlomond,' 'with branches to Helensburgh and other places.' The length of the main line is $20\frac{3}{4}$ m.; of the branches, $12\frac{3}{4}$ m.; total, $33\frac{1}{2}$.

Clydesdale Junction.—From the Polloc and Govan Railway at Rutherglen to Hamilton, with a branch to the Wishaw and Coltness Railway at Motherwell. Main line rather over 8 m., Motherwell branch $6\frac{1}{2}$ m., and another short branch, making $15\frac{1}{4}$ m. in the whole. Act passed 1845. Amalgamated with the *Caledonian* Railway, which see.

Cumnock Branch.—See *Glasgow, Paisley, Kilmarnock, and Ayr.*

Deeside.—From Ferryhill, near Aberdeen, to Aboyne; length, 29 m. The act, passed in 1846, confers powers for leasing the line to the *Aberdeen* Railway Company.

Dunblane, Doune, and Callander.—Length $10\frac{1}{2}$ m.; act passed 1846. Power given to lease to the *Scottish Central* Railway Company, whose line it joins at Dunblane.

Dundee and Arbroath. [P. C., p. 266.]—Gauge to be altered to 4 f. $8\frac{1}{2}$ in. An act of 1846 authorises a branch to Broughty Ferry Castle, and another to the Arbroath and Forfar line at Almericeloss. Length, under $1\frac{1}{4}$ m.

Dundee and Newtyle. [P. C., p. 266.]—Leased to the *Dundee and Perth.* Original gange, 4 f. $6\frac{1}{2}$ in.

Dundee and Perth.—Length, $20\frac{3}{4}$ m.; act passed 1845. A second act, of 1846, sanctions some deviations in the line, a short extension at Perth; and the leasing or purchase of the *Dundee and Newtyle* Railway.

Drumpeller.—To connect coal-fields with the Monkland canal. Length $1\frac{3}{4}$ m. Act passed 1843.

Dunfermline and Charlestown.—Length $3\frac{1}{4}$ m. Made without an act of parliament, prior to 1840. Passengers and goods conveyed by horse-power.

East of Fife.—From the Edinburgh and Northern Railway at Markinch to Anstruther Easter, nearly 18 m., with a branch of $\frac{1}{4}$ mile to the Kirkland iron-works. Act passed 1846.

Edinburgh and Bathgate.—Main line, from near the Ratho station of the Edinburgh and Glasgow Railway to Bathgate, nearly $11\frac{1}{4}$ m.; Mid Calder branch, nearly $2\frac{1}{4}$ m.; Binny quarries branch, $1\frac{1}{2}$ m.; Whitburn branch (from Barrack), nearly $5\frac{1}{4}$ m.; Whitburn branch (from Bathgate), nearly 3 m.; total, about $23\frac{1}{4}$ m. Act passed 1846. Leased to the *Edinburgh and Glasgow* Railway Company.

Edinburgh and Dalkeith. [P. C., p. 266.]—Original gauge, 4 f. 6 in. Purchased, and to be improved for locomotives, by the *North British* Railway Company.

Edinburgh and Glasgow. [P. C., p. 266.]—Opened February, 1842. An act of 1844 authorised an extension of $1\frac{1}{4}$ m. at Edinburgh, to join the North British and Edinburgh, Leith, and Granton Railways at the North Bridge, which extension was opened in 1846. An act of 1845 authorised several short connecting branches, amounting in the whole to 6 m., and also the *Glasgow Junction* line, described elsewhere; and an act of 1846 authorises a branch of nearly $6\frac{3}{4}$ m. from the Gogar station to South Queensferry. Arrangements had been made by the Directors for amalgamating with, purchasing, or leasing, the *Monkland Mineral* railways, consisting of the *Monkland and Kirkintilloch, Ballochney,* and *Slamannan* lines; the *Airdrie and Bathgate Junction;* the *Edinburgh and Bathgate;* the *Glasgow, Airdrie and Monklands Junction;* the *Stirling and Dunfermline;* the *Stirlingshire Midland Junction;* and the *Wishaw and Coltness* Railways; and also the Forth and Clyde Canal; but in September, 1846, the canal amalgamation was broken off, and a subsequent change of directors may probably be followed by the abandonment of other contemplated arrangements. It is reported (November, 1846), that the Wishaw and Coltness line has been relinquished by this and taken up by the Caledonian Railway Company.

Edinburgh and Hawick.—This line, branching out of the North British Railway, and forming a continuation of the Edinburgh and Dalkeith line, has been amalgamated with the *North British.* Length, $45\frac{1}{2}$ m.; act passed 1845. The bill for a proposed extension to Carlisle was lost in 1846. For branches see *North British.*

Edinburgh, Leith, and Granton (originally *Edinburgh, Leith, and Newhaven*). [P. C., p. 266.]—The name was changed in 1844, by an act which authorised a new branch of $1\frac{1}{4}$ m. to Leith, and one of 1 m. to Granton. The total length of the present lines is nearly $4\frac{1}{2}$ m. Part of the main line was opened in 1842, and the branches and tunnel to Princes Street in 1846. The company proposes to amalgamate with the *Edinburgh and Northern* Railway Company.

Edinburgh and Northern.—By the original act of 1845 this is a main line of $35\frac{1}{4}$ m. from Burntisland, on the Firth of Forth, to Perth, with a branch of $5\frac{1}{4}$ m, to Cupar or Coupar, and one of $\frac{1}{2}$ m. to Kirkcaldy harbour; total, $41\frac{1}{4}$ m. Acts of 1846 add a branch of nearly 15 m. from Thornton to Dunfermline, of nearly $15\frac{1}{4}$ m. from Cupar to Newport, and of 600 yards from Kinghorn to Pettycur harbour; and also a line of 9 m. from Newburgh to the Scottish Central Railway at Hilton (called in the bill the Strathearn Deviation), and a deviation of 3 m. near Dysart. Exclusive of the Dysart deviation the new lines amount to about 40 m. Another act allows the purchase of the ferry across the Tay between Ferry-Port-on-Craig and Broughty. See *Edinburgh, Leith, and Granton.*

Garnkirk and Glasgow. [P. C., p. 266.]—The original gange of this line was 4 ft. 6 in., and not, as there stated, 4 ft. $8\frac{1}{2}$ in.; but by an act of 1845 it is to be increased to that width. By an act of 1844, authorising extensions to the amount of $2\frac{1}{4}$ m., the name of the company was changed to the *Glasgow, Garnkirk, and Coatbridge,* which see.

General Terminus and Glasgow Harbour.—From the Polloc and Govan Railway to the river Clyde and the harbour of Glasgow, 1 m.; with branches to the joint line of the Glasgow, Paisley, and Greenock, and Glasgow, Paisley, Kilmarnock, and Ayr Railways, and to the Glasgow, Barrhead, and Neilston Direct line; total length, under $2\frac{1}{4}$ m.; act passed 1846.

Glasgow, Airdrie, and Monklands Junction.—Main line, from Glasgow to Airdrie, $10\frac{1}{2}$ m.; branches to the Clydesdale Junction and Garnkirk extension lines, and to Mile-End, 4 m.; total, $14\frac{1}{2}$ m.; act passed 1846. Leased to the *Monkland Mineral* Railways, which see.

Glasgow, Barrhead, and Neilston Direct.—From Glasgow to Croftbead, near Neilston, 9 m.; branches out of the Glasgow, Paisley, and Greenock Railway. Act passed 1845. Under an act of 1846 branches to Thornliebank and Househill, together under $1\frac{1}{2}$ m., are authorised. Together with the *Glasgow Southern Terminal* line, this undertaking is to be leased to the *Caledonian.* See also *Glasgow, Kilmarnock, and Ardrossan,* and *Glasgow, Strathaven, and Lesmahagow Direct.*

Glasgow and Belfast Union.—From the *Glasgow, Paisley, Kilmarnock, and Ayr* line (to the owners of which it is to be made over). to Girvan, $21\frac{1}{2}$ m., with a branch of nearly 1 m. to Maybole; act passed 1846. This is only part of a much more extensive project.

Glasgow, Dumfries, and Carlisle.—From the Glasgow, Paisley, Kilmarnock, and Ayr Railway, near Cumnock, to the Caledonian Railway near the crossing of the river Sark, nearly 65 m.; Canobie branch, $8\frac{1}{2}$ m.; Annan harbour branch, under $1\frac{1}{2}$ m.; Crawick branch, $16\frac{1}{4}$ m.; total, $90\frac{3}{4}$ m. Act passed 1846. To be

* In the case of several of the earlier Scotch railways the gauge is erroneously stated in P. C. to be 4 f. $8\frac{1}{2}$ in., whereas, as will be seen by the cases in the above table in which the matter is noticed, most of them were laid with a gauge of 4 f. 6 in. Some are already, and others will be ere long, altered to the ordinary mode of gauge of 4 f. $8\frac{1}{2}$ in.

amalgamated with the *Glasgow, Paisley, Kilmarnock, and Ayr*, and the portion from Annan to Gretna to be worked by the *Caledonian* Railway Company.

Glasgow, Garnkirk, and Coatbridge.—This railway is the line originally called the *Garnkirk and Glasgow* (which see), as extended under an act of 1844 by new lines, one of which joins the Wishaw and Coltness, to the extent of 2¼ m. Of these the Garnkirk and Coatbridge extension, of rather more than 1 m., was opened in 1845, in which year an act was obtained to widen the gauge to 4 ft. 8½ in. Under three new acts of 1846 the line is transferred, by sale, to the *Caledonian* Company, and an extension of 173 yards at Glasgow, and the connecting branches mentioned under *Caledonian* are sanctioned.

Glasgow Junction.—From the Edinburgh and Glasgow Railway near Pinkston Bog to the Cut of Junction Canal at or near Broomhill, and to the north quay of the harbour of Glasgow. To be made by the *Edinburgh and Glasgow* Railway Company. Length, under act of 1845, 2¼ m.; but by an act of 1846 a length of 425 yards is to be abandoned, and a new line of 372 yards substituted for it.

Glasgow, Kilmarnock, and Ardrossan.—From the Glasgow, Barrhead, and Neilston Direct Railway at Crofthead to Kilmarnock, 14¼ m.; Ardrossan branch, nearly 10¾ m.; Irvine branch, 3¼ m., and some smaller branches; total length, about 29¾ m. Act passed 1846. The company have purchased the *Ardrossan* Railway and Harbour; and the line has been projected in connexion with the *Caledonian.*

Glasgow, Paisley, and Greenock. [P. C., p. 266.]—Opened throughout in March, 1841. Acts of 1846 authorise a branch of 352 yards to the Clyde at Greenock, and one of 330 yards to the Polloc and Govan Railway. See also *Glasgow, Barrhead, and Neilston.* To be amalgamated with the *Caledonian.*

Glasgow, Paisley, Kilmarnock, and Ayr. [P. C., p. 266.]—Main line completed in August, 1840; Kilmarnock branch, 11 m., April, 1843. Acts passed in 1845 for a branch of 18¼ m. to Cumnock, and in 1846 for deviating the Cumnock branch for 1¼ m. near Kilmarnock, and making new branches to Linwood, over 1 m.; to Swinlees, 2¼ m.; to Troon, nearly 1 m.; from Bushy to Irvine, 5¼ m., with subsidiary branches of about ¾ m. each to Perceton and Irvine harbour; and from near Blair to Strathaven, 18 m.; making a total of nearly 30 m. See also *Ayrshire and Bridge of Weir; Glasgow and Belfast Union; Glasgow, Dumfries, and Carlisle;* and *Kilmarnock and Troon.* The company has leased or purchased the Glasgow, Paisley, and Johnstone Canal.

Glasgow Southern Terminal.—From the Glasgow, Barrhead, and Neilston Direct to the Caledonian Railway; length rather over 1 m.; act passed 1846. Part of a more extensive project; and is to be made over to the *Glasgow, Barrhead, and Neilston Direct* Railway Company.

Glasgow, Strathaven, and Lesmahagow Direct.—From the Glasgow, Barrhead, and Neilston Direct Railway near Pollokshaws, to Strathaven; length 15¼ m.; act passed 1846.

Great North of Scotland.—From Aberdeen to Inverness, with branches to Banff, Portsoy, Garmouth, and Burghead. Main line, 107¾ m.; branches, 33¼ m.; total length, 138¼ m.; act passed 1846. See *Great North of Scotland; Eastern Extension.*

Great North of Scotland; Eastern Extension.—From Dyce to Fraserburgh, with branches to Peterhead, &c. Main line, 36¾ m.; branches, 10¾ m., total length, 47¼ m.: act passed 1846. To be leased to the *Great North of Scotland* Railway Company.

Hawick Branch.—See *Edinburgh and Hawick.*

Johnstone and Ardrossan.—See *Ardrossan.*

Kilmarnock Branch.—See *Glasgow, Paisley, Kilmarnock, and Ayr.*

Kilmarnock and Troon. [P. C., p. 266.]—The act of 1837, mentioned in P. C., note (*h*), was never carried into effect; but an act of 1846 sanctions the leasing of the line to the *Glasgow, Paisley, Kilmarnock, and Ayr* Railway Company, the alteration of certain parts, the conversion of the whole into a locomotive line, and two new branches, amounting to 2¼ m.

Leith Branch.—See *Edinburgh and Dalkeith.*

Monkland and Kirkintilloch. [P. C., p. 266.]—An act of 1843 authorised new branches amounting to about 1 m., and one of 1846 sanctions a branch of 2 m. 1100 yards to Chapel Hall, and one of 231 yards to the Glasgow, Garnkirk, and Coatbridge Railway. The original gauge of the line was 4 ft. 6 in.; but an act of 1845 provides for an alteration to 4 ft. 8½ in. See *Monkland Mineral.*

Monkland Mineral.—This is the collective title of the *Monkland and Kirkintolloch, Slamannan,* and *Ballochney* Railways, which have amalgamated with one another, though without the authority of an act of Parliament, and have leased the *Glasgow, Airdrie, and Monklands* Junction line. It was agreed to amalgamate the whole with the *Edinburgh and Glasgow;* but as intimated under that line, the carrying out of the arrangement is (November, 1846) very uncertain.

Morayshire.—From Stotfield and Lossiemouth Harbour to Elgin, Rothes, and Craigellachie; length 11¼ m.; act passed 1846.

Newtyle and Coupar Angus. [P. C., p. 266.]—Purchased by the *Scottish Midland Junction* Railway Company, to form part of their line.

Newtyle and Glammis. [P. C., p. 266.]—Length, 7¼ m. Purchased by the *Scottish Midland Junction* Railway Company to form part of their line.

North British.—Main line, from Edinburgh to Berwick 57¾ m.; branch to Haddington, 4¼ m.; act passed 1844; opened June, 1846. The company has purchased the *Edinburgh and Dalkeith* line under the powers of an act of 1845, which authorises them to improve it and to make new branches amounting to 1¾ m. in connexion with it. In the same session an act was obtained for the *Edinburgh and Hawick* line, which is now incorporated with the North British; and in 1846 acts were passed for making alterations in the Musselburgh and Leith branches of the Edinburgh and Dalkeith line; for making new branches to the extent of about 15¼ m., consisting of the Tranent branch, of ¾ m., the Cockenzie branch, of nearly 1½ m., the North Berwick branch, of over 4¼ m., and the Dunse branch, of rather more than 9 m.; and also for making branches to the extent of about 25 m. in connexion with the Hawick line, consisting of the Selkirk branch, rather over 5 m.; the Kelso branch, nearly 12¼ m., and the Jedburgh branch, nearly 7¼ m.

Paisley and Renfrew. [P. C., p. 266.]—Gauge, 4 ft. 6 in. Both passengers and goods are conveyed by horse power.

Polloc and Govan. [P. C., p. 266.]—See *Clydesdale Junction.* Amalgamated, under an act of 1846, with the *Caledonian* Railway.

Scottish Central.—The original act, passed in 1845, was for a main line of nearly 46¼ m., from the Edinburgh and Glasgow Railway, by Stirling, to Perth, with a branch of 1¼ m. to Falkirk; others, passed in 1846, sanction branches of 4¼ m., by Alloa Ferry to Tillicoultry; of nearly 9¼ m. to Crieff; and of 3¼ m. to Denny; and also terminal branches amounting to 2¼ m. at Perth. It had been agreed to amalgamate with the Edinburgh and Glasgow Railway Company; but the bill for that purpose having been thrown out in 1846, arrangements have been since made for leasing the line to the *London and North-Western, Lancaster and Carlisle,* and *Caledonian* Railway Companies jointly. See also *Dunblane, Doune, and Callander.*

Scottish Grand Junction.—Main line, from Oban to Crianlarich, in the county of Perth, 39¾ m.; branch to Lochlomond, 6¼ m.; act passed 1846. Part of a more extensive projected railway, for connecting the West Highlands and islands of Scotland with Glasgow.

Scottish Midland Junction.—The original act, passed in 1845, was for a main line of 30¾ m. from Perth to Forfar, with short branches, increasing the length to 33¼ m., to connect it with the Scottish Central and Arbroath and Forfar Railways. An act of 1846 sanctions additional branches to the extent of nearly 16 m., consisting of the Dunkeld branch, 8¼ m., the Blairgowrie branch, 5 m., and the Kirriemuir branch, over 2¼ m. The company have purchased the *Newtyle and Coupar Angus* and *Newtyle and Glammis* Railways, which will be altered so as to form part of their main line. It had agreed to amalgamate with the Edinburgh and Glasgow and Scottish Central Railway Companies, before their contemplated union was broken off.

Shotts and Wilsontown.—See *Wilsontown, Morningside, and Coltness.*

Slamannan. [P. C., p. 266.]—The original projected branch to Bathgate not having been executed, the company obtained an act in 1846 for a new one of nearly 4¼ m., and also for a branch to Jawcraig, of 1¾ m. See likewise *Slamannan and Borrowstounness* and *Slamannan Junction.* Both of those lines were included in the arrangements by which, prior to the recent changes noticed under *Edinburgh and Glasgow,* it was intended to amalgamate the Slamannan Railway, with its associated lines, the *Ballochney,* and the *Monkland and Kirkintilloch,* under the general name of the *Monkland Mineral* Railways, with the Edinburgh and Glasgow. Like the other mineral lines in the district, the Slamannan Railway was originally laid on the 4 ft. 6 in. gauge.

Slamannan and Borrowstouness.—Main line, from near the northern terminus of the Slamannan Railway to the Frith of Forth, and thence to the town or harbour of Borrowstouness, 5¼ m.; and two branches to the Edinburgh and Glasgow Railway, about 1½ m., total length, 6¾ m. Act passed 1846. To be made by the *Slamannan* Railway Company, which see.

Slamannan Junction.—A line of about 1 m. to connect the Slamannan and Edinburgh and Glasgow Railways. Act passed 1844; containing power to lease or sell the line to the Edinburgh and Glasgow or Slamannan Railway Companies. See *Slamannan.*

Stirling and Dunfermline.—Main line, 20¾ m.; branches from near Alloa to Tillicoultry and the harbour of Alloa, 3¾ m.; total 24¼ m.; act passed 1846. Proposed to be leased to the *Edinburgh and Glasgow* Railway Company.

Stirlingshire Midland Junction.—Main line, from the Edinburgh and Glasgow Railway to the Scottish Central Railway, 5¼ m.; branch to Carron iron-works, 1¼ m.; branch to Falkirk iron-works, ¾ m.; total, 7¾ m.; act passed 1846. Sold to the *Edinburgh and Glasgow* Railway Company.

Strathtay and Breadalbane.—From the line of the projected

Perth and Inverness Railway, (a scheme abandoned for the present during the session of 1846,) to Aberfeldy; length, nearly 9¼ m.; act passed 1846.

Wilsontown, Morningside, and Coltness, (originally called *Shotts and Wilsontown*).—A mineral line of about 8½ m., in extension of the Wishaw and Coltness Railway; made under an act of 1841, and opened in June, 1845. Acts of 1846 authorise the improvement of the original line, and the construction of branches of nearly 1½ m. to Shotts, of nearly 4¾ m. to Climpy, of 5½ m. to Bathgate, and of 8¾ m. to join the Caledonian Railway.

Wishaw and Coltness. [P. C., p. 266.]—An act of 1846 authorises the construction of a line of nearly 2¼ m. from near the southern termination of the Cleland branch to Murdieston, with a branch from it of rather more than 2¼ m. to Goodockhill, in the parish of Shotts; making a total of 5 m. An agreement had been made for the sale of the whole undertaking to the *Edinburgh and Glasgow* Railway Company; but it is now (November, 1846) expected that a union with the *Caledonian* Railway Company will be substituted for the intended arrangeme

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Belfast and Ballymena.—Main line nearly 33 m.; Carrickfergus branch 3 m.; Randalstown branch 2 m.; total 38 m.; act passed 1845.

Belfast and Cavehill. [P. C., p. 266.]

Belfast and County Down.—From Belfast to Downpatrick. 24¼ m.; with branches to Holywood, Newtownards, Bangor, and Donaghadee, amounting to 20¾ m.; total length, 45½ m.; act passed 1846.

Clonmel and Thurles.—From the Waterford and Limerick Railway at Clonmel, to the Great Southern and Western Railway at Cashel, 15½ m.; branch to the Slievardagh Collieries, 10¼ m.; total, 25¾ m. Act passed 1846. Sold to the *Great Southern and Western* Railway Company.

Cork and Bandon.—Length, 20 m.; act passed 1845.

Cork, Blackrock, and Passage.—From Cork, through Blackrock, to Passage West; length, 6¾ m.; act passed 1846.

Cork and Passage. [P. C., p. 266.]—Abandoned; but see *Cork, Blackrock, and Passage*.

Cork and Waterford.—Main line, 78 m.; branch to Fermoy, 18 m.; branch to Tramore, 1½ m.; total length, 97½ m.; act passed 1846.

Dalkey.—See *Dublin and Kingstown*.

Dublin, Belfast, and Coleraine Junction.—Main line from Armagh to Portrush, 70 m.; branch to Randalstown, 13 m.; branch to Ballymoney, 4¾ m.; total length, 87¾ m.; act passed 1846.

Dublin and Belfast Junction.—Main line, from Drogheda to Portadown, 56 m.; branch to Navan, 17¼ m.; act passed 1845. An agreement was made in 1846, for selling the Navan branch to the *Dublin and Drogheda* Railway Company.

Dublin and Drogheda. [P. C., p. 266.]—Opened May, 1844; gauge 5 ft. 3 in. An act of 1845 authorises the *Howth Branch*, 3¾ m. long, the greater part of which was opened in July, 1846. The company has purchased the Navan branch of the *Dublin and Belfast Junction*, which see.

Dublin, Dundrum, and Rathfarnham.—Dublin to Dundrum, rather over 3 m.; branch to Rathfarnham, over 2¼ m.; total length, nearly 5¼ m.; act passed 1846.

Dublin and Kingstown. [P. C., p. 266.]—An extension of 1¾ m. to Dalkey, worked by atmospheric power, was made without an act of parliament, and opened in March, 1844. It follows the line of a tramroad made by the Commissioners of Kingstown harbour. An act of 1846 authorises a further extension of 7¼ m. to the bridge of Bray. See *Waterford, Wexford, Wicklow, and Dublin*.

Dundalk and Enniskillen.—From Dundalk to the Newry and Enniskillen line at Clones, 40¾ m.; the remaining distance, about 36 m. from Clones to Enniskillen, to be made by the Newry Company, with provisions for its joint use by both lines; act passed 1845.

Dundalk Western. [P. C., p. 266.]—Abandoned.

Galway and Kilkenny.—See *Kilkenny and Great Southern and Western*.

Great Leinster and Munster. [P. C., p. 266.]—Owing to financial difficulties the act of 1837, amended by one of 1841, was never carried into effect. The *Great Southern and Western* line has superseded the Great Leinster and Munster between Dublin and Carlow, but an act of 1846 confers renewed powers for the remainder of the line from Carlow to Kilkenny, about 25¼ m. with a branch of 1½ m. to Milford; and another act of the same session authorises an extension of 31¼ m. from Kilkenny to Clonmel. The *Wexford, Carlow, and Dublin Junction* line is to be amalgamated with this undertaking under the new name of the *Irish South-Eastern* Railway.

Great Southern and Western.—Main line from Dublin to Cashel, 98¼ m.; branch from Monasterevan to Carlow, 24 m. For these the act was obtained in 1844. A second act, passed in 1845, allows an extension of 77 m. to Cork, with a branch of 21½ m. to Limerick. The Limerick branch, however, being identical with part of the *Waterford and Limerick* Railway is not to be made if that line is carried into effect. Another act passed in 1846, authorizes an extension of nearly 1¼ m. to the river Lee at Cork. Of the original line, the portion between Dublin and Carlow, about 56¼ m. was opened in August, 1846. See also *Clonmel and Thurles*; *Limerick, Ennis, and Killaloe Junction*; *Mallow and Fermoy*; *Mountmellick Junction*; and *Templemore and Nenagh*.

Irish South-Eastern.—See *Great Leinster and Munster*; and *Wexford, Carlow, and Dublin Junction*.

Kilkenny and Great Southern and Western.—From Kilkenny to the Great Southern and Western Railway near Cuddagh; length 26 m.; act passed 1846. Part of a much more extensive scheme called the *Galway and Kilkenny* Railway. Power given to lease or sell the line to the *Waterford and Kilkenny* Railway Company.

Killarney Junction.—From Mallow to Killarney, length 39¾ m.; act passed 1846.

Limerick, Ennis, and Killaloe Junction.—Main line, from Limerick to Ennis, 23¼ m.; branch from Limerick to Killaloe, 12¼ m.; branch from Limerick to Clare, nearly 1 m.; junction with Great Southern and Western line, ½ m.; total length, about 37 m.; act passed 1846. Power given to lease or sell the line to the *Great Southern and Western* Railway Company.

Londonderry and Coleraine.—Main line, crossing Lough Foyle, 32¼ m.; branch to Newtown Limavady, 6¾. Act passed 1845. To reclaim 18,000 acres of land from the sea.

Londonderry and Enniskillen.—Length, by original act of 1845, 56 m. An act of 1846 sanctions a deviation of 22 m.; a branch of nearly 1 m. to Omagh; and an extension of 1½ m. Nearly completed (November, 1846) from Londonderry to Strabane.

Mallow and Fermoy.—Joins the *Great Southern and Western* Railway (with which the act gives power to amalgamate) at Mallow; length, 16¾ m.; act passed 1846.

Midland Great Western.—The original act, passed in 1845, authorises a line of 77½ m., from Dublin to Mullingar and Longford, chiefly running upon the banks of the Royal Canal, which has been purchased by the company. Acts of 1846 sanction an extension or branch of nearly 28 m., from Mullingar to Athlone; a branch of 2¾ m. to the river Liffy, at Dublin; and a deviation of 14¼ m. near Longford.

Mountmellick Junction.—From the Great Southern and Western Railway at Carne or Curraghane to Mountmellick; length, barely 3¾ m.; act passed 1846. Gives power to lease or sell the line to the *Great Southern and Western* Railway Company.

Mullingar and Athlone.—See *Midland Great Western*.

Navan Branch.—See *Dublin and Belfast Junction*.

Newry and Enniskillen.—Length, 71¼ m.; act passed 1845. See *Dundalk and Enniskillen*.

Newry, Warrenpoint, and Rostrevor.—Main line, from Newry to Rostrevor, 8¼ m.; branch to Warrenpoint, ½ m.; act passed 1846.

Slievardagh Collieries Branch.—See *Clonmel and Thurles*.

Sligo and Shannon.—From Lough Allen to Lough Gill, in the county of Leitrim; length, 13 m.; act passed 1846.

South-Eastern.—See *Irish South-Eastern*.

Templemore and Nenagh.—Length, 20¼ m; the act, passed in 1846, gives power to amalgamate with, or lease or sell the line to, the *Great Southern and Western* Railway Company.

Ulster. [P. C., p. 266.]—Completed in September, 1842, to Portadown, about 25 m. The remaining 11 m. to Armagh was abandoned, but a new act was obtained for it in 1845. Gauge 6 ft. 2 in., but to be altered to 5 ft. 3 in.

Waterford and Kilkenny.—Main line, 31 m.; branch to Kells, 6¼ m.; act passed 1845.

Waterford and Limerick.—Length, including a short branch at Waterford, 78 m.; act passed 1845. An act for a similar line was obtained in 1826, but the project was abandoned.

Waterford, Wexford, Wicklow, and Dublin.—Main line, from Waterford to Dublin, 111¼ m.; line from Wexford to join it near Scarawalsh Bridge (to connect it with a projected line from Enniscarthy to Carlow), 22 m.; branch to Wicklow, rather over 2 m.; total length, 135¼ m. The act, passed in 1846, confers power to lease the *Dublin and Kingstown* Railway.

Wexford, Carlow, and Dublin Junction.—From Wexford to Carlow; length, 29 m.; act passed 1846. Amalgamated with the *Great Leinster and Munster* under the title of the *Irish South-Eastern* Railway Company.

TRANSOM. [MULLION, P. C.]

TRANSPOSITION, in Music, is a change of the original key to one higher or lower. This is generally performed, at a moment's notice, by the accompanist,—sometimes to suit the reasonable convenience, but more often to gratify the whim, of the singer.

To the singer Transposition is unattended by any difficulty whatever: the change is little more than imaginary, except so far as relates to the compass of the voice. To the accompanist it is far otherwise. The latter, unless playing from memory, must assign to all the notes, as regards their pitch,

* The gauge of all Irish railways is required to be 5 feet 3 inches, in accordance with a recommendation made by the Board of Trade in 1843.

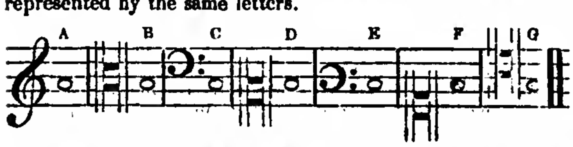
or their situations on his instrument, names wholly different from those in the copy placed before him. To accomplish this he has to *suppose* a change of clef, or clefs, and thus give new designations to all the lines and spaces. For instance—and without going into the extreme case of transposing from a score—a pianoforte player is required to transpose an air a whole tone lower,—from A to G. For this purpose he must assume a change in both clefs, the treble into the tenor, and each note to be played an octave higher than it is written; the base into the alto, and each note to be played an octave lower than it is written. Example in A.

The same as read by the performer, when transposed to G.

The difficulty attending this process is so great, that no amateur, and few discreet musicians, unless professed accompanists, or well acquainted with the composition to be transposed, will undertake the task; for to perform it in an artist-like manner, at first sight, requires a degree of practical skill only to be gained at the expense of much time that might be employed to far greater advantage in studying those higher branches of the art in which the most experienced will always find something to learn. Our remarks, it will be understood, relate to performers on the pianoforte and organ. To those who read from a single staff, and play single notes only, as violinists, flutists, &c., the task of transposing is comparatively easy.

To meet all the demands of Transposition, a familiar knowledge of no less than seven clefs is necessary, and two of these—the mezzo-soprano, and barytone, or bass clef on the 3rd line [CLEF, P. C.]—may be said to have become obsolete, for we venture to assert that not one musician in five hundred is practically acquainted with either.

The annexed table will exemplify the use of clefs in transposition. It shows how to transpose a given key-note—A for instance—into any other note of the scale, and, consequently, how to transpose the whole of any composition. It is hardly necessary to add, that the semitonic scale, as concerns line and space, is governed by the diatonic; that A ♯, A ♭, &c., have the same places in the staff as the natural notes represented by the same letters.



TRAVERS, JOHN. The author of compositions so popular, elegant, and charming as 'Haste, my Nanette,'—'I, my dear, was born to-day,'—'When Bibo thought fit,'—'Soft Cupid,'—is fairly entitled to a few lines in our biographical department, though his life was void of any remarkable incident. He was educated first in St. George's Chapel, Windsor, afterwards under the celebrated Dr. Greene [GREENE, P. C.]. About the year 1725 he followed Kelway as organist of St. Paul's, Covent Garden, and subsequently filled the same situation also at Fulham. In 1737 he was appointed organist to the Chapels Royal. He died in 1758, and was succeeded in the latter office by Dr. Boyce.

Travers composed much cathedral music, but except an anthem, 'Ascribe unto the Lord,' and a 'Te Deum,' his productions for the church have fallen into disuse. We will only add, that Dr. Burney's notice of him is neither discriminating nor just.

TRAVERSE. [PLEADING, P. C.]

TREASON. [LAW, CRIMINAL, P. C. S.]

TRENTO, ANTONIO DA, supposed to be the same person as Antonio Fantuzzi. He was born at Trent about the commencement of the sixteenth century; and was, according to Vasari, the pupil of Parmigiano at Parma. Parmigiano employed Antonio to engrave his works in wood, and he was one of the first and most eminent of the Italian wood-engravers: he appears to have imitated the cuts of Hugo da Carpi. Antonio Fantuzzi lived with Parmigiano, but apparently unwillingly, for about 1530 he decamped from his master, taking with him many of his drawings, plates, and wood-cuts, and went, it is supposed, to France, where he appeared again under the name of Antonio da Trento. He attached himself in France to Primaticcio, who employed him to engrave or etch some of his works in copper: he executed also etchings after some other masters while in France. Bartsch describes 37 etchings by him, but he is more celebrated for his wood-cuts which he engraved in chiaroscuro. The time of his death is not known, but it happened probably about 1550; the dates on his prints reach to 1545.

Some of the wood-cuts of Antonio are printed with three, others with two blocks; they are chiefly after Parmigiano, as —The Twelve Apostles; St. John in the Wilderness; the Martyrdom of St. Peter and St. Paul; St. Cecilia; the Tiburtine Sibyl; and others. Among his etchings is one of Regulus in the Cask, after Giulio Romano.

(Vasari, *Vite de' Pittori*, &c.; Bartsch, *Peintre-Graveur;* Nagler, *Allgemeines Künstler Lexicon.*)

TRETOSTE'RNON, fossil genus of Chelonidæ from Tilgate forest. (Owen.)

TREVI'GI, or TREVI'SI, GIRO'LAMO DA, born at Trevigi in 1508, was apparently the son of the painter Piermaria Pennacchi, who was doubtless his son's instructor in the art. Girolamo, however, not wholly satisfied with the accuracy of the Venetian painters, became an imitator of the style of Raphael, and combined to a considerable extent the qualities of both schools. He lived some time in Bologna, where he painted some excellent works, especially from the story of Sant' Antonio of Padua, in oil, in the cathedral. He left Bologna in consequence of the superior fame of Perino del Vaga, then at Bologna. After painting several works in fresco at Venice, Trent, and some other places, he came to England and entered the service of Henry VIII., who employed him as architect and engineer, with a fixed salary of nearly 100*l.* per annum. He was engaged in the capacity of engineer in the year 1544 before Boulogne, and was there killed by a cannon-shot, in his 36th year.

There are some excellent portraits by Girolamo; they are well coloured and in an elaborate but broad manner, much in the style of the portraits by Raphael: there is a fine specimen in the Colonna palace at Rome; it is a half length of a man in the picturesque costume of the period, holding a ring or signet in his hand. There are or were other pictures by Girolamo in this palace. A picture of the Madonna with various saints, which, according to Vasari, was Girolamo's masterpiece, is now in the collection of Mr. Solly, in London: it was formerly in the church of San Domenico at Bologna.

There was an earlier painter called Girolamo da Trevigi by whom there are still works bearing dates from 1470 to 1492: his surname according to Federici was Aviano.

(Vasari, *Vite de' Pittori*, &c.; Ridolfi, *Vite*, &c.; Lanzi, *Storia Pittorica*, &c.)

TRICARPEL'LITES, a genus of fossil fruits from Sheppey. (Bowerbank.)

TRICHO'MANES, a genus of ferns belonging to the sub-order Hymenophyllaceæ. The thecæ are on an elongated filiform receptacle within a cup-shaped involucre of the same texture with the frond.

T. speciosum is the only British species. It is extremely rare, and very beautiful, combining the characters of the true ferns, mosses, and sea-weeds. In texture as well as in scent it resembles some of the marine algæ, and it is found to assume the same life-like appearance when immersed in water after being kept perfectly dry for many years. It is found at Killarney, Wicklow, and Youghal in Ireland, in great beauty. The soil which seems to suit it best is a mixture of loam and sand, interspersed with pieces of turf.

(Newman, *British Ferns;* Babington, *Manual of British Botany.*)

TRICHONE'MA, a genus of plants belonging to the natural order Irideæ. It has a regular 6-cleft perianth, with spreading segments. The 3 stigmas are bifid, the lobes slender. *T. columnæ* is the only British species; it has a solitary 1-flowered nodding scape, filiform compressed leaves, the spath longer than the tube of the corolla, the style shorter than the stamens. The flower is pale purple or violet, with a yellow centre. It is found in sandy places in Jersey and Guernsey. (Babington, *Manual.*)

TRIE'NTALIS, a genus of plants belonging to the natural order Primulaceæ. It has a 7-parted calyx, a rotate 7-parted corolla, and 7 stamens inserted at the base of the corolla. The capsules are many-seeded, opening with 5 revolute fugacious valves. The seeds are invested with a reticulated tunic. *T. Europæa* has oblong obovate obtuse leaves, a stem from 4 to 6 inches high, with the leaves mostly at the top. The flowers are on short peduncles, white, with a yellow ring. The valves of the capsules soon fall off. It is native of England and the Highlands of Scotland. (Babington, *Manual.*)

TRIGLA, a genus of Acanthopterygious osseous fishes, popularly known as Gurnards, and belonging to the family *Loricati* in the arrangement of Cuvier.

The head of *Trigla* is mailed and angular: the opercle and shoulder-bones armed with spines; the body is scaly; there are two distinct dorsal fins; beneath the pectorals are three detached rays; the branchiostegous membrane has seven rays; both jaws and the front of the vomer are armed with fine velvety teeth. The gurnards are fishes always remarkable for singularity of form, and often for brilliancy of colouring. They derive their popular appellation from a grunting noise which they make when taken out of the water. In the British seas the commonest species are the grey gurnard (*Trigla Gurnhardus*), a silvery grey fish more or less clouded with brown and speckled with black; the red gurnard (*Trigla Pini*), of a bright rose-red colour; and the sapphirine gurnard (*Trigla Hirundo*), a large and handsome fish remarkable for the vivid green and blue hues of the inner surface of its large pectoral fins. The two last are most abundant in the western coasts. Several other rarer species are also inhabitants of the British seas. There are some beautiful small species in the Mediterranean, where also lives the flying-gurnard (*Dactylopterus volitans*), which differs generically from *Trigla* in having the fin-rays of the pectorals connected by membranes, by means of which the fish is enabled to support itself for some time in the air in the manner of the flying-fish. It is a handsome species, above a foot long. Another flying-gurnard (*Dactylopterus Orientalis*) lives in the Indian Ocean.

TRIGLYPH. [CIVIL ARCHITECTURE, P. C.]

TRIGONELLI'TES. This obscure genus of fossil mollusca, to which many names have been applied (as Aptychus, Ichthyosagonites, &c.), contains several forms which undoubtedly appertain to Cephalopoda, and offer analogies to a part of the Sepiosteum, and a part of the Belemnite.

TRIGONOCARPUM, a genus of Monocotyledonous fossil fruits in the coal formation of England. (Brongniart.)

TRILLIUM, a genus of plants belonging to the natural order Melanthaceæ. It has 3 herbaceous sepals, 3 coloured petals, and 3 sessile stigmas. The berry is superior and 3-celled, the cells many-seeded.

T. erectum has a large præmorse rhizoma with thick horizontal fibres. The stem is about a foot in height, and sheathed at the base. The leaves large, acuminate, and sessile. The peduncle about half as long as the leaves, inclining to one side. The flower is large and of a dark purple. (Lindley, *Flora Medica.*)

TRINU'CLEUS, a large and remarkable group of Trilobites chiefly or wholly found in the lower Silurian strata of Europe. (Murchison.)

TRIO'DIA, a genus of grasses belonging to the tribe Avenineæ. The glumes are from 2 to 3 flowered; the outer palea rather coriaceous, smooth, rounded on the back, bifid with an intermediate broad point sometimes becoming the base of a kneed awn. *T. decumbens* has a racemose panicle, few oval spikelets, the flowers scarcely extending beyond the glumes, without awns. The leaves flat, sheaths rather hairy. Ligule reduced to a tuft of nerves. The glumes smooth, coriaceous, and hiding the flower. It is found in mountain pastures in Great Britain. (Babington, *Manual.*)

TRI'ODON. [GYMNODONTES, P. C. S.]

TRIO'STEUM (from τρι, three, and ὀστέον, a bone; in reference to the three bony ends in each berry), a genus of plants belonging to the natural order Caprifoliaceæ. It has a calyx, with an ovate tube and a 5-parted permanent limb, with linear lanceolate permanent lobes. The corolla is tubular, almost equally 5-lobed, gibbous at the base, and longer than the calyx. The stamens are 5, and inclosed; the stigma oblong and thick; the berry coriaceous, obovately triquetrous, crowned by the calyx, 3-celled, and 3-seeded. The species are permanent herbs, rarely suffruticose.

T. perfoliatum, Fever-wort, has an erect hairy fistular round stem from one to four feet high. The leaves opposite, the pairs crossing each other, ovate, lanceolate, acuminate, entire, rather flat, abruptly narrowed into the petiole; the flowers sessile, apparently verticillate. It is native of North America, in the United States, on rich rocky grounds, particularly in limestone soil.

The species of *Triosteum* will grow in almost any kind of soil, although they prefer a vegetable or peat mould, and they are easily propagated by dividing at the root or by seeds, which generally ripen in abundance.

(Don, *Gardener's Dictionary;* Lindley, *Flora Medica.*)

TRISE'TUM, a genus of grasses belonging to the tribe Avenineæ. It has crowded spikelets. Glumes from 2 to 6 flowered. The outer palea with fenced lateral nerves, ending in 2 acute teeth, armed. The awn dorsal, kneed, and twisted. The ovary glabrous. The fruit neither crested nor furrowed. *T. flavescens* has a much-branched panicle, diffuse and equal; the glumes very unequal, about 3-flowered. The radical leaves and sheaths hairy. The ligule very short and obtuse. The spikelets yellowish. The upper glume oblong, lanceolate, acuminate. The floral axis hairy. It is found in fields in Great Britain. (Babington, *Manual.*)

TRISTI'CHIUS, a genus of fossil fishes from the coal measures near Glasgow and Fermansgh. (Agassiz.)

TRIXA'GO, a genus of plants belonging to the natural order Scrophularineæ. It has a tubular 4-cleft calyx, a tubular 2-lipped corolla, pointed capsules, and many-seeded cells. The seeds are slightly angular and very minutely crenate ribbed. *T. viscosa*, the only British species, has a round high simple stem, a fibrous root, and opposite leaves; the upper leaves are alternate, ovate, lanceolate, sessile, and acutely serrate. The flowers axillary, distant, and yellow; the anthers hairy. It is found in damp places in the west of Scotland and south of Ireland. (Babington, *Manual.*)

TROCHO'CRINUS, a group of fossil Crinoidea (Portlock), from the Silurian strata of Tyrone.

TROSSACHS are in Scotland, on the northern declivities of Ben Venu, on the southern banks of Loch Katrine. They constitute a landscape of a very peculiar kind: for about two miles in length the surface of the ground presents the greatest imaginable irregularity, consisting of a succession of ravines, depressions, slopes, level tracts, and descents, sometimes gentle and sometimes precipitous. The whole is overgrown with bushes or trees, and constitutes the most complete maze which can be conceived. The paths which traverse this tract turn at every few paces into a different direction, and thus the traveller finds himself almost at every minute in a country which has totally changed its aspect, and presents quite different objects from those which met his eyes a few moments before. The difficulty of exploring and searching the recesses of this tract, favoured, in the last century, the illicit distillery of whiskey; but it is stated that, at present, this trade has entirely ceased.

TROUGHTON, EDWARD, the first astronomical instrument maker of our day, was born October, 1753, and died at his house in Fleet Street, June 12, 1835. He came of a family of respectable yeomen, and was placed in the firm of his uncle and brother, who carried on business in London as mathematical instrument makers. In 1782 the Troughtons established themselves in Fleet Street; in 1826 Edward Troughton, then the sole survivor, took Mr. W. Simms into partnership. There is a full memoir of Troughton in the monthly notices of the 'Astronomical Society,' vol. iii. p. 149. A handsome subscription bust, by Chantrey, is in the Observatory at Greenwich. In the last years of his life Mr. Troughton was nearly deaf, only hearing by the help of a powerful trumpet; and he never could distinguish colours otherwise than by their brightness,—a ripe cherry and its leaf were to him of the same colour.

The larger astronomical instruments are not the facsimiles of one another, which the smaller and more usual ones are, any more than the great architectural displays of a large city are of the same resemblance to one another which exists in the houses of one and the same street. Each one has its own difficulties, its own objects, and its own way of overcoming the first to meet the second. The great works of Troughton are as well known in the astronomical world as those of Wren in the architectural; but he also applied himself to all the minor branches of his business, and 'of him it may be said with truth that he improved and extended every instrument he touched, and that every astronomical instrument was in its turn the subject of his attention.' 'The instruments which facilitate navigation were peculiarly objects of interest to Mr. Troughton; and long after his infirmities were an effectual bar to the application of his most esteemed friends, he exerted himself to supply the seamen with well-adjusted and accurate sextants.' The articles on astronomical instruments in this work contain frequent references to Troughton's improvements. He wrote one or two articles in the 'Philosophical Transactions,' and several in Brewster's 'Cyclopædia,' &c., references to which will be found in the memoir cited.

TROUS DE LOUP, in the military art, are pits dug in the ground in the form of inverted cones or pyramids, in order to serve as obstacles to the advance of an enemy: each is made about 6 feet in diameter, or in breadth, and as many in depth, and a pointed stake is planted upright in the bottom. The pits should be disposed chequer-wise in two or three rows, their centres being at distances of about 10 feet from one another; and their sides should have such a slope that the enemy's riflemen, should they attempt to occupy them, may not be concealed in them from the view of the troops whom the pits protect.

The earth obtained from the excavations should be formed into a sort of glacis within the line of pits in order that the enemy may not use it to fill them up. Trous de loup are generally formed before the salient points of field-works or in the intervals between them; and they are sometimes executed in rear of such works in order to protect the gorges when these are withou parapets.

TRYPHONI'NUS, CLAUDIUS, a Roman jurist who lived under Septimius Severus and his son Antoninus Caracalla. He wrote notes on the works of Cervidius Scaevola, and twenty-one books of Disputationes, from which there are excerpts in the Digest. There is a rescript of Antoninus to him (Cod. 1, tit. 9, s. 1), but whether in his capacity of governor of Syria or as the agent of the Fiscus is uncertain. He is cited once by Paulus.

TUNNY. [THYNNUS, P. C. S.]

TYLO'PHORA (from τύλος, a swelling, and the root φορ, to bear, in reference to the ventricose pollen masses), a genus of plants belonging to the natural order Asclepiadeæ. It has a rotate 5-parted corolla, the coronet 5-leaved, the leaflets simple and fleshy. The anthers terminated by a membrane; the pollen masses erect, fixed by the base, with simple margins, transverse or ascending, minute and ventricose. The follicles smooth, tapering to the point, compressed, and somewhat angular on one side. The species are twining herbs or subshrubs. The leaves opposite, membranous, and flat. The flowers usually small.

T. asthmatica has a root consisting of many long thick whitish fleshy fibres issuing from a small hard head. It has several twining slender stems, the young parts downy. The leaves are opposite, petioled, linear, cordate-ovate, and from two to three inches long. The flowers rather large, on long pedicels, purplish; the segments of the corolla acute. The roots are acrid, and are used on the coast of Coromandel for the same purpose as ipecacuanha. It is native of various parts of the East Indies. The species grow freely in loam, peat, and sand, and are easily managed. Cuttings readily take root in a moist heat under a glass.

(Don, *Gardener's Dictionary;* Lindley, *Flora Medica.*)

TYMPANO'PHORA, a genus of fossil plants from the Oolitic series of Yorkshire. (Lindley.)

TYPHA, a genus of plants belonging to the natural order Aroideæ and the suborder Lemneæ. The sterile and fertile spikes are cylindrical. The stamens surrounded with setæ. The three anthers on one filament; the ovary surrounded with setæ, at length stalked.

T. latifolia, great Reed-mace, has a stem from six to seven feet high; linear leaves, nearly flat; the sterile and fertile catkins contiguous and very long. The leaves very broad and overtopping the inflorescence. It is found in ponds and lakes in Great Britain. (Babington, *Manual.*)

TYPHUS, a form of fever, in which low nervous symptoms predominate. The following are its principal features:—It has a slow and insidious origin, lasting from fourteen to twenty-eight days. It is attended during the principal part of its course with symptoms of depressed or exhausted nervous power, with feeble pulse, great muscular weakness, and low delirium. There is a dry, rough, dark tongue, black sordes on the teeth and gums, and general fœtor of the body. It is capable of being propagated by the contagious emanations from the person affected. This is the low nervous or typhoid fever of this country. For an account of fever and its distinctions, see FEVER, P. C.; SYNOCHUS, P. C. S.

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VOLUME II.

U.

UDAL TENURE. [SHETLANDS, P. C., p. 385.]

UDOTEA. A spongoid fossil from Bridlington is referred to this genus by Mr. J. E. Lee.

ULODENDRON, one generic division of the great group of Lepidodendroid families of plants which occur in the coal formations.

UNDULATORY THEORY OF LIGHT. This subject has been already treated briefly, under the same designation; and for further notices concerning its principles, as well as for its applications explanatory of the remarkable phenomena of light, the reader is referred to DIFFRACTION, and to POLARIZATION OF LIGHT (P. C.), also to the following articles, which have been introduced in this Supplement: CIRCULAR POLARIZATION; COLOURS OF PLATES; ELLIPTICAL POLARIZATION; POLARIZATION, MOVEABLE; POLARIZED RINGS; SWIFTEST PROPAGATION, PRINCIPLE OF; and VIBRATIONS OF LIGHT.

UNION OF ESTATES. [MERGER, P. C.]

UNITED STATES OF NORTH AMERICA. Since the article OREGON QUESTION, P. C. S., was written the dispute concerning the Oregon territory has been settled. On the 29th of June, 1846, Sir Robert Peel, in the speech in which he announced his resignation of office, informed the House of Commons that the British government had offered a convention to the government of the United States, of which the President of the United States, on the 13th of June, 1846, announced the acceptance by the American government, without the addition or alteration of a single word. The first proposal of the British government was as follows:—

'That from the point in the 49th parallel of N. lat. in which the boundary laid down by existing treaties between Great Britain and the United States terminates, the line of boundary between the territories of the two countries shall be continued westward along the 49th parallel to the middle of the channel which separates the continent from Vancouver's Island, and thence southerly through the middle of the said channel and the Fuca Straits to the Pacific Ocean. Provided the navigation of the channel and straits, south of the 49th parallel, shall be free and open to both parties.'

This leaves to the British the whole of Vancouver's Island, with equal rights of navigation in the Straits. The second proposal was—

'That from the point at which the 49th parallel of N. lat. intersects the great northern branch of the Columbia river, the navigation of the said branch shall be free and open to the Hudson's Bay Company, and for all British subjects trading with the same, to the point where the said branch meets the main stream of the Columbia, and thence down the said main stream to the ocean, with free access into and through the said river or rivers; all the usual portages along the line thus described to be free and open to both parties. Provided that in navigating the said river British subjects shall be on the same footing as those of the United States: it being always understood however, that nothing herein shall be considered as preventing the government of the United States from making any regulations as to the navigation of the river not inconsistent with the present convention.'

The circumstances under which Texas has been annexed to the Union are stated under TEXAS, P. C. S.

Michigan, described as a territory in P. C., was admitted into the Union as a State at the end of 1835. The Governor is elected for two years, and his salary is fixed at present at 1500 dollars per annum. The Senate consists of 18 members, elected for two years; the House of Representatives of 53 members, elected annually. The pay of the members is three dollars a day during the session. The seat of government is at Detroit, or wherever the legislature shall direct, till 1847, when it is to be established permanently. The legal establishments are, a Court of Chancery, a Supreme Court, Circuit Courts, and a District Criminal Court. The Chancellor has a salary of 1500 dollars, and there are five Chancery Circuits. In the Supreme Court there is a Chief Justice, with a salary of 1600 dollars, and three associate Justices with salaries of 1500 dollars each. The four Judges of this court are appointed by the Governor, with the advice and consent of the Senate, for a period of seven years. There are four judicial circuits, in each of which one of the Judges of the Supreme Court presides. The University of Michigan, which was opened at the end of 1842, has since been gradually increasing. At the end of 1845 the main institution at Ann Arbor had about 70 students, and the five branches, or preparatory schools, at Tecumseh, Romeo, Kalamazoo, White Pigeon, and Ann Arbor, about 180 students. The professorships were—1, Greek and Roman Language,; 2, Mathematics; 3, Moral and Mental Philosophy; 4, Geology and Mineralogy; 5, Botany and Geology. In 1844 the number of scholars in the Common Schools was 66,818, and the amount apportioned from the state treasury among the several districts was 28,063 dollars. Michigan is thought, both as to the means of education and the success of the system pursued, to be little behind the most forward of the eastern States. The state prison at Jackson is constructed on the Auburn plan. The Central Railroad runs from Detroit to Marshall, 110 miles, and 36 miles more of the road were expected to be completed by the end of 1845. The Southern Railroad runs from Monroe to Hillsdale, 68 miles. The population of Michigan in 1830 was 31,639; in 1840 it was 212,267. There are no slaves.

Florida was admitted into the Union as a State in 1845, the first Governor having entered upon his office in October of that year. The Governor is elected for four years, the Senators for two years, the Representatives for one year. The number of Representatives is never to exceed 60. The Judges of the Supreme Court are to be elected by a concurrent vote of both Houses, at first for five years, and after that according to good behaviour. The right of voting is to belong to every free white male, aged 21 or upwards, who has resided in Florida two years, and six months in the county in which he votes, and who shall be enrolled in the militia or by law be exempt from serving therein. No laws are to be passed to emancipate slaves, or to prohibit the immigration of persons bringing slaves with them. The General Assembly may prevent free coloured persons from entering the State. The population in 1830 was 34,730; in 1840 it was 54,447, of whom 25,717 were slaves. (*American Almanacs*, 1837, 1845, 1846.)

URANOSCOPUS, a genus of Acanthopterygious osseous fishes of the perch family, and very nearly related to the weavers (*Trachinus*) of the British seas. One or two species inhabit the Mediterranean. The head is nearly cubical, and the eyes placed in the flat summit, so that they look upwards: hence the name. The mouth is turned up in a similar manner. This arrangement agrees with the habits of the fish, which buries itself in sand all but the summit of the head, and thus lies in wait for its prey. Its colour resembles the sand in which it lives.

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V.

VACHELLIA, a genus of plants belonging to the natural order Leguminosae. The flowers are polygamous; the calyx 5-toothed; the corolla tubular, gamopetalous, and 5-toothed. The stamens are numerous and distinct; the legume cylindrical and turgid, scarcely dehiscent, filled with pulp, and a double row of seeds.

V. Farnesiana is a native of the East and West Indies and Africa. It is a large shrub or small tree, with straight sharp thorns. The leaves are bipinnate, the leaflets linear and nearly glabrous; the peduncles and petioles more or less hairy; the flowers capitate, the heads globular, 2 or 3 together, each on an axillary peduncle. The bark exudes a considerable quantity of gum. The flowers when distilled yield a delicious perfume.

(Lindley, *Flora Medica.*)

VAILLANT, WALLERANT, a very distinguished portrait painter, was born at Lille in 1623, and was the pupil of Erasmus Quellinus, at Antwerp. He painted the portrait of the Emperor Leopold I. at Frankfort, and many of the people of his court. He subsequently went with Marshal Grammont to Paris, and was there equally distinguished by the French court. After having amassed considerable riches he died at Amsterdam, in 1677.

Vaillant was employed in 1656 at Brussels by Prince Rupert to assist him in executing some plates in the new method of mezzotinto engraving then communicated to the Prince by Siegen [SIEGEN, LUDWIG VON, P. C. S.]. As Vaillant is the first *artist* who engraved in this style, his prints have more than ordinary interest. Among these are two portraits of Prince Rupert, one of which is inscribed—Prins Robbert, vinder van de Swarte Prent Konst, which is one of the principal causes of Siegen's being so long deprived of the merit of his invention.

Vaillant had four younger brothers, who were all painters or engravers and his pupils.

(Descamps, *Vies des Peintres Flamands*, &c.; De Laborde, *Histoire de la Gravure en Manière Noire.*)

VALENS, ABURNUS, a Roman jurist, whose age is partly determined by the fact that he cites Javolenus and Julianus (Dig. 4, tit. 4, s. 33), from which we may conclude that he was younger than both. He is called Aburnius in the Florentine Pandect. He was a Sabinian, as appears by his being placed by Pomponius among the followers of Javolenus. It appears that he was living under Antoninus Pius (Capitol., *Pius*, 12), though, as the text of Capitolinus stands, he is called Salvius Valens. His complete name may have been Salvius Aburnus Valens; or Salvius in this passage may be separated from Valens and may mean Salvius Julianus. But there is a rescript of Pius (Dig. 48, tit. 2, s. 7, § 2) addressed to Salvius Valens.

Valens wrote seven books on Fideicommissa, from which there are excerpts in the Digest; and there is also in the Digest a passage from the seventh book of a work on Actiones. Valens is mentioned by Pomponius, and cited several times by Paulus (Dig. 4, tit. 4, s. 33).

VALVASOR. [VAVASOR, P. C.]

VAN, or WAN. [ARMENIA, P. C., p. 360.]

VAN HOECK, JAN, a distinguished Flemish painter, was born at Antwerp about 1600. He first studied for one of the learned professions, but became the pupil of Rubens, and studied afterwards some time in Rome. While in Italy he was invited by the Emperor Ferdinand II. to his court, and was much employed by him. He eventually returned to his own country, where he died, according to Houbraken, in 1650.

Van Hoeck was admirable in history and portrait, and excelled both in light and shade and colour; his figures also are better drawn than is the case with those of the pupils of Rubens and the Flemish school generally. The 'Christ on the Cross' in the church of Saint-Sauveur, or the cathedral, at Bruges, is one of the finest pictures in Belgium. The Christ, which is of the size of life, has extraordinary effect and reality, and is certainly superior to the celebrated Christ of the church of St. Michael, at Ghent, by Vandyck, and it is more real and impressive than any of those of Rubens: beneath the cross are the Virgin and other saints. There is a print of it by the younger Cornelius Galle; this engraver however is not very accurate in his drawing. Independent of the Christ, the composition of the picture is meagre and formal, and wants dramatic truth.

VARIATION OF PARAMETERS. A *parameter* was a name originally given to a particular line connected with a conic section: being the third proportional to a diameter and its conjugate. In time the word was applied to any line which serves by its value to distinguish, or to help to distinguish, one individual of a family of curves from another: thus the radius of a circle, the axes of an ellipse, the co-ordinates of the centre of either, were called parameters. When a word gets into the descriptive name of a method, it may happen, as part of a phrase, to outlive its own separate use: and such has been the case with the word *parameter*. As this word is now generally abandoned, and *element* is the most frequent substitute for it, it would be desirable to speak of *variation of elements*.

Whatever phrase we may use, the thing occurs both in physics and mathematics, in modes which are closely connected with each other. A planet moves in a curve which is not an ellipse, but which would change and become an ellipse if the disturbing attractions of the other planets were removed, and that of the sun only continued. The easiest way of calculating the planetary motions is to consider the planet as moving in this ellipse, while during the motion the elements which determine the ellipse are perpetually changing: so that the form and position of the ellipse both vary. This is done in such manner that the ellipse of each moment is that which the planet would go on to move in, if at that moment the disturbing attractions were all removed. The advantage is that in this case the elements will vary very slowly, or it will be long before the disturbing attractions produce much effect. In theory, any curve might be taken. A planet for instance might be supposed to move in a parabola, which varies its dimensions and position in a manner to be determined. In TROCHOIDAL CURVES, P. C., all the curves given are produced by a point moving in a circle with variable elements; that is, of variable centre, though given radius. If it were required to investigate trochoidal curves with loops and undulations of different magnitudes, the best way would be to consider them as made in the same manner, with a circle of variable radius also: or else to make both circles variable.

In the differential calculus the variation of elements is introduced thus:—If an algebraical expression containing some variables and some constant elements be proper to answer a certain purpose, it is not impossible that it may answer the same purpose when the constants are made variable, provided they are made to vary in a proper manner. Now, if the purpose which is to be answered involve differentiation, the infinity of the number of suppositions which may be made as to the variation of the (former) constants is equivalent to introducing an arbitrary function instead of each constant, to be determined by the conditions of the question. Two species of cases have frequently arisen.

1. When under certain circumstances a problem is solved by an expression containing certain constants, and the circumstances are then altered; it is often convenient to inquire whether the altered problem might not be solved by the same expression, on the supposition that the constants become variable. And the question then is, how the (former) constants are to be made to vary.

2. Without any alteration of the circumstances, having a solution which contains constants, it may be asked how to substitute variables in place of constants, so that the altered expression may still be a solution.

In both cases it is obvious that as soon as the constants are made variable the differential co-efficients of all expressions into which they enter will receive an accession of terms above what they had before. These new terms, which we may describe as functions of the variations of the elements, must, in the first case above noted, be so taken as to provide for the effect of the altered circumstances. But in the second case they must destroy one another's effects altogether. We shall take a few instances in which the variation of elements is successful or unsuccessful.

1. The equation $y'+Py=0$, P being a function of x, is solved by

$$y=C\varepsilon^{-\int Pdx}$$

C being a constant. Now alter the equation into $y'+Py=Q$, and to meet the alteration, let C become a function of x. On this supposition $y'+Py$ becomes

$$-CP\varepsilon^{-\int Pdx}+C'\varepsilon^{-\int Pdx}+CP\varepsilon^{\int Pdx}$$

But this ought to be Q: therefore we must have

$$C'\varepsilon^{-\int Pdx}=Q, \quad \text{or } C=\int(Q\varepsilon^{\int Pdx})+E$$

E being another constant. Here $y'+Py=Q$ is solved by $y'+Py=0$ and subsequent variation of an element.

Now try $y'+y^2=0$ and $y'+y^2=Q$ in the same manner. The first is solved by $y=(x+C)^{-1}$ and if C be made variable, and y thus altered be introduced into the second, it is found, making $z=x+C$, to require the solution of

$$z'+Qz^2-1=0$$

as difficult an equation as the original. In this case then we are unsuccessful.

2. Let $\frac{du}{dx}+\frac{du}{dy}=x$. One solution of this is $u=\frac{1}{2}x^2+a(x-y)+b$, a and b being constants. To find a more general solution of this same equation let b be a function of a, a being a function of x and y. We have then

$$\frac{du}{dx}=x+a+\left(x-y+\frac{db}{da}\right)\frac{da}{dx}$$
$$\frac{du}{dy}=\quad -a+\left(x-y+\frac{db}{da}\right)\frac{da}{dy}$$

and the equation will obviously still be satisfied if b and a be so related that

$$x-y+\frac{db}{da}=0$$

Now as b is what function of a we please, so also is $\frac{db}{da}$: hence it follows that if $b=\phi a$, and $x-y=-\phi' a$, we may make a what function of $x-y$ we please. Let $a=\psi(x-y)$ and let $\chi v=-\int v\psi' v dv$. We have then

$$u=\frac{1}{2}x^2+(x-y)\psi(x-y)+\chi(x-y)$$

of which the last two terms merely amount to an arbitrary function of $x-y$, so that the complete solution is

$$u=\frac{1}{2}x^2+\phi(x-y)$$

ϕ meaning any function whatever.

This subject has many developments. We have introduced it here under the idea that some students of the differential calculus may be led to consider it at an earlier period of their reading than books will give it to them.

It is to be remarked that this method does not merely search for *some* solutions of a question: if the number of constants be sufficient, it goes direct to the most general solution. In our first example, there is no function of x but what is capable of being represented by $C\varepsilon^{-\int Pdx}$; in our third there is no function of x and y but what is capable of being represented even by $\frac{1}{2}x^2+a(x-y)$ or $\frac{1}{2}x^2+b$, and also by $\frac{1}{2}x^2+a(x-y)+b$ with a relation between a and b. Whatever function of x, or of x and y, will solve these equations, is sure to be found, if the method be successful. This point would need a little more development than we have here space to give.

VEGETABLE MORPHOLOGY, or METAMORPHOSIS, is that department of science which contemplates the laws which regulate the forms of plants and of their particular parts. In the earlier period of the history of botany plants were studied as individuals or groups of individuals, without any reference to the general laws which governed either the external or the internal forms of plants, or those which influenced the production of various forms in the same individual at different periods of its existence, or of the same species under varying circumstances.

Linnæus, although he never made any practical application of his idea, seems to have been the first to have suspected that the varied forms of the flowering organs, and even other appendages of the axis of the plant, were modifications of the leaf. In his 'Philosophia Botanica' he has the following remarkable passage:—'The origin of the flowers and the leaves is the same; the origin of the buds and the leaves is the same: the bud consists of the rudiments of the leaves; the flower comes from the rudiments of the leaves united.' Although the doctrine of morphology, to a limited extent, was thus aphoristically proclaimed by the great Swede, and many facts pointed out by him to prove its truth, yet little or no notice was taken of this department of science by his followers. The next person who drew attention to this subject, and apparently quite independent of Linnæus, was not a botanist, but a poet. Goethe frequently occupied himself with natural history studies; and in one of his letters, dated 1786, mentions that he believed he had discovered 'the whole secret of the generation and organization of plants, and that it is the simplest thing that can be imagined.' It was some years after that he first published his poem on the metamorphoses of plants, in which he distinctly states the great law of morphology, that every part of the plant is but the repetition of a primitive type:

> Gleich darauf ein folgender
> Trieb sich erhebend erneuet,
> Knoten auf Knoten gethürmt,
> Immer das erste Gebild.

This was followed by a paper on the subject, in which he clearly points out the importance of this idea of the unfolding of a primitive type. At the time these papers were published they were regarded as the fancies of a poet rather than the sober realities of science. In Great Britain they found but little favour, but were quietly thought over by Robert Brown, who by a series of accurate observations demonstrated the practical value of the morphological idea in the arrangement of the various families of plants. The idea of Goethe was also adopted by De Candolle, in his doctrine of a primitive type among plants, from which all departed by the decrease, increase, and adhesion of their organs. In this way the doctrine of morphology has more or less influenced the greatest botanical observers of the present day, and it assumes a position of the first importance in botanical inquiries.

Morphology may be divided into great divisions. First, that which treats of the forms of plants and their organs in general, and which is only concerned with a few of those general forms which are found common to all plants; and secondly, that which treats of the forms of particular groups of plants and of individual organs. This latter department is by far the most extensive and is that which contributes so greatly to the just apprehension of the relations which exist between the various groups of plants and their organs. It may be divided into two parts, one of which regards the external form of the plant, as resulting from the combination of the various tissues into organs; the other treats of the internal form which the various tissues of the plant assume.

There are certain general principles in morphology which have been everywhere assumed in the description of the organs of plants in the Penny Cyclopædia, such as that every plant has an ascending and descending axis; the former of which is called the stem [EXOGENS, P. C.; ENDOGENS, P. C.], and the latter the root [ROOT, P. C.]. These may be traced downwards or upwards through the various series of plants: downwards till we arrive at a point where the cells exhibit no tendency to either an ascending or descending growth, as in the cells of Protococcus; or upwards till the increasing development of the stem exists in the most complicated variety of forms. It is in the latter or higher groups of plants that the laws of morphology have been studied with greatest attention, and have led to the belief that its only application existed in the series of changes which the leaf of the higher plants undergoes in its conversion into the parts of the flower and the fruit. It is from this department of botany that the most convincing illustrations of the truth of the laws of morphology may be drawn, and it is here that the most obvious practical applications of them may be made; but form does not more distinguish the higher than the lower plants, and in many of the phenomena of the latter morphological laws as general may be applied as to the highest plants.

The leaf however affords the best illustration of the nature of morphological laws. This organ may be regarded as a *theoretical* point of departure for all other organs which are found upon the stem. The word theoretical is used here to prevent the supposition ordinarily entertained, that organs which are said to be metamorphosed have ever really been leaves at all. The leaf is only the theoretical type on which the other organs are formed, and from which they are supposed to have departed. In support of this theory we have the fact, that all the organs of the axis may be traced by insensible gradation either to or from the leaf. Thus the bract is often undistinguishable from the leaf, the sepal from the bract, the petals from the sepals, the stamens from the petals, the carpels from leaves, and the ovules from leaf-buds. This is the series of gradations which prove the positions of morphology. When these gradations take place, as they mostly do in nature, from the leaf to the internal organs of the flower, it is called an ascending metamorphosis; when it takes place from the central organs of the flower to the leaf, it is called a descending metamorphosis. This latter phenomenon is frequently observed in cultivated plants, and such changes are called monsters. Most of the double flowers of our gardens are the result of a descending metamorphosis, in which petals are developed instead of stamens. As an instance of organs which have not assumed the development of leaves, but which yet are formed on the same type and obey the same laws, we may name the stipules and scales of leaf-buds.

The result of these facts is that we may regard the flower as a collection of leaves arranged in whorls, and in fact a branch with a short axis. This idea explains at once those apparently anomalous occurrences where branches grow out of the fruit of the pear or the apple. The apple does but represent the growing point of a branch, which, if the circumstances no longer exist which produced the peculiar leaves from which it is formed, will take on the ordinary growth of a branch. The admission of these principles has led to the expression of certain laws which regulate the growth of the flowers and fruits of plants, and which, being applied to their peculiarities, are the best means of securing a natural classification. These laws are—1. That each series of floral envelopes must normally alternate with that which preceded it. 2. That the number of parts in every series must be equal to or a multiple of the number of parts in the first or outer series. The actual departures from this theoretical structure are numerous, but they may be reduced to the simple conditions of the increase, decrease, or adhesion of the various organs, which also obey definite laws.

(Lindley, *Introduction to Botany*, 2nd edition; Goethe, *Metamorphosis der Pflanzen*; Linnæus, *Philosophia Botanica*; De Candolle, *Théorie Elémentaire de Botanique*; Schleiden, *Grundzüge der Wissenschaftlichen Botanik*.)

VEII. [Etruria, P. C., p. 56.]

VELLA (Latinised from *Velcor*, the Celtic name of the cress), a genus of plants belonging to the natural order Cruciferæ. It has an ovate pouch, with a dilated winged leafy flat style, longer than the convex valves. The flowers are yellow, and are, as well as the pod, erect.

V. annua was found in the time of Ray on Salisbury plain, but has not since been noticed. It has doubly pinnatifid leaves and deflexed pouches.

V. pseudocytisus, False Cytisus, or Cress-Rocket, is a native of Spain; it has yellow petals with long dark purple claws; the larger stamens are connate by pairs; the seeds two in each cell.

This shrub, though generally kept in a greenhouse, is sufficiently hardy to live during the winter in the border in a warm aspect. Young cuttings will strike root in sand under a handglass.

(Don, *Gardener's Dictionary*; Babington, *Manual of British Botany*.)

VENTRE INSPICIENDO, WRIT DE. 'When a woman is suspected to feign herself with child in order to produce a supposititious heir to the estate, the heir presumptive may have a writ *de ventre inspiciendo*, to examine whether she be with child or not; and, if she be, to keep her under proper restraint till delivered; which is entirely conformable to the practice of the civil law: but if the widow be, upon due examination, found not to be pregnant, the presumptive heir shall be admitted to the inheritance, though he hath to lose it again, on the birth of a child within forty weeks from the death of a husband' (Blackstone, *Comm.* i. 456). The Roman practice is explained in the Title of the Digest (25 tit. 4): *De inspiciendo ventre custodiendoque partu.* This title contains a Rescript of Aurelius and Verus, in a case in which a wife denied her pregnancy and the husband maintained it. The wife had separated from the husband, and probably wished to keep the child that might be born, though by law it would belong to the husband. If a woman alleged that she was left pregnant by her deceased husband, it was her duty to announce the fact to those whom it concerned, and to inform them that they might, if they pleased, send women to inspect her (quæ ventrem inspiciant). All the proceedings of inspection and of watching the woman, if she should be reported to be with child, are minutely described in the Prætor's Edict. The penalty in case of the woman not complying with the Edict was, that the Prætor would refuse to the child the Bonorum Possessio.

The form of the English writ De Ventre Inspiciendo is given Co. Litt. 8 b. It is directed to the sheriff, and commands him to empanel a jury of twelve women to search whether she be enseint. If they find that she is with child, another writ issues, which commands that she shall be safely kept and duly inspected by the women, who must be present at the delivery. Bracton is the writer by whom this work is first mentioned.

The use of this writ is an instance in which what is called a proceeding at common law is taken from the Roman system. The writ is not obsolete, as some people suppose; it has issued within the last few years. (Co. Litt. 8 b., and N. 44 in Butler's edition; Comyns, *Digest*, Bastard, C.)

VENULEIUS. [Saturninus, P. C. S.]

VERMIGLI, PIETRO MA'RTIRE, born at Florence in 1500, studied for the church, and entered early the Order of the Regular Canons of St. Augustin; in which he became distinguished for his learning, and rose to offices of trust. Being at Naples he became acquainted with John Valdes, a Spaniard, who had become a convert to the doctrines of the Reformation. Vermigli adopted some of those tenets, but concealed them for a time. Being sent by his superiors to Lucca, as prior of San Frediano, he there publicly avowed his new doctrine, and was soon after compelled to fly to Switzerland, in 1542. He thence went to Strasburg, where he was appointed Professor of Divinity. In 1547, at the invitation of Bishop Cranmer, he repaired to England, where he was graciously received by King Edward VI. and was appointed Lecturer upon the Holy Scriptures at Oxford, where he met with much opposition from the heads of colleges and the higher graduates, and ran some personal risk. In 1553, after the accession of Queen Mary, being obliged to leave England, he returned to Strasburg, where he resumed his chair as Professor of Divinity, and likewise of Aristotelian philosophy. In 1556 he was invited by the senate of Zürich to fill the chair of theology in that University, which he accepted. In 1561 he repaired, with other Protestant divines, to the conference of Poissy, in France. In the following year Vermigli died at Zürich, much regretted. He wrote on dogmatic and ethical subjects, commentaries on parts of the Scripture, besides numerous epistles to 'His Brethren of the Protestant church of Lucca,' to the Protestant churches in Poland, to the English church, to Calvin, Bullinger, Beza, Melanchthon, and other reformers, to Queen Elizabeth, and to several English prelates and noblemen. Tiraboschi, a zealous Catholic, acknowledges Vermigli was free from the arrogance and virulence of Luther and other Reformers, that he was deeply acquainted with the Scriptures and the fathers, and was one of the most learned writers of the reformed communion. His works were translated from the Latin into English. 'The Common Places of the most famous and renowned Divine Doctor Peter Martyr, divided into four principal parts by Anthony Marten,' dedicated to Queen Elizabeth, in 1583, with a biography of Vermigli by Josias Simler, of Zürich: this collection contains a complete course of Christian ethics, and may be read with advantage even now.

VERNET, ANTOINE CHARLES HORACE, commonly called Carle Vernet, a French historical, genre, and battle painter, was born at Bordeaux, August 14, 1758, and was the pupil of his father, Claude Joseph Vernet, the celebrated marine and landscape painter. He studied also in the French Academy at Paris, where he gained the second prize for painting when in his eighteenth year, and in 1782, six years afterwards, he obtained the grand prize, and with it the privilege of studying for a certain period in the French academy at Rome.

In 1787 he was elected a member of the French Royal Academy of Painting for a large picture of the Triumph of Paulus Aemilius, and he was subsequently, after the remodelling of the academy, nominated a member of the Institute of France.

His principal works are—the large picture of the Battle of Marengo, and a battle against the Mamelukes, exhibited in 1804; the Morning of the Battle of Austerlitz, with the Emperor giving orders to his Marshals, and an equestrian portrait of Napoleon, in 1808; the Bombardment of Madrid, the Battle of Rivoli, and another picture of the Emperor, in 1810; John Sobieski forcing the Turks to raise the Siege of Vienna, in 1683, exhibited in 1819; the Taking of Pampeluna in 1824; the Entrance of Napoleon into Milan; and the Battle of Wagram.

Carle Vernet has painted also an immense number of pictures of small dimensions, chiefly of military subjects, but also many of the chase, of scenes of familiar life, and from the imagination. He was also a celebrated painter of horses, and by some considered the best of his time; among his pictures are many small equestrian portraits. In 1806 he was appointed painter to the Dépôt de la Guerre: and he was made subsequently Chevalier of the orders of St. Michel, and of the Légion d'Honneur. He died September 27, 1836. Horace Vernet, the most able painter and most prolific pencil of the present century, is the son of Carle Vernet, and was first instructed by him in his art.

(Gabet, *Dictionnaire des Artistes de l'Ecole Française au dix-neuvième Siècle.*)

VESTED REMAINDER. [REMAINDER, P. C.]

VIBRATIONS OF HEAT. [HEAT, P. C.]

VIBRATIONS OF LIGHT are the movements conceived to take place among the molecules of an ætherial medium which is supposed to exist in space and even to occupy the interiors of bodies; they are the cause of the waves by which are obtained perceptions of light and vision; and they are considered as analogous, in some cases, to the vibrations of the molecules of air by which sound is excited.

From experiments which are alluded to in the article [UNDULATORY THEORY OF LIGHT, P. C., p. 512] it has been determined that the length of a wave in air, for the light at the red extremity of the spectrum, is 0·0000266 inches, and for the light at the violet extremity is 0·0000167 inches; hence the velocity of the waves of light, of each colour, being estimated at 192,000 miles per second, if the inches in this number of miles be divided by each of the above numbers, it will be found that the number of ætherial undulations which are made in air, in one second of time is, for the first kind of light, about 458 millions-millions, and, for the last, about 727 millions-millions, it follows that, if unity be divided by each of these numbers, the quotient will express the very small fraction of a second in which a complete vibration is performed in air by a molecule of the lumeniferous æther.

The waves of sound move in air through less than 1200 feet per second; and it follows that the velocity of light is more than 800,000 times greater than that of sound; but the velocity of an undulation varies with the square root of the elasticity of the medium in which it is propagated; and hence it should follow that the elasticity of the luminiferous æther is to that of air in a ratio exceeding that of the square of 800,000 to unity.

Undulations of the lumeniferous æther are presumed to take place within the substances of all refracting media, as air, water, glass, &c.; but it is probable that the vibrations of the molecules of æther in such situations are modified by the vibrations of the molecules of the substances; the observed phenomena of refraction render it necessary to consider that the greater is the refracting power of a medium, the less is the elasticity of the æther within it, and the less is the velocity with which the waves of light are propagated through it.

The ætherial vibrations which, by affecting the retina of the eye, give rise to the sensation of light, take place, as above stated, with great rapidity, but the impression made by any single vibration is inconsiderable; therefore, in order that the combined actions of the vibrating molecules may be sufficiently powerful to produce effects which are sensible, it is necessary to suppose that the vibrations are performed in equal intervals of time, the intervals depending on the nature of the vibrations of which the retina is susceptible; as in order to give motion to a pendulum by a repetition of very small forces, these must be made to act at the end of equal intervals of time which depend on the length and form of the pendulum. The particular colour of light is made to depend on the velocity of the ætherial molecules, or on the extent to which those molecules vibrate on either side of their mean places; and whatever be the number of vibrations made by the particles of æther in a given time, that is, whatever be the colour of light, it is to be understood, agreeably to the laws of the propagation of motion in elastic media, that the velocities of the waves of light are uniform in every direction. The intensity of the impression of light in the eye depends on the square of the greatest extent to which a molecule of æther vibrates on each side of its point of rest. [UNDULATORY THEORY OF LIGHT, P. C, p. 510.]

In common or white light, the vibrations of the ætherial molecules may be conceived to take place in any manner, but M. Fresnel assumed that when light is polarized, the eye is affected by the transverse vibrations only, or those which take place in planes perpendicular to the direction of the motion of the wave or ray, the vibrations in this direction, if such exist, being of a nature to produce no sensible effect. The hypothesis is supported by experiments made on a pencil of light which, after diverging from a radiant point, is reflected from two mirrors inclined to one another at a very obtuse angle, or is made to pass through a prism of glass having a great refracting angle, so as to proceed as if it formed two pencils diverging from different points; the reflected or refracted waves are found to interfere with one another so as to produce dark fringes or bars alternating with such as are bright; but when two plates of tourmaline having their axes at right angles to one another, which consequently polarize the light in planes at right angles to one another, are placed in the directions of the waves reflected from the two mirrors or transmitted through two faces of the prism, the waves cease to interfere with one another and no dark fringes are seen. It follows that no vibrations could have then taken place in the directions of the motions of the waves; since if they had, interferences ought to have been observed in the light which was polarized as well as in that which was not so.

For the composition of the vibratory motions in two polarized pencils, by which circular and elliptical polarizations are produced, see CIRCULAR POLARIZATION, P. C. S.

VICTOR, CLAUDE PERRIN, Duke of Belluno and Marshal of France, was born at La Marche, in the Department of the Vosges, on the 7th of December, 1764. He was seventeen years of age when, on the 16th of December, 1781, he enlisted as a private soldier in the 4th regiment of artillery, at that time in garrison at Auxonne. He had obtained his discharge when the first events of the Revolution of 1789 occurred, but, animated with the warlike spirit which then pervaded the French nation, he again eagerly sought for military employment, and entered as a volunteer the third battalion of the Department of the Drôme. A few months sufficed for this young and intrepid soldier to raise himself from the lowest rank to that of adjutant-major and 'chef de bataillon.' With the battalion under his command he distinguished himself at Coarara, by foiling the attack of three thousand Piedmontese and a regiment of emigrants. At the head of the same battalion he obtained considerable success, in 1793, at the siege of Toulon; under the orders of General Lapoye, he gained the important heights of Pharon, and afterwards, with similar good fortune, attacked the Fort l'Aiguillette, the capture of which greatly contributed to the favourable issue of the siege. These brilliant actions, in which he was twice wounded, were rewarded by his promotion to the rank of adjutant-general. Transferred to the army of the Eastern Pyrenees, with the rank of general of brigade, he rendered himself conspicuous for his skill and bravery at the sieges of Collioura (June 5, 1794) and Rosas (January 2, 1795). After the termination of the war between France and Spain by the treaty of peace signed on the 22nd of July, 1795, Victor joined the army of Italy. The courage which he displayed in the several battles of that campaign, and particularly in the action at Borghetto (May 30, 1796), brought him under the favourable notice of Bonaparte, who gave him every opportunity for further distinction by entrusting him with the management of manœuvres as honourable as they were perilous. His conduct during the sanguinary engagements which took place at Cossaria and Mondovi (April 5 and 16, 1796) justified the high estimation in which he was held by his chief, and were recognised by the government at Paris in a flattering letter which they sent him. The following year, by a series of skilful manœuvres, he greatly contributed to the success obtained by Masséna [MASSÉNA, MARSHAL, P. C. S.] over the Austrian general Wurmser [WURMSER, P. C.] at Corona (August 11, 1797). It was on account of his successes during this campaign, of which we have enumerated a very small portion, that he was raised to the rank of general of division. In this capacity he powerfully seconded the operations directed by General Lannes against the Papal States [LANNES, P. C. S.], after defeating the Roman troops on the river Serio, he occupied with the troops under his command the towns of Faenza and Cesena; he afterwards marched against Ancona with a detachment of twelve hundred men, and captured it without a shot being fired, though it was defended by one hundred and twenty pieces of cannon, and a garrison of five thousand degenerate Romans. 'General Victor,' says Napoleon, 'crossed the Po at Borgo Forte, at the head of four thousand infantry and six hundred horse, and formed a junction, at Bologna, with the Italian division of four thousand men, under General Lahoz. These nine thousand men were quite sufficient to conquer the States of the Church.' (Montholon, *History of the Captivity of Napoleon at St. Helena*, vol. ii. p. 56.)

After the peace of Campo Formio, General Victor was appointed to the difficult command of the province of the Vendée. By his skilful dispositions, and by his conciliatory, but firm and decisive conduct, he maintained the tranquillity of that country. Being recalled, in 1798, to the army of Italy, he was placed at the head of a division. In the following year he acquired fresh renown at the engagement of Sta. Lucia (March 30, 1799). Shortly after this battle he received orders to cross the Apennines, and to facilitate the retreat of the French army of Naples through the valley of the Bormida; in effecting this movement, his division was attacked by a large body of Piedmontese insurgents, in the narrow and difficult passes of those mountains; his troops however bravely repelled this attack at the point of the bayonet, and, after surmounting great dangers, he was enabled to effect a junction with the army under the command of General Macdonald. [Macdonald, Marshal, P. C. S.] Victor bore a distinguished part in the engagement on the banks of the Trebbia, which proved disastrous to the French. He was afterwards sent to Paris by General Moreau, to solicit from the Directory reinforcements for the army in Italy. On the failure of his mission, he returned to Italy and resumed the command of his division, which acquired fresh laurels at the battle of Bassano, where it formed part of the centre under the command of General Championet.

At the memorable battle of Marengo, the division of Victor formed part of the advanced guard; to the bravery and perseverance which he displayed on this occasion may in a great measure be ascribed the favourable issue of this long-disputed engagement. His services were rewarded by the presentation of a sabre of honour, on which was inscribed a flattering testimonial to his merit. He was afterwards transferred to the Batavian army, with the rank of second in command; his conduct in that campaign, though unmarked by any brilliant exploit, was such as to maintain the high reputation he had acquired.

After the peace of Amiens, he was sent to the court of Denmark as ambassador from the First Consul. He held this office till 1806, when, on the breaking out of the war with Prussia, he was appointed to the command of the tenth corps of the grand army. A wound, which he received at the battle of Jena, did not prevent him from directing in person the operations of the corps under his command during this short but brilliant campaign; and he powerfully contributed to the victory obtained over the combined forces of the Prussians and Russians at Pulstuck (December 26, 1806). In this campaign he was taken prisoner by a body of partisans, but, by means of an exchange, he speedily recovered his liberty. The following year was marked by the great battle of Friedland (June 14), in which Victor, at the head of the first corps of the grand army, so greatly distinguished himself, that Napoleon, on the field of battle, raised him to the dignity of Marshal of the empire.

After the treaty of Tilsit (July 6-9, 1807), Marshal Victor was appointed Governor of Berlin, a government including the greater part of Prussia. This office, which he held for fifteen months, was one which afforded many temptations to an abuse of power, but he appears to have exercised his authority with dignity and moderation.

In 1808 he was intrusted by Napoleon with the command of the first corps of the French army in Spain. Shortly after his arrival in that country, he obtained important advantages over the Spaniards in the engagements of Epinosa (November 10 and 11, 1808), Sommo Sierra (November 30), and Madrid (December 4). On the 13th of January, 1809, he routed the remnants of the Spanish army which had been defeated at Tudela [Lannes, P. C. S.], but which, reinforced by fresh levies from the provinces of Murcia and Valencia, had taken up a menacing position at Ucles. In this engagement upwards of three hundred officers, including two generals and twelve thousand soldiers, were made prisoners; all the enemy's artillery and thirty standards were captured by the French. According to the Spanish accounts, this victory was stained by the exercise of wanton cruelty towards the prisoners, in retaliation for similar cruelty exercised on former occasions by the Spaniards towards the French. (Napier, 'History of the Peninsular War,' vol. ii. p. 16.) At Medelin (March 28, 1809) Marshal Victor obtained another important victory over the Spanish army under General Cuesta, in which six thousand Spaniards are said to have fallen, and three thousand to have been taken prisoners. He was afterwards sent with his division to the support of the army of Marshal Soult in Portugal; but he had scarcely entered that country, when he was obliged to effect a retreat. Having formed a junction with the troops of Joseph Bonaparte, Marshal Jourdan, and General Sebastiani, he was induced to attack the army of Sir Arthur Wellesley, which was advancing into Spain. The issue proved disastrous to the French arms; after a long contested and sanguinary engagement, Victor was defeated at Talavera de la Reyna (July 28, 1809). This battle however did not materially change the position of the hostile armies. [Talavera, P. C.] Victor having united his forces with those of Marshal Ney and Mortier, and the British army being obliged to retire before the superior numbers of the enemy, the French were again enabled to occupy the town of Talavera. To the credit of the French commander of Talavera, it may be stated that a large number of sick and wounded English soldiers were treated with the greatest kindness.

On February 4, 1810, the duty of investing Cadiz was assigned to Marshal Victor, whom Napoleon had created Duke of Belluno; he conducted the operations of this siege with skill and perseverance, but though protracted for a considerable length of time, they finally proved unavailing. In 1812 he was summoned from the blockade of this town to join the grand army destined for the expedition to Russia, and was appointed to the command of the ninth division. His name stands conspicuous in the annals of this disastrous campaign. [Bonaparte, P. C.] During the retreat, he rendered the most important services to the French army, and in particular at the perilous passage of the Beresina (November 28, 1812), where, with six thousand men, he successfully resisted the efforts of General Wittgenstein [Wittgenstein, P. C.] and thirty thousand Russians. His courage in this action was rendered more remarkable by his humanity. Being recalled, on the approach of evening, from the position which he occupied at Stoudziancka, he took upon himself to disobey his orders, and remained there during the whole night, for the purpose of giving every assistance to the remnants of the French army, which had not yet effected the passage of the river. At daybreak, he skilfully managed to evacuate this position, without loss of either baggage or artillery, taking with him the wounded and a large number of camp followers, who, without his humane aid, must have fallen into the hands of the pursuing enemy.

The following year, Marshal Victor commanded the second division of Napoleon's army: to the conduct of that division at the battle of Dresden (August 26, 1813) the victory the French there obtained has generally been attributed. With the same division he likewise greatly distinguished himself at the battles of Wachau (October 16, 1813), Leipzig (October 18, 19), and Hanau (October 30). After the passage of the Rhine had been effected by the French army, Marshal Victor was actively employed in putting in an efficient state of defence the strong places of Alsace and the Franche Comté; he also for a long time bravely opposed the entrance of the Russian army into France. Compelled at length to fall back upon the Meuse, he effected this movement with his usual skill. He afterwards dislodged the allies from the position they had taken up at St. Dizier (January 27, 1814), and drove them out at the point of the bayonet from the village of Brienne. During the whole campaign he zealously seconded the efforts of Napoleon and the French army in checking the advance of the allies. On the 9th of February he marched his troops towards the Seine, for the purpose of more effectually co-operating with the movements of his chief, and sustained his high character as a soldier in the defence of the bridge of Nogent (February 11, 1814) and in the actions of Nangis (February 17) and Villeneuve le Roi. His failure in dislodging the allies from Montereau, where he had the misfortune to lose his son-in-law, General Château, exposed him to the displeasure of the emperor, who deprived him of his command. The marshal, it is said, refused to leave the service, and observed with emotion to his chief, that 'he had once been a private soldier, that he had not forgotten the use of the musket, and would again take his place in the ranks.' The emperor, moved by this proof of his fidelity, put him at the head of two brigades of his guard, with which he distinguished himself, a few days after, at the battle of Craonne, where he was severely wounded, and was obliged to retire from the field

When the success of the allies and the abdication of Napoleon had replaced the Bourbon dynasty on the throne, he was among the first to offer them his allegiance, and was rewarded by an appointment to the command of the second military division. On the return of Napoleon from Elba, he issued a proclamation, in which he allowed himself to speak of the creator of bis fortunes in terms which reflect high discredit upon his character; he describes him as 'the man who has tyrannized, desolated, and betrayed France during twelve years;' and he urges every Frenchman to pursue to the utmost not only this tyrant, but 'his satellites who have accompanied him on his plundering excursion.' Independently of the ingratitude which this language betrays, it evinces a singular want of discernment, coming from one who had once been among the most conspicuous of these satellites. He afterwards followed the examples of Marshals Berthier [BERTHIER, P. C.] and Marmont in accompanying Louis XVIII. to Ghent. [LOUIS XVIII., P. C.] On the second restoration, he was created a peer of France, and appointed one of the four major-generals of the royal guard. He was also unfortunately conspicuous as the president of the commission charged to inquire into the conduct of his former brethren in arms during the hundred days [NEY, MARSHAL, P. C. S.]: in that capacity he is reported to have displayed an unnecessary and pertinacious severity. In 1816, Marshal Victor was appointed to the command of the sixteenth military division of France. In 1821, he was named by Louis XVIII. minister of the war department; in this capacity he altogether disappointed the expectations to which his military talents had given rise; he alienated the affections of the new army as effectually as he had done those of the old, and lost the little popularity he had hitherto enjoyed. He actively promoted the expedition to Spain of 1823 [SUCHET, P. C. S.], and, having retired from the ministry, accompanied the army as second in command to the Duke of Angoulême. After the revolution of 1830, [CHARLES X., P. C. S.] he ceased to take any active part in public affairs; though he gave in his adhesion to the government of Louis-Philippe, he attached himself to the legitimist party, and appears on one occasion to have been seriously compromised, with several of the leading men of that party, in espousing the cause of the Bourbon claimant to the throne of France. He died on the 3rd of March, 1841.

The position occupied by Marshal Victor among the generals of Napoleon is not a very high one. Though his services to the Imperial cause were numerous and many of his exploits were brilliant, he is rather distinguished as a brave soldier than as a skilful commander. At the head of a division he executed with boldness and precision the movements indicated to him by his chief, but he was devoid of the military genius requisite to originate a skilful plan of battle. Hence, in a separate command, as in many instances in the Peninsular War, he was generally unsuccessful. He does not however appear to have merited the very harsh remark made concerning him by Napoleon, which O'Meara records: 'Victor était une bête sans talens et sans tête.' ('Napoleon in Exile,' vol. i. p. 511.) Such a judgment probably escaped Napoleon under the influence of the feelings which Victor's conduct, on his return from Elba, had excited. It is indeed scarcely possible that it was the real estimate he had formed of this general's military character, since he had raised him from the position of a private soldier to the highest dignities of his empire, dignities which were in every case the reward of some species of merit, and not the mere fancy of favouritism.

(*Biographie Universelle des Contemporains, Supplément*, Paris, 1836; *Biographie Moderne*, Paris, 1815; *Dictionnaire Historique des Batailles;* Tissot, *Précis des Guerres de la Révolution; Dictionnaire des Girouettes;* see a notice of this work at the end of art. MAURY, P. C. S.; Norvins, *Histoire de Napoleon;* Labaume, *Relation de la Campagne de Russie*, Paris, 1814; Alison, *History of Europe*, vol. iii.; Napier, *History of the Peninsular War*, vol. ii.; *Court and Camp of Bonaparte.*)

VIEN, JOSEPH MARIE, one of the most celebrated French painters of the eighteenth century, was born at Montpellier, June 18, 1716, and was the pupil of various painters, among them A. Rivalz, of Toulouse, and finally C. Natoire, at Paris, whither he repaired in 1740. He was very sickly in his youth, and his parents thought that even the fatigue of the drawing board was more than his strength could bear, and endeavoured to lead him to other pursuits; his own enthusiastic devotion to art, however, got the better of all obstacles, and in the year 1743, he competed successfully at Paris, for the grand prize of the French Academy, and obtained accordingly also the government pension for Rome. The subject of the picture was the Plague of the Israelites, in the time of David. In 1744 he departed for Rome and remained there until 1750, when he returned to Paris. Besides numerous studies he painted many excellent pictures during his six years' residence in Rome, including several church or altar-pieces of great merit, as the Slaughter of the Innocents, St. John for the town of Montpellier, and the only two pictures by Vien now in the gallery of the Louvre, Saint Germain and Saint Vincent receiving the Crown of Glory from the hands of an Angel, and the Sleeping Hermit.

These were followed by a long series of works at Paris, many of them compositions of the highest pretensions, and indicating a decided revival in the French school of painting from the insipid puerile state to which it had been reduced by Vanloo and Boucher. The pictures of Vien approach the style and technical excellence of the scholars of the Caracci, though for some time his works were much maligned by the scholars of Boucher and Vanloo, and among them his own master Natoire. His St. Denis preaching to the Gauls, one of his best works, was pronounced by them inferior to the picture by F. Doyen of the Miracle des Ardons, illustrating the tradition of the miracle performed by St. Geneviève when by her prayers she arrested the conflagration of Paris, which was caused by lightning in the year 1129. Vien's picture was placed in the church of St. Roch, where Doyen's is also now placed: they are nearly the same size, being about 24 feet high by 13 wide. In a few years however, and before the French revolution, Vien was justified by his contemporaries, who gave him the title of regenerator of painting in France: Count Caylus had always been an admirer of his genius. It was his object to restore the study of the antique, and of nature as represented in the works of the best Italian masters, and he succeeded to a considerable extent in both respects; but his admiration for the antique was carried to the utmost extreme by his pupils Vincent and David and their scholars.

Vien was elected a member of the French Academy in 1754, when he gave as his presentation piece a picture of Dædalus attaching his wings. In 1775, after the painting of his picture of St. Denis, which was exhibited in the Louvre in the previous year, he was decorated with the order of St. Michel, and was appointed director of the French Academy at Rome, where he resided from that time until 1781, and was elected in the meanwhile member of the Academy of St. Luke. After his return to Paris he became one of the rectors and director of the Academy there (he had previously been professor); and he was finally appointed principal painter to the king in 1789. This post he of course lost at the revolution, but he was from its foundation a member of the Institute of France; he was also created by Napoleon a member of the senate, a count of the empire, and a commander of the Legion of Honour. He died at Paris, March 27, 1809, having nearly completed his ninety-third year, and he was buried in the Pantheon. He painted until within a year of his death. Vien's pictures are very numerous, amounting to little short of two hundred; this number would not be great, if many of them were not of very large proportions. Few of them have however been engraved; the St. Denis, already mentioned, which is by some considered his master-piece, has been engraved only in outline by C. Normand for the 'Annales du Musée,' published by Landon, and in the 'Musée de Peinture,' &c. of Réveil and Duchesne. His works are from various subjects, but chiefly from the Sacred Scriptures, from antient and modern history, and from Greek mythology. Among his more celebrated pictures are—Julius Cæsar contemplating the Statue of Alexander at Cadiz, and regretting that he was still unknown at an Age when Alexander was already crowned with Glory; the Consecration of the Equestrian Statue of Louis XV.; Marcus Aurelius causing Provisions to be distributed among the People; St. Louis vesting the Regency of the Kingdom in his Queen, Blanche of Navarre; St. Jerome; the Embarkation of St. Martha; Christ breaking Bread; the Resurrection of Lazarus; the Virgin attended by Angels; St. Gregory; Briseis in the Tent of Achilles; the Parting of Hector and Andromache; Hector exhorting Paris to go out to battle; Venus wounded by Diomede; Æneas pursuing Helen during the burning of Troy; Andromache showing the Arms of Hector to her Son; Mars forcing himself from the Arms of Venus; Cupid and Psyche; Sappho playing on her Lyre; Proserpine adorning the Statue of Ceres;

Cupid flying from Slavery; a Woman selling Cupids; and a young Greek Girl comparing her Bosom with a Rose-bud.

Vien has left also many drawings, some in series, as—the Sports of Nymphs and Cupids, in 20 pieces; the Vicissitudes of War, also in 20 pieces; and the Union of Cupid and Hymen, Love and Marriage, in 36 pieces. There are also some etchings by Vien: he executed a set from a series of designs of the Adventures of Lot and his Daughters; and a Fête or Masquerade given by Vien and other students of the French Academy at Rome to the Cardinal de Larochefoucauld in 1748: it is in 32 pieces, under the following title—'Caravane du Sultan à la Mecque, Mascarade Turque donnée à Rome par Messieurs les Pensionnaires de l'Académie de France et leurs Amis, au Carnaval de l'Année 1748; Jos. Vien, inv. et sc.'

Madame Vien, born Marie Reboul, was a distinguished painter of birds, flowers, and still life; and was a member of the old French Academy of Painting. She died in 1805, aged seventy-seven.

Joseph Marie Vien, the younger, the son of M. and Madame Vien, though a distinguished portrait-painter, practised only as an amateur. He was born at Paris, in 1761. He exhibited several pictures in the Louvre from 1800 until within the last few years: among them a portrait of his father, as M. Vien, sénateur, in 1804.

(Gabet, *Dictionnaire des Artistes de l'Ecole Française au dix-neuvième Siècle;* Fiorillo, *Geschichte der Mahlerei*; Landon, *Annales du Musée;* Réveil et Duchesne, *Musée de Peinture*, &c.; Brulliot, *Dictionnaire des Monogrammes*, &c.)

VIGAN LE, a town in the arrondissement of Le Vigan, in the department of Gard, in the south of France. It is out of the high road, and its distance from Paris can only be given, approximately, at from 385 to 390 miles S. by E., by the road through Fontainebleau, Montargis, Briare, Nevers, Moulins, Gannat, Clermont, St. Flour, Mende, and Florac. The town stands on the left bank of the Arre, a small feeder of the Hérault, in a very beautiful and romantic valley amid the lower south-eastern declivities of the Cévennes, amid green fields and orchards, watered by a number of clear streams. The town is old and ill built. The principal 'place' is decorated with a bronze statue of Le Chevalier d'Assas, a native of the town, who died, with circumstances of peculiar self-devotion, in the battle of Clostercamp, near Guelders, fought in October, 1760, between the French and the allies during the Seven Years' War. The population of the commune in 1826 was 4246; in 1831 it was 4909, of whom 4480 inhabited the town itself, the remainder the outparts of the commune; in 1836 it was 5049. The principal manufacture carried on is of hosiery, especially of silk stockings: cotton-yarn is also spun; and there are tanyards and currying-shops, a paper-mill, and a glasshouse. There are six fairs in the year. Coal is dug in the neighbourhood of the town.

The government establishments are, a subordinate court of justice, a stamp-office, and a board of indirect taxation; and there are a consulting chamber of manufactures, an agricultural and two Biblical societies.

The arrondissement of Le Vigan has an area of 543 square miles, with a population in 1831 of 65,247, and in 1836 of 65,755. It comprehends ten cantons or districts, each under a justice of the peace.

(Malte Brun, *Géographie Universelle; Dictionnaire Géographique Universel;* Vaysse de Villiers, *Itinéraire descriptif de la France.*)

VILL. [Town, P. C.]

VILLEHARDOUIN, GEOFFROY DE, was born near Arcis-sur-Aube about the year 1167, and was descended from one of the most ancient and distinguished families of the Comté de Champagne. He was Maréchal of Champagne when, in 1199, his sovereign lord Thibault, Count of Champagne and of Brie, determined upon joining the cause of the crusades, and Villehardouin was among the first chosen to accompany him. Previous to the departure of his lord he was sent as ambassador to Venice, to solicit the aid and co-operation of that Republic in their enterprise. He arrived at that city with five other deputies in the beginning of Lent, 1201, and met with an honourable reception from Henry Dandolo, the Doge. Admitted before the council of state, Villehardouin eloquently explained the motives of his mission, and the reasons which had induced the Count of Champagne to apply to the Venetians for assistance, in preference to other powers. 'We have chosen you before all other nations in Europe,' he said, 'as being the most powerful, the most generous, and the most capable of seconding so glorious an enterprise. We have come to demand your assistance and the junction of your forces to ours, without which we can never expect to re-conquer Jerusalem; and, as we are resolved to undertake this conquest, we have been commanded not to leave your city till we have received a favourable answer to our request, leaving it to you to impose the conditions on which it is to be granted.' To this energetic appeal were joined the tears and entreaties of the other deputies, who, in the holiness of their mission, forgot the shame of kneeling as suppliants before the haughty representatives of commercial power. Moved by their appeal, and by the pecuniary advantages which were likely to result from the transaction, an unanimous acclamation arose from the assembly of 'Nous l'octroyons! Nous l'octroyons!' A treaty was concluded between the French deputies and the Republic, by which it was agreed, that the Venetians should furnish the vessels necessary for the transport of 4500 horsemen and 9000 squires and attendants, and also 20,000 foot soldiers, with nine months' provisions; that the vessels should be equipped and ready to sail in the month of June in the following year, and that their service should only count from the time that they left Venice. For these services the crusaders were to pay the Venetians the sum of 80,000 marks of silver, or, according to some accounts, 85,000. The payment of so exorbitant a sum, for that period, proves equally the generous zeal of the crusaders and the attentive regard of the Venetians to their interests. After the conclusion of this treaty, Villehardouin returned to France, where he found the Count Thibault dangerously ill. The death of Thibault, which occurred soon after, left the crusaders without a chief. The command of the expedition having been offered to the Duke of Burgundy, and afterwards to the Count of Bar, who both declined it, it was finally accepted by the Marquis of Montserrat, who appointed Venice as the place of general meeting.

The first exploit of the crusaders, after leaving Venice, was, at the solicitation of Alexis Comnenus, to re-establish on the throne of Constantinople the Emperor Isaac his father. The French having afterwards to complain of the conduct of Alexis, who had not ratified the stipulated conditions for the succour they had lent him, sent Villehardouin as their deputy to make the necessary remonstrances.

Villehardouin was present at the siege of Constantinople in 1204, when that city was taken by the Venetians and French [Constantinople, P. C.], and to him history is indebted for a minute and graphic description of this remarkable siege. He thus describes the impression which the first appearance of the imperial city made upon his rude companions in arms:—'That such a city could be in the world they had never conceived, and they were never weary of staring at the high walls and towers with which it was entirely encompassed, the rich palaces and lofty churches, of which there were so many that no one could have believed it, if he had not seen with his own eyes that city, the queen of all cities; and know that there was not so bold a heart there that it did not feel some terror at the strength of Constantinople.' Chap. 66. (See the notes at the end of vol. xxiv. of the 'Waverley Novels,' Edinburgh, 1843.) The services of Villehardouin were rewarded by the Emperor Baldwin, whom the victorious Franks had placed on the throne, by his appointment to the important office of 'Maréchal' of the province of Romania. His military skill and bravery also insured him the esteem of the Emperor Henry, the successor of Baldwin, to whom the Marquis of Montserrat had given his daughter in marriage; from him he received, as a free gift, the entire city of Messinopolis, together with its dependencies. This valuable donation induced him to reside in Thessaly, where he died about the year 1213. While however enjoying the honours which his merit had acquired, he appears not to have been unmindful of the country of his birth; in 1207, he richly endowed the abbeys of Froissy and Troyes, to which his sisters and his two daughters belonged. The lustre of his name gave power and influence to his descendants, who for nearly two centuries ruled over the most important principalities of Greece.

It is chiefly as an historian that the name of Geoffroy De Villehardouin has become celebrated. To him we are principally indebted for the history of one of the most important periods in the wars of the crusades [Crusades, P. C.], from 1198 to 1207. His work is entitled 'L'Histoire de la Prise de Constantinople par les Français et les Vénitiens.' The author relates the events in which he was an active participator with modest simplicity and tolerable candour. His narration is remarkable for brevity and clearness, and generally bears the impress of truth. His talents as a negotiator caused him frequently to be employed on missions of importance, and to be summoned to the councils of the army; he has thus been enabled to give a minute detail of several events, of which we might otherwise have remained ignorant. His history is rendered the more valuable from the fact, that it is probably the oldest historical record in prose which the French language possesses. The first edition of it was published at Venice in 1573, the second in Paris in 1585: the most valuable is that by the learned Du Cange, 'whose notes,' says Mills, 'are as valuable as his notes on the Alexiad.' [BYZANTINE HISTORIANS. P. C.] The title of this edition of Du Cange, which is now not easily to be met with, is as follows: 'Histoire de l'Empire de Constantinople, divisées en deux parties, &c., écrite par Geoffroy De Ville-Hardouin, avec la suite de cette Histoire jusqu'en 1240, tirée du Manuscrit de Philippe Mousker, &c., le tout avec Observations faites par Charles du Fresne, Sieur du Cange; Paris, de l'Imprimerie Royale, 1657, in fol.' In this edition the old text is accompanied with a modern French version. The history of Villehardouin is also to be found in vol. xxviii. of the 'Recueil des Historiens des Gaules et de la France;' Paris, 1822, in fol.: the text in this edition has been revised on three manuscripts, and to it is appended a glossary.

(*Biographie Universelle*, tome xlix., Paris, 1827; Laugier, *Histoire de Venise*, tome second, livre vi., Paris, 1758; Mills, *History of the Crusades*, vol. ii., London, 1820; Michelet, *Histoire de France*, livre iv., chap. vi.)

VINCENT DE PAUL, SAINT, was born on the 24th April, 1576, at Ranquines in the parish of Pouy, near the Pyrenees, in the present department of the Landes. He was the third son of Guillaume de Paul, who owned and cultivated a small farm in that parish. The narrow means of his family promised him a life of laborious toil, and till the age of twelve he assisted his parents in the care of their farm. He had however from early youth manifested so great an acuteness of intellect and sensibility of disposition, that they were induced to endeavour to give him a suitable education. He was placed as a student in a convent of the Cordeliers at Acqs, the residence of the bishop of his diocese. At the age f sixteen, he was considered qualified to become tutor to the children of M. de Commet, an advocate of Acqs, and the magistrate of his native village. This situation enabled him at the same time to relieve his parents from the expenses attendant on his education, and to prepare himself for the ministry of the church, to which he had now determined upon devoting himself. He assumed the tonsure on the 20th December, 1596, and the next year he went to Toulouse, in order to follow the course of theology of that university. But he was compelled, on account of the slender pittance which was allowed him, to combine the duties of a teacher with those of a student. In the year 1600, after having received the previous orders, he was made a priest by the Bishop of Perigueux; in the same year the offer was made him of the parish of Tilh, one of the most valuable in the diocese of Acqs, which he declined in order to devote himself more entirely to the study of theology. In this study, notwithstanding the difficulties under which he laboured, he soon became eminent, and on the 12th October, 1604, obtained the degree of bachelier des lettres, with a permission to lecture.

In 1605, a legacy of fifteen hundred livres, which had been left him by a friend who had died at Marseille, compelled him to make a journey to that city. After taking possession of his legacy, he was returning by sea, when he was taken prisoner by some Tunisian corsairs, and was wounded in the conflict. He has left us a minute relation of his capture and imprisonment, in a letter written to his early patron, M. de Commet, on his return to France in 1607, of which there is a copious extract in the 'Biographie Universelle.' During his captivity at Tunis and Algiers, he became the slave of three successive masters; the last of them, an Italian renegade, he converted to his former faith. After a delay of ten months, he was sufficiently fortunate to induce his master to forego the temporal advantages of a residence in a land where he was obliged to conceal his profession of Christianity, and to escape with him to France, in which country they landed on 28th June, 1607. At Avignon, the penitent renegade was publicly readmitted to the privileges and consolations of the religion he had denied. Shortly afterwards the vice-legate of the pope, Paul V., who had performed this ceremony, induced Vincent and his companion to accompany him to Rome. He there became acquainted with the ambassador of the French king, who selected him to be the bearer of an important and confidential message to Henry IV. He arrived in Paris at the commencement of the year 1609, and obtained several interviews with the king. His time however he chiefly devoted to the service of the sick of l'Hôpital de la Charité, near which he had taken up his residence.

The period of Vincent's residence in Paris was embittered by an accusation of robbery made against him by a fellow-lodger, a native of the same province as himself, and for six years he was unable to clear himself of the charge. During that time, though suffering severely from the cruel imputation, he contented himself, when questioned concerning it, with a simple denial, joined to the remark that 'God knew the truth.' The real author of the robbery was at length discovered, and the reputation of Vincent rose still higher in the estimation of those who had witnessed the patience and resignation which he had displayed under the false accusation. His adversity however was alleviated by the sympathy and support of several influential personages, whose friendship and esteem his merit had conciliated. Among them was Margaret of Valois, sister of Henry III., and the divorced queen of his successor, who appointed him her almoner, and Pierre de Berulle, afterwards cardinal, and founder of the congregation of the Oratoire. By the latter he was induced to accept the cure of the parish of Clichy in the neighbourhood of Paris, where he discharged his duties with exemplary diligence. His short residence in that village was blessed with the happiest results; not only were the sick attended to, the poor assisted, and the afflicted consoled, but family discords and dissent in religious matters were made by his pious influence to cease.

In 1613, he was obliged to abandon this peaceful scene of spiritual labour, to undertake the education of the three sons of Philippe Emmanuel de Gondi, Count of Joigny, and general of the galleys of France. These pupils of Vincent were destined to occupy an important position in the history of their country: one of them became the well known Duc de Retz; another, the famous cardinal, who acted so conspicuous a part in the civil wars of the Fronde. [RETZ, P. C.]

In 1616, he accompanied the Countess de Joigny to her country residence at Folleville, in the diocese of Amiens, where he commenced a series of missionary labours among the inhabitants, which were eminently successful. The memory of this mission he was in the habit every year, on the festival of the conversion of St. Paul, of celebrating with pious gratitude. The following year, he left the residence of the Count de Joigny to undertake the cure of the parish of Châtillon, in Bresse, where his labours were attended with similar success. It was there that he first established and organized a religious association for the relief of the temporal and spiritual wants of the sick and poor, to which he gave the name of the 'confrérie de charité,' which became the model of many similar institutions in France and other countries. Towards the end of the same year, he was induced to return to the Count's family, and, with the permission and co-operation of the Countess, a lady of pious disposition and intelligent mind, who had placed herself under his spiritual direction, he undertook several successful missions in the dioceses of Beauvais, Soissons, and Sens. An opportunity was now afforded him to labour in a cause still more important, and which presented the prospect of much danger, disappointment, and difficulty. He was in the habit of accompanying to Marseille the Count de Joigny, whose situation as commander of the royal galleys rendered it necessary for him frequently to visit that city. He was there moved with compassion on witnessing the sufferings and severities to which were subjected the unhappy criminals condemned to the galleys. To ameliorate their condition and to alleviate their sufferings was the pious task which Vincent took upon himself He found them in narrow and unhealthy dungeons, almost entirely deprived of air and light, with bread and water for their only food: disfigured by filth, and covered with vermin, these wretched victims of their own misdeeds, and of the misguided policy of the state, sank shortly after their admission into a brutal state of ignorance and ferocity. Vincent began his work of reformation by introducing himself among them as their friend and benefactor, and, undeterred by the rude scoffs and jests to which he was at first exposed, and undismayed by the havocks of a pestilential disease, which was the habitual sojourner of these prisons, he unremittingly pursued his charitable mission: his kindly manner, his patient attention to their wants, his reproofs, tempered by mildness and Christian charity, and, above all, his own example of humility and self-devotion, soon overcame all obstacles; he gained their confidence, and thus secured a ready acquiescence in his efforts for their welfare. In a short time, the most unexpected success attended the improvements which he introduced and the reformation which he effected. The ameliorated condition of these criminals was sensibly felt and gratefully acknowledged by his patron, who called the attention of the king, Louis XIII., to the change which had taken place among the criminals under his care and to the devoted man by whom it had been produced, and the king, with appropriate consideration for the services he had rendered, appointed Vincent almoner-general of the galleys of France; the date of his appointment to this important office was 8th February, 1619. In the beginning of the following year, Francis de Sales, the celebrated bishop of Geneva, whose intimacy he had for some time previously enjoyed, confided to him the direction of the first convent of the Order of the Visitation, which he had lately established. [SALES, DE, FRANCIS, SAINT, P. C. S.]

In 1623, Vincent established two 'confréries de charité' in the town of Mâcon, one for men and the other for women. He next visited the city of Bordeaux, for the purpose of inquiring into the condition of the criminals there condemned to the galleys. On leaving that city, he visited his friends and relations in his native village; having assembled together those who remained of his family, he informed them of his determination to die as he had lived, destitute of all worldly wealth; told them that money left by a priest to his family seldom prospered, and thus weaned them from any expectation they might have formed of obtaining property at his death. This resolution however did not prevent him, on a subsequent occasion, from distributing among them about a hundred pounds of our money, which had been bequeathed to him.

The next scene of Vincent's labour was the town of Chartres, where he founded an association under the name of the 'Congregation of the Missions,' which was intended to supply the provinces of France with efficient teachers of religion, who were to act as assistants to the regular clergy, and were to be subordinate to the authorities of the church. On 6th March, 1624, the 'Collége des Bons Enfans' was given to him as the first residence of the new company he had formed. For the better watching of his infant institution, he left the family of the Count de Joigny, and retired to this college. In 1627, he had the satisfaction to see the Congregation of the Missions authorized by letters patent from the king, and in 1631, formally approved by a bull of the Pope Urban VIII. During this period he was actively employed in establishing retreats for the members of the society, and for persons destined to enter the orders of the church; a measure which greatly tended to the reformation of many existing abuses. In 1632, he yielded to the repeated requests of the Prior of St. Lazarus, Adrien Lebon, to accept his house and property for the purpose of furthering his projects for the instruction and relief of the poorer classes of the peasantry. Small as were the beginnings of this institution, he lived to see the order of the Lazarists spread its charitable influence over the greater part of Europe. The institution however which has probably been productive of the most beneficial consequences was that which he established in 1634; it was composed of a company of pious females, called Sisters of Charity, who especially devoted themselves to the attendance of the sick; a branch of this society, called 'les Dames de la Croix,' was intended for the sole service of l'Hôtel Dieu at Paris. To Vincent de Paul this city indeed has been peculiarly indebted for many valuable institutions, whose utility is recognised to this day. Among them may be mentioned the hospitals of 'La Pitié,' 'Bicêtre,' 'La Salpêtrière,' and 'Les Enfans Trouvés,' or Foundling Hospital. [PARIS, P. C.; FOUNDLING HOSPITAL, P. C.] The origin of this last-mentioned institution exhibits a striking proof of the disinterested zeal of Vincent. Previous to the establishment of the Foundling Hospital in Paris, an immense number of children, the fruits of licentious intercourse or the victims of their parents' poverty, were daily exposed in the streets and public places of that city, and often left there to perish. The pitiable condition of these innocent sufferers excited the commisseration and stimulated the charitable zeal of this devoted minister of the church. For the purpose of affording them food and succour he enlisted in his cause several ladies of the capital, over whom his simple piety had already exercised a beneficial influence. He called them together at the commencement of the year 1640, and so energetically set before them the motives for their charitable intervention in the cause of these unhappy foundlings, that they determined upon making the trial of taking under their protection all who should hereafter be discovered. The generous gift of an annual rent of 12,000 livres from the Queen Anne of Austria was the first assistance they received in their humane design. Soon however the wants of these foundlings exceeded the funds which charity could raise; discouraged in their efforts, and fearful that the task which they had undertaken was beyond their means and abilities, the adopted parents of these children were about to abandon their charitable enterprise. To avert so unhappy an issue to his charitable project, in 1648, Vincent called together another and more numerous assembly. He there summoned to his aid every argument which could be urged in support of his cause, and pleaded the interests of these innocent outcasts of society in a language of fervid and impassioned eloquence; an eloquence unaided indeed by the arts of a polished education, but which was the utterance of deep-seated sincerity and ardent zeal. The termination of his address on that occasion has been recorded by a high authority as one of the finest pieces of eloquence in any language. (Maury, 'Essai sur l'Eloquence de la Chaire.') [MAURY, P. C. S.] Rich and plentiful were the fruits of his energetic pleading; alms were collected in abundance, two large buildings were converted into hospitals for foundlings, and the capital of France was no longer disgraced by the daily exhibition in its streets of helpless children dying from the want of food and succour. Besides the hospital already mentioned, Vincent founded two others, which have been productive of considerable benefit: one at Paris, which went under the designation of the name of Jesus, for the maintenance of forty poor men, whom age had incapacitated for labour; the other, that of Sainte Reine, in the diocese of Autun, in Burgundy, for the relief of the poor and sick among the numerous pilgrims who are accustomed to visit the shrine of that martyr.

While occupied in the formation of societies and in the establishment of institutions destined for the permanent relief of his fellow-creatures, he was no less zealous and persevering in attending to the immediate wants of those who came within the reach of his assistance. The province of Lorraine was, during the latter period of the reign of Louis XIII., suffering under the threefold calamity of war, pestilence, and famine. To that province, by his charitable exertions, for several successive years, Vincent caused considerable sums of money, which he collected in Paris, to be sent for the succour of its inhabitants. His biographers differ with respect to the amount, the highest stated being two million livres, and the lowest from five to six hundred thousand.

During the wars of the Fronde, the Queen-regent, Anne of Austria, instituted a council for the settlement of disputes on questions of theology, and appointed Vincent de Paul its president. In this capacity, he took an active part in the religious controversies of that period, and warmly espoused the cause of the Jesuits against the followers of Jansenius. [JANSENISTS, P. C.; PORT ROYAL, P. C.] Through his influence, a letter signed by eighty-eight bishops was sent to the reigning pontiff, praying him authoritatively to condemn the witness of Jansenius, and in particular the work entitled 'Augustinus.' In carrying on this controversy however, he does not appear to have exceeded the bounds of moderation, and to have employed against his adversaries only the legitimate weapons of argument and expostulation. The four last years of his life were spent under the burden of infirmities, which compelled him to keep within the precincts of the convent of St. Lazarus, where nevertheless he continued efficiently to preside over the interests of the community he had established. His death, which occurred on the 27th September, 1660, was preceded by severe and protracted sufferings, which were borne with his accustomed patience and resignation. His remains were deposited in the church of St. Lazarus, in presence of the assembled clergy and the highest dignitaries of the capital, who mourned his loss as that of their spiritual father; but perhaps the tears of most genuine affection were shed on his tomb by the multitude of the poor and needy, who gratefully remembered that they had often been consoled by his counsels and relieved by his charity.

The panegyric of this eminent minister of the church has been written by two of its most distinguished prelates, Boulogne, Bishop of Troyes, and the Cardinal Maury; the last of these has been greatly admired for the beauty of its style and the energy of its expressions; it may be seen in the last edition of his 'Essai sur l'Eloquence de la Chaire.' [MAURY, P. C. S.] The memory of Vincent de Paul was consecrated by a ceremony, known in the church of Rome by the name of Beatification, by Benedict XIII., on 14th August, 1729, and he was canonized as a saint on 16th June, 1737, by Clement XII., who appointed 19th July as the day of his festival in the Roman calendar.

The name of St. Vincent de Paul stands deservedly high in the list of benefactors of mankind. His entire life was devoted to the advancement of the best interests of humanity; he was a constant actor on the ever recurring scene of sickness and suffering, poverty and crime, and his presence was always attended by consolation and relief to their victims. Men of all creeds and persuasions have rendered homage to his worth, and the members of his own church have ascribed to his relics the power of working miracles. The greatest miracle however was himself, and the mighty works of which he was the instrument; the many hospitals which he founded, the religious communities which he established, the missionaries whom he sent abroad, the vast sums of money which he caused to be distributed to the poor and sick, his untiring activity in ministering to their wants, his disinterestedness and self-devotion, his evangelical patience and religious resignation; above all, his genuine humility, which, while it shed lustre on those of his charitable deeds which are known, has caused a large proportion of them to be unknown and unwritten, save in the records of the book of life;—these, it must be allowed by all, are the real miracles on which stands the fame of this apostolical man.

The following is a list of the writings he has left:—1, 'Regulæ seu Constitutiones communes Congregationis Missionis,' Paris, 1658; 2, 'Lettre au Pape Alexandre VII., pour solliciter la Canonization de François de Sales, prince-évêque de Genève;' 3, 'Conférences spirituelles pour l'Explication des Règles des Sœurs de la Charité,' Paris, 1826, in 8vo.

The two most important biographies of St. Vincent de Paul are those of Abelly, who was intimately acquainted with him, and Collet, who was a member of his community; there is also a third, by M. de Capefigue, Paris, 1827, in 8vo.

(*Biographie Universelle*, tome xlix., Paris, 1827: the article in this biography is written by Labouderie, and is valuable from the research and impartiality which it displays; *Life of St. Vincent of Paul, Founder of the Congregation of the Missions and of the Sisters of Charity*, by Mons. Collet, Priest of the Mission: translated from the French by a Catholic clergyman, Dublin, 1846; *Vies des Pères, Martyrs*, &c., from Alban Butler, traduction de Godescard, Versailles, 1819, tome vi.; *Penny Magazine* for 1838, p. 4; Abelly, Evêque do Rhodez, *Vie de St. Vincent de Paul*, Paris, 1839, 2 vols. 8vo., the most complete and valuable biography of St. Vincent.)

VINCULA'RIA. A species of fossil Zoophyte is referred to this genus of Defrance by Portlock, from the carboniferous limestone of Ireland.

VINER, CHARLES, died June 5, 1756, at his house, Aldershott, Hampshire. When or where he was born has not been recorded. He is known as the compiler of 'A General and Complete Abridgment of Law and Equity,' 24 vols. folio, 1741-1751, and as the founder of the Vinerian Professorship of Common Law in the University of Oxford. The 'Abridgment' was printed at his own house, at Aldershott. The 24th volume is an Index, by a Gentleman of Lincoln's Inn. It appears to have occupied only ten years in printing, but Viner was probably occupied many years previously in preparation. Blackstone says he was half a century about it. This stupendous work was reprinted in 24 vols. roy. 8vo., 1792-1794, and was followed by 6 supplemental volumes, roy. 8vo., 1799-1806, the compilers of which were James Edward Watson, Samuel Comyn, James Sedgwick, Henry Alcock, John Wyatt, James Humphreys, Alexander Anstruther, and Michael Nolan.

Viner having resolved to dedicate the bulk of his property, as he himself states, 'to the benefit of posterity and the perpetual service of his country,' bequeathed by his will, dated December 29, 1755, about 12,000*l.* to the Chancellor, Master, and Scholars of the University of Oxford, to establish a Professorship, and to endow such Fellowships and Scholarships of Common Law in the university as the produce of his legacy might be thought capable of supporting. The Professor is to read a lecture in the English language within a year after his admission, and a course of lectures on the laws of England every year in full term. The course is to consist of at least twenty-four lectures, to be read in one and the same term, with such intervals that not more than four are to be read in a week. As relates to the reading of the lectures, Easter and Trinity Terms are reckoned as one Term. There are at present (1846) two Fellowships with 50*l.* a year each, and five Scholarships with 30*l.* a year each. Both Fellowships and Scholarships expire at the end of ten years after each election.

Blackstone was elected the first Vinerian Professor. He had commenced his lectures on English law in the year 1753, two years before Viner made his will, and it is therefore probable that Blackstone's lectures gave Viner the hint for founding the Professorship. The succession of professors is as follows:—1758, William Blackstone, D.C.L.; 1760, Richard Chambers, Knt., B.C.L.; 1777, Richard Wooddeson, D.C.L., author of 'Lectures on the Law of England,' 3 vols. 12mo.; 1793, James Blackstone, D.C.L.; 1824, Philip Williams, B.C.L.; 1843, John Robert Kenyon, D.C.L.

(Chambers's *Biographical Dictionary*; *Oxford University Calendar*, 1846.)

VIOLIN STRINGS. [CATGUT, P. C. S.]

VISMIA (in honour of M. de Visme, a Lisbon merchant), a genus of plants belonging to the natural order Hypericaceae. The calyx is five-parted, the petals 5, usually villous on the inside. The berry membranous, the styles 5, stigmas peltate. The stamens are numerous, disposed into 5 bundles opposite the petals, alternating with 5 glands or scales. The anthers are small, roundish, 2-celled, bursting lengthwise, the seeds with a double covering. The leaves usually protected with a rusty down, rarely with pellucid dots.

V. guianensis is a small tree with a stem about eight feet high, the leaves ovate, lanceolate acuminate, dilated at the base, rufous beneath, smooth above, filled with transparent dots. The petiole is short, the calyxes ovate, obtuse, tomentose with ciliated margins. The flower yellow and corymbose. The berry yellowish, ovate, soft, and somewhat 5-cornered. The bark when wounded yields a gum resin, which when dry becomes hard, and resembles gamboge. The leaves and fruit likewise yield a similar secretion. It is used in medicine as a purgative, in doses of from 7 to 8 grains. A decoction of the leaves is recommended in intermittent fever. This species is native of Guiana and Bengal. There are about twenty other species growing in the East Indies, Bengal, and Guiana: those from Guiana yield a resinous gum, which finds its way into Europe under the name of American Gamboge.

(Lindley, *Flora Medica*.)

VITRU'VIUS BRITA'NNICUS. [GANDON, JAMES, P. C. S.]

VITTORI'NO DA FELTRE, born in 1379, at Feltre in North Italy, studied at Padua under the celebrated Guarino of Verona, and afterwards became professor of rhetoric and philosophy in the same university. Being some time after invited by G. F. Gonzaga, lord of Mantua, to superintend the education of his children, Vittorino repaired to Mantua, where a separate and commodious residence was prepared for himself and his pupil, which was named 'La Giocosa.' Other youths of distinction repaired thither in succession to avail themselves of Vittorino's instruction, and among them Federico di Montefeltro, afterwards duke of Urbino, Giberto, prince of Correggio, Taddeo Manfredi, of the princely house of Faenza, Gio. Battista Pallavicino, afterwards bishop of Reggio, Lodovico Torriano and Bernardo Brenzoni, who became afterwards celebrated as jurists, Theodore Gaza and George of Trebisond. Ambrogio Traversari, or Camaldulensis, who visited the school of Vittorino at Mantua, gives in his Epistles (lib. vii. & viii.) an interesting account of his system of education; and Carlo Rosmini, who died lately, has written a work on the same subject, entitled 'Idea dell' ottimo precettore nella vita, e disciplina di Vittorino da Feltre a de' suoi discepoli.' It appears from the example of Vittorino, of Guarino Veronese, and others, that education, in the larger sense of the term, was better understood in Italy in the fourteenth century than it has been since, but it was confined to the upper classes. Gymnastics formed a part of Vittorino's system. He lived with his pupils and took his meals with them. Their fare was wholesome, but plain. He had tablets of various colours to teach his younger pupils the rudiments of reading. His older pupils were instructed in rhetoric, mathematics, and ethics. He was very strict with regard to their morals. He watched the disposition and abilities of each pupil, in order to direct him to that particular professional course for which he was best adapted. Temperate in his corrections, he allowed time to pass between the offence and its punishment, and he never showed himself out of temper. He was beloved by his disciples, and he loved them like a father. Such was the character of this distinguished preceptor.

(Corniani, *I Secoli della Letteratura Italiana;* Tiraboschi, *Storia della Letteratura Italiana;* Rosmini, as above mentioned.)

VOLPI, GIAN ANTONIO, born at Padua in 1686, studied in his native town, and became a good Latin and Greek scholar. In 1717 he and his brother Gaetano Volpi established a printing-press in their house for the purpose of bringing out correct editions of classic authors, and they engaged for their assistant the printer Giuseppe Comino. This press—known by the name of Volpi-Cominiana, produced among others a valuable edition of Catullus with copious notes. The edition was much commended by scholars, and the city of Verona struck a gold medal, which was presented to Volpi: the title is, 'Calus Catullus Veronensis et in eum Jo. Antonii Vulpii novus Commentarius,' 4to., Padua, 1737. Volpi afterwards edited Tibullus and Propertius. He translated from the Greek into Italian the dialogue of Zacharias Scholasticus; he wrote a disquisition on the satire of the Romans: 'Liber de satyræ Latinæ natura et ratione, item paraphrasis perpetua et commentarius uberrimus in X satyram Juvenalis,' Padua, 1744; he edited the poems of Sannazaro, with a biography of the author; he published a new edition of Dante; and he wrote three books of Latin poems, to which he added those of his ancestor and namesake Gian Antonio Volpi, the elder, who was bishop of Como and was one of the Fathers of the Council of Trent. Volpi was for many years professor of philosophy and of rhetoric in the University of Padua. In his old age he became blind, and he died in 1766. His brother Gaetano Volpi edited Sallust in 1722, and he was an active assistant to his brother at the press. He wrote an account of their joint labours: 'La Libreria dei Volpi e la Stamperia Cominiana.' Giuseppe Comino having died in 1752, his son Angelo Comino continued to carry on the business. Another brother of Volpi, named Giuseppe, undertook the continuation of Cardinal Corradini's great work, 'Vetus Latium profanum,' which he completed.

(Tiraboschi, *Storia della Letteratura Italiana*, with the continuation by Lombardi.)

VO'LTZIA, a genus of fossil (coniferous?) plants which occurs in the Magnesian limestone of England, and in the new red sandstone of Germany. (Brongniart.)

VOYAGE. [SHIPS, P. C.; BOTTOMRY, P. C.]

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VOLUME II.

W.

WACE, ROBERT, MASTER. The name of this early Anglo-Norman poet is variously written in different manuscripts of his poems, and in the ancient writings which make mention of him. Tho most usual forms are Wace, Gasse, Gace, Guaze, Huace, and Huistace, names which appear to be abbreviations of Eustache or Eustace. His Christian name is likewise doubtful, as he never styles himself otherwise than 'Master Wace.' Du Cange supposed it to have been Matthew, and Huet is tho first writer who calls him Robert. He was born in the island of Jersey about the year 1112, and received his early education at Caen; he completed his studies, which appear to have been chiefly connected with the clerical profession, during a residence of some time in the territories of the King of France, and he afterwards returned to Caen, where Henry I. usually held his court. In this town ho spent the greatest portion of his life; his chief occupation was the composition of metrical romances, so called from their being written in the Roman or vulgar dialect. The 'Roman du Rou,' which he completed in 1160, was dedicated to Henry II., and was presented to him by Wace in person, who was rewarded with a canonry in the cathedral church of Bayeux; this preferment, according to the antient capitularies of that church, he held from 1161 to 1171. As he frequently styles himself 'clerc lisant,' reading clerk, it has been supposed that he was attached to the private chapel of Henry II. He complains, however, and that somewhat bitterly, that the reward ho received from the Dukes of Normandy neither answered his anticipations nor came up to the promlses they bad made him. He is said to have died in England, about the year 1184.

The principal details in this brief notice of the life of Wace, are given to us by himself in his 'Roman du Rou.'

"Lunge* est la geste des Normanz,
Et à metre est griève en Romanz.
Si l'on demande qui ço dist†
Ki ceste estoire‡ en Romanz mist;
Jo§ di è dirai ko jo sui,
Wace, de l'isle de Gersui,
Ki est en mer vers occident.
Al fieu‖ de Normendie appent.¶
En l'isle de Gersui fu nez.
A Caen fu petis portez,
Ilore** fu a letres mis,
Puis fu lunges en France apris.
Quand de France jo repairai,††
A Caen lunges conversai;‡‡
De Romanz fere m'entremis,
Mult §§ en ecris et mult en fis.
Par Deu aïe ‖‖ è par li Rei
Altre ¶¶ fors li servir ne dei.
Me fut donnée, Dex li rende,
A Baieues une *** provende;
Del rei Henri segund vos di.
Nevou Henri, père Henri."

The rhymed chronicle from which this extract is taken is entitled 'Le Roman du Rou (Rollo) et des Ducs de Normandie,' and is the best known of the writings of Wace; it is held in high esteem as a monument of the language and as an historical document, which, though incorrect in some of its details and sometimes inexact in its dates, presents a faithful picture of society during that period. It contains the history of the Dukes of Normandy from the first invasion by Rollo down to the eighth year of King Henry I., and not simply, as Hallam states, the narrativo of the battle of Hastings and conquest of England by the Normans. The first, or introductory part, is written in lines of eight syllables, and presents us with the history of the first irruption of the Normans into England and France. The second part or section is written in Alexandrine verse, and relates the principal events which took place in the reign of Rollo; the third, in the same metre, the history of William Longsword and his son Richard, tho first Duke of Normandy of that name; in the fourth part, which is alone longer than the three preceding, he resumes the eight-syllable measure, and presents us with a sequel of the history of Richard, and that of his successors to the year 1106. [NORMANDY, P. C.] The whole poem contains oxactly 16,547 lines. He generally follows Dudon and William of Jumièges as his guides in the relation of historical facts, but he adds many interesting and curious details which he reports to have received from hearsay.

His description of the battle of Hastings [WILLIAM I., P. C.] is given with considerablo minuteness of detail, and has been largely drawn upon by succeeding historians. Among the disadvantages under which the English laboured, Wace says that they could not fight on horseback, nor shelter themselves under a buckler with one hand, while with the other they directed their blows against tho enemy.

The other recognised poems of Waeo are—1, 'Lo Brut d'Angleterre,' a work which preceded his 'Roman du Rou.' The date of it is ascertained by the following lines near the end of the poem:—

'Pois ke Dex* Incarnation
Prist por nostre rèdemption
M.C.L. et cinq ans. (1155)
Fist mestre Wace cest romanz.

The prinoipal incidents in it are derived from a Latin translation, by Geoffrey of Monmouth, of a poem composed in tho dialect of Lower Brittany. The subject of it is a certain Brutus, who is imagined to have been the great grandson of Æneas, and who ruled over Great Britain. It contains nearly eighteen hundred lines, in the same metre as those above quoted, and is by some supposed to have been the first work containing the origin of Arthur's round table, his knights, and tournaments. [ARTHUR, P. C.]

The next authentic work of Wace is styled 'La Chronique ascendante des Ducs de Normandie:' it commences with Henry II. and goes back to Rollo. It is a short poem of only three hundred and fourteen Alexandrine verses, and is published in the first volume of the 'Mémoires de la Société des Antiquaires de la Normandie,' p. 144. It must have been written later than 1173, as it makes mention of the troubles excited in Normandy during that year by the revolt of the sons of Henry II. against their father.

The other two remaining poems of Wace possess less interest, and are not so generally known. The first of them is entitled 'L'Establissement de la Feste de la Conception, dicte la Feste as Normands;' the second, 'La Vie do S. Nicolas,' of which Hickes has published several extracts in his 'Thesaurus Litteraturæ Septentrionalis.'

The above-mentioned works are the only ones which have been preserved, and on their authenticity no doubt exists. Two other poems have been ascribed to him, 'Le Roman du Chevalier au Lion,' and 'Le Roman d'Alexandrie;' but, though they are undoubtedly productions of the twelfth century, they are now generally supposed by the best critics not to belong to Wace.

The manuscripts of his poems are very numerous; there are complete manuscripts of the 'Roman du Rou' both at the Royal Library of Paris, No. 7567, and at the library of the Arsenal; that in the Royal Library is supposed to have been written in the fourteenth century. The most antient is in the British Museum, and was probably written in the first years of the thirteenth century; it contains however only the fourth part of the 'Roman du Rou.'

There is a valuable essay on the manuscripts of the 'Roman du Rou' by M. de Brequigny, in the fifth volume of his 'Notices des MSS. de la Bibliothèque Royale.'

In 1827, there was published at Rouen a remarkably fine edition of the 'Roman du Rou,' in two octavo volumes, with very valuablo notes, by M. Frederic Pluquet, who had devoted several years to the laborious task of carefully collating the texts of tho various manuscripts in existence.

The following works may be consulted for a more ample account of the life and writings of Wace:—1. Capefigue, 'Essai sur les Invasions Maritimes des Normands dans les Gaules,' 1823; 2. Depping, 'Histoire des Expeditions Maritimes des Normands,' 1826; 3. Wheaton, 'History of the Northmen,' London, 1831. In these two works there are copious and interesting extracts from the 'Roman du Rou;' Depping particularly has very justly appreciated the value of Wace as a poet and an historian. 4. Pluquet, 'Notice sur la Vie et les Ecrits de Robert Wace, suivie de Citations extraites de ses Ouvrages,' Rouen, 1824. In this work will be

* Longue. † Qui dit cela. ‡ Histoire. § Je. ‖ Fief. ¶ Appartient. ** La. †† Je revins. ‡‡ Demeurai. §§ Beaucoup. ‖‖ Aide. ¶¶ Autre excepté lui. *** Prébende.

* Puis que Dieu.

found the most complete account of the writings of Wace. In the 'Guernsey and Jersey Magazine,' London, 1836, vol. ii., p. 89, is to be found a notice of Wace, which is however chiefly a translation of Pluquet's work. In the same magazine, vols. ii., iii., iv., is a very interesting analysis of the 'Roman du Rou.' Roquefort, 'Glossaire de la Langue Romane,' Paris, 1808, 2 vols., will be found useful to the readers of Wace.

WAIGATZ is a large island in the Russian government of Archangel, situated in the Frozen Ocean at the entrance of the Gulf of Kara. It is separated by the Straits of Waigatz from the continent, and by the Straits of Woronowskai from the island of Nova Zembla. It lies between 57° 30′ and 59° 25′ E. long. and 67° 20′ and 68° 5′ N. lat. It is desolate, rocky, without wood, and almost without vegetation: it abounds in fur-bearing animals, snipes, plovers, fish, and is inhabited by a few families of Samoieds, and frequented by the Russians for the sports of hunting and fishing. Some old accounts speak of mountains connected with the Ural, and a map indicates a mountainous chain, which corresponds with that on the continent. There are some other islands, Maldigef, Dolgoi, and Bilinof in the Straits of Waigatz, which are small, desolate, rocky, low, without wood, and only frequented by the Samoieds and Russian fur-hunters. The strait was discovered by the Dutch in 1594, who were endeavouring to find a new way to China.

(Hassel, *Handbuch*; Stein, *Lexicon*.)

WAKHAN is a very remarkable alpine valley in Asia, situated in the Tartash-l-lIng, or Bolor Tagh, between 36° 40′ and 37° 30′ N. lat., and between 71° 30′ and 73° 40′ E. long. It is more than 130 miles long, and traversed in its whole length by the river Oxus, which issues from the western extremity of Lake Sir-i-col, and in these parts is called Panja. The lake occupies the eastern extremity of the valley, and is 15,600 feet above the sea-level. The river runs for about 60 miles in a glen, and here the valley is not cultivated, but the declivities of the mountain supply excellent pasture-ground during the summer; in winter they are covered by a layer of deep snow. When the river leaves the glen it enters a valley, which in general is one mile wide, though in some places it is narrowed by rocky masses projecting from the snow-capped mountains which enclose it on the north and south. This larger portion of the valley extends for about 70 miles, when it terminates at a high ridge which advances close to the bed of the river. This ridge is traversed by a mountain-pass whose summit is 10,900 feet above the sea-level. The higher portion of the wider valley is 10,000 feet, and the lower probably not less than 9000 feet above the sea. A small part of this valley is cultivated, and produces peas and barley, and also some wheat. [TARTASH, P. C. S.]

The land requires to be irrigated, and to yield even a moderate crop it must be richly manured. The strong wind that blows with little intermission throughout the winter and spring down the valley of the Oxus, is unfavourable to vegetation. Their flocks of sheep and goats constitute the wealth of the Wakhani; the goats yield that kind of wool of which the shawls of Cashmere are made. The horses are small, but strong. Of quadrupeds, wolves, foxes, and hares are mentioned. There is also a kind of wild sheep called *Kutch-kar*, which is of the size of a two-year-old colt, and has splendid curled horns; in autumn, when this animal is in prime condition, no venison is better flavoured. It lives in herds of several hundreds. The skin rather resembles the hide of a cow than the fleece of a sheep. There is still another animal found in the adjacent mountains called *Rass*, which is described as being larger than a cow and smaller than a horse, and has immense horns; it appears to be rare. The population of the valley does not exceed 1000 individuals, according to the statement of Lieut. Wood. The Wakhani boast of being descended from Hazrat Zekunder, or Alexander the Great, but Lieut. Wood did not discover any difference between them and the Tadjiks who inhabit the plains of Turan, whose language they also speak. The chief of Wakhan is dependent on the sovereign of Kunduz; but this dependence appears only to be nominal, except that he sends an annual present to the Uzbeck prince. Through this valley runs a caravan-road which leads eastward to the town of Yarkand, in Chinese Turkistan, and westward to Kunduz and Balkh, and thence to Bokhara, Kabul, and Candahar.

(Burnes, *Travels into Bokhara;* Wood, *Journey to the Source of the River Oxus.*)

WALCHIA, a genus of Lycopodioid fossil plants from the coal and oolite formations. (Sternberg.)

WALKING WHEEL is a cylinder which is put in motion about an axle by the weight of men or animals; it is used for the purposes of raising water, grinding corn, and various other operations for which a moving power is required.

It is probable that a wheel so put in motion was employed in the East, in a very early age, to raise water; for Moses reminds the posterity of Israel (*Deuteronomy* xi. 10), that in Egypt they sowed their seed and '*watered it with the foot*' as a garden of herbs; and in China walking wheels are used for raising water to the higher grounds on which rice is grown. In a treatise on machines, which was published at Nürnberg in 1661, there is a description of a walking wheel which was used for grinding corn; it consisted of an inclined plane of a circular form, and turned upon an axle placed obliquely to the horizon, the axle resting at its lower extremity in a gudgeon firmly fixed to the ground, and at its upper extremity, in one which was attached to a part of the building in which the machinery was contained. The wheel or plane was made to revolve on its axis by men, who, while stepping on its upper surface, pressed with their hands against a horizontal rail and with their feet against slips of wood which were nailed to the surface in the direction of the radii; and, below the wheel was a pinion whose *leaves*, acting against the cogs of a trundle on a horizontal shaft, gave a revolving motion to the machinery.

A similar kind of walking wheel was at one time proposed in this country, but it does not appear to have been much used: it was provided with a brake by which it might be rendered immovable at the will of the person employed to give it motion; and consequently the danger of accidents from a failure of the machinery might be considered as obviated. Such a wheel permits a man, by merely changing his place on it, to put his power in equilibrio with different degrees of resistance; thus, when the resistance is great, he may walk near the circumference of the wheel, and when small, he may find a place near the centre at which he may act with most convenience to himself; but a serious objection to it is, that the force arising from the weight of a man being oblique to the surface of the plane, its effect in giving motion, compared with that of an equal weight applied at the circumference of a vertical wheel of equal diameter, is only as the sine of the inclination of the plane to the horizon (about 30 degrees) is to unity; therefore the former effect is only about half of the latter. The weight of the man or men employed to walk on a large wheel of this kind causes its plane to bend; and when, in order to prevent this effect, the wheel is supported by vertical props, the friction is greatly increased, notwithstanding the application of friction rollers at the points of support.

Wheels for drawing water from deep wells, as well as for other purposes, were at one time constructed in the form of hollow cylinders, and turned on horizontal axles by the weight of men or animals moving on their concave surfaces; they were of considerable dimensions, sometimes about 15 feet in diameter; and they had an advantage over the inclined wheel in being subject to less resistance from friction. The weight of the moving agent, a horse or a man, could not, however, be made to act on the circumference at a point more than 20 or 30 degrees from a vertical line passing through the axle, or where a tangent to the circumference makes an angle of 25 or 30 degrees with the horizon, and consequently the effect of the moving power compared with that of an equal weight applied at the extremity of a horizontal diameter, is only as the sine of that inclination is to unity. Two ranks of men were sometimes made to walk in the wheel behind one another; when, since the rear-rank men were necessarily at a less distance than those in the front rank from a vertical plane passing through the axle, their weight must have been still more disadvantageously applied. The lives of the men employed to give motion to such wheels were evidently in great danger on any accident happening to the machinery.

In the year 1803 the late Mr. David Hardie, then in the service of the East India Company, obtained a patent for a wheel which turned on a horizontal axle by men on its convex surface; the wheel was six feet in diameter, and projecting from its surface like the floats of a water-wheel were 24 boards or steps whose planes, if produced, would pass through the axle. On these boards the men trode as in the act of ascending steps, keeping themselves in vertical positions and very nearly at the extremity of a horizontal diameter of the wheel; consequently in the most advantageous circumstances for the application of their weight. Above the wheel were fixed a number of vertical bars, by holding which the men might keep themselves steady; a number of bars were also made to project horizontally from a fixed beam above the wheel, at about three feet from the board on which the foot of the man was placed in stepping; and taking hold of two of these, pulling upwards as if he were lifting two bodies from the ground, a man might add his muscular energy to his dead weight, so as on an emergency to press vertically with a force amounting to double that weight.

The circumference of the wheel is about 19 feet; and in raising up weights, by means of a rope passing over its axle, two revolutions are generally made in one minute; therefore, if a working day be estimated at eight hours, and a man rest during a quarter of an hour after being on the wheel half-an-hour, so as to be actually at work during 320 minutes daily, the space which the man causes a point on the circumference of the wheel to describe during one day will be 12,064 feet; hence, assuming the weight of the man to be 160 pounds, his daily action is equivalent to 1,930,240 pounds raised one foot vertically, or about 365 pounds raised one mile. According to the experiments of Coulomb, the daily action of a man ascending stairs unburthened is equivalent to 291 pounds raised one mile vertically. [ANIMAL STRENGTH, P. C. S.]

The TREAD-WHEEL which has been introduced by Mr. Cubitt into prisons as a means of employing the culprits in useful labour is of the same nature as that which has just been described [TRANSPORTATION, P. C., p. 150]. These wheels, which are about 5 feet in diameter, vary in length from 8 to above 20 feet, and they are connected with machinery for grinding corn, beating hemp, or pumping.

WALLACE, WILLIAM, a mathematician of considerable eminence, was born September 23rd, 1768, at Dysart, in Fifeshire, N.B., in which town his father, a manufacturer of leather, had settled. He received the rudiments of education at a dame's school in his native town, and, at seven years of age, he was sent to a school in which, under a master, he acquired the power of writing, but to his father he was indebted for instruction in arithmetic. In 1784 his father, after the failure of his business at Dysart, having gone with his family to reside at Edinburgh, he was placed with a bookbinder in that city, to whom soon afterwards he was bound as an apprentice; he lodged, however, with his parents, and thus he continued to have the benefit of his father's moral superintendence, as well as advice and assistance in the prosecution of his studies. Without any encouragement from his master the youth derived some advantage from the opportunities which occasionally presented themselves of perusing the books which he was employed to bind; and having, besides, found means to purchase some mathematical works, he succeeded in making himself master of their contents. It is said that before he was twenty years of age he had acquired a knowledge of elementary geometry and trigonometry, algebra with fluxions, conic sections, and astronomy.

About the same time he became acquainted with a man who was employed by Dr. Robison as an assistant in making the experiments by which the subjects of his lectures were exemplified; and, when the term of his apprenticeship expired, he accepted the offer of this person to introduce him to that distinguished professor. Dr. Robison finding, after an examination, that the young man had attained to considerable proficiency in mathematical science, and being made acquainted with his humble condition in life, kindly permitted him to attend the course of lectures on Natural Philosophy which was then about to commence. Of this permission he thankfully availed himself, and he regularly attended the class, though, in order to be enabled to do so, he was obliged to labour in his vocation during a portion of the time which should have been given to repose. Dr. Robison soon afterwards proposed to him to give lessons in geometry to one of his own pupils; he also introduced him to Professor Playfair, who, taking an interest in his welfare, contributed both by advice and by loans of books to facilitate his progress in acquiring a knowledge of the higher branches of mathematics.

In the hope of obtaining more time for the prosecution of his studies, Wallace quitted the calling for exercising which he had qualified himself by serving an apprenticeship, and became a warehouseman in a printing-office: while engaged in this employment he acquired, with the assistance of a student in the university, a knowledge of Latin; and soon afterwards he began the study of the French language. He subsequently became a shopman to one of the principal booksellers of Edinburgh, and while holding this situation he gave lessons occasionally in the evenings in mathematics.

In 1793 his increasing love for science, and a desire to have greater opportunities of cultivating it, led him to resign his employment, and become a private teacher of mathematics; he, however, followed this occupation about a year only (during which time he attended the lectures of Professor Playfair, and a course of lectures on chemistry), for in 1794 he was appointed assistant teacher of mathematics in the Academy at Perth. He married soon afterwards, and during the vacations he regularly visited Edinburgh, where his talents procured him an introduction to the distinguished scientific men of that city.

Mr. Wallace continued to fulfil the duties of his appointment at Perth during nine years; but in 1803 he was invited to offer himself as a candidate for the post of a mathematical master in the Royal Military College, which had then recently been formed at Great Marlow, in Buckinghamshire, and by the advice of Professor Playfair he accepted the invitation. On presenting himself at the College, his qualifications were found to be such as entitled him to a preference over his competitors, and he was immediately appointed. The institution was afterwards removed to Sandhurst, in Berkshire; and at both places he performed the duties of his post greatly to the satisfaction of the persons in authority. In the year 1818 it was determined that a half-yearly course of lectures on Practical Astronomy should be given for the benefit of the students, and that these should be combined with instruction on the manner of making celestial observations; for these purposes the plan of a small observatory was furnished by Dr. Robinson, of Oxford; and Mr. Wallace, who was appointed to deliver the lectures, superintended the details of its construction. Such instruments were provided as suffice for the object proposed; and it may be said that the establishment of a course of astronomy at the college has contributed materially to the efficiency of military officers holding staff appointments abroad.

In the following year the death of Professor Playfair and the appointment of Mr. (Sir John) Leslie to succeed him in the chair of Natural Philosophy at Edinburgh, left a vacancy in the chair of Mathematics; and Mr. Wallace, whose highest ambition had always been to obtain a professorship in a Scottish university, immediately became a candidate for the post. He was elected, after a severe contest, by a majority of votes, and he held the appointment till the year 1838, when, on account of ill health, he resigned it. On this occasion the university conferred on him the honorary title of Doctor of Laws, and he received from government a pension in consideration of his attainments in science, as well as of his services in the Military College and at the University of Edinburgh.

Mr. Wallace died at Edinburgh, respected and regretted, on the 28th of April, 1843, and consequently in the 75th year of his age, after an illness which for several years had prevented him from entering into society. He had been a Fellow of the Royal Astronomical Society from the time of its formation; he was also a Fellow of the Royal Society of Edinburgh; a corresponding member of the Institution of Civil Engineers; an honorary member of the Cambridge Philosophical Society; and, a few weeks before his death, he was elected an honorary member of the Royal Irish Academy.

In 1796 he presented to the Royal Society of Edinburgh his first paper, which was entitled 'Geometrical Porisms, with Examples of their Applications to the Solution of Problems;' it contains some new porismatic propositions, investigated according to the method of the ancient geometers, and affords proof of considerable inventive power. About the same time he contributed the article 'Porism' to the third edition of the 'Encyclopædia Britannica.'

In 1802 he presented to the Royal Society of Edinburgh a paper containing a new method of expressing the co-efficients in the development of the formula which represents the mutual perturbation of two planets; and, in an appendix, he gave a quickly converging series for the rectification of an ellipse. In one point the subject of the paper had been previously investigated by Le Gendre, but the works of that great mathematician were then little known in this country, and apparently Mr. Wallace had not seen them. Six years afterwards he presented to the same society a third paper, entitled 'New Series for the Quadrature of the Conic Sections, and the Computation of Logarithms,' which contains some remarkable formulæ for the rectification of circular arcs and the sectors of equilateral hyberbolas, and for computing logarithms. In 1823 he presented a paper on the 'Investigation of Formulæ for finding the Logarithms of Trigonometrical Quantities from one another;' and in 1831 one entitled 'Account of the Invention of the Pantograph, and a Description of the

Eidograph,' the latter being an instrument which he had invented in 1821. [EIDOGRAPH, P. C. S.] In 1839 he gave a paper on the 'Analogous Properties of Elliptic and Hyperbolic Sectors;' and his last contribution to the society was one entitled 'Solution of a Functional Equation, with its Application to the Parallelogram of Forces, and the Curve of Equilibration:' this paper, which was published in vol. xiv. of the 'Transactions,' contains a table to ten decimal places of the values of the ordinates and arcs of a catenary.

Mr. Wallace contributed to the 'Transactions of the Royal Astronomical Society' a paper entitled 'Two Elementary Solutions of Kepler's Problem by the Angular Calculus,' which is published in the volume for 1836; and in the sixth volume of the 'Transactions of the Cambridge Philosophical Society' there is a paper by him under the title of 'Geometrical Theorems and Formulæ, particularly applicable to some Geodetical Problems.' In 1838, while suffering from sickness, he composed a work on the same subject, which he dedicated to his friend Colonel Colby.

In his early life Mr. Wallace was a contributor to Leybourne's 'Mathematical Repository,' and 'The Gentleman's Mathematical Companion;' he also wrote the principal mathematical articles for the 'Edinburgh Encyclopædia,' and for the fourth edition of the 'Encyclopædia Britannica.'

(*Monthly Notices of the Royal Astronomical Society*, vol. vi.)

WARNER, WILLIAM, a native of Oxfordshire, is supposed to have been born about 1558. He was a student at Oxford, but left the University without a degree, and, going to London, became an attorney in the Common Pleas. He died suddenly in 1609, and was buried in the parish church of Amwell. He was the author of 'Albion's England,' an historical poem, or rather a collection of ballads, in thirteen books, in the Alexandrine stanza. This work, in his own time, was exceedingly popular, and was frequently reprinted in the course of the thirty years after 1586, when it was first published. Some of his contemporaries compared, or even preferred him, to Spenser. The general simplicity of the feeling and language, and the frequent indelicacy of the images, are alike instanced in the beautiful pastoral episode of 'Argentile and Curan,' which is given by Percy and Campbell, as well as in several other collections. The whole poem, reprinted, is in Chalmers' 'British Poets:' a distinction which it well deserved, although it was far from meriting the extravagant commendations of older times. Warner was also the author of 'Syrinx, a Seavenfold Historie,' a collection of prose stories, published in 1597; and he is supposed also by Warton and others to have been the writer of a translation of the 'Menæchmi' of Plautus, which first appeared in 1595, and was reprinted by Steevens in 1779, in his 'Six Old Plays, on which Shakspeare founded.'

WATER, COMPRESSIBILITY OF. [COMPRESSIBILITY OF WATER, P. C. S.]

WATER-PLANTAIN. [ALISMACEÆ, P. C.]

WATSON, CHARLES, VICE-ADMIRAL, was born in the year 1714, and was the son of the Rev. Dr. Watson, Prebendary of Westminster. The loss of his father when he was but nine years of age enabled him to follow the inclination he had already manifested of entering the naval profession. His skill and bravery soon procured him promotion; in February, 1738, he was appointed captain of the Garland frigate, and, in 1744, he was transferred to the Dragon of 60 guns, under Admiral Matthews, on the Mediterranean station. In that command his services were required on several important occasions, and were generally attended with success. He was afterwards sent by his admiral to Cadiz, with orders to cruize off that harbour for a certain time, afterwards to proceed to Lisbon, and from thence to England. Though these orders opened to him the prospect of making many rich prizes, he ventured to disobey them on receiving intelligence that the enemy's fleet was preparing for sea at Toulon; and, regardless of his interests, he directed his course to the Hieres, in order to join the English fleet. During the course of the war, Captain Watson obtained distinction in the several ships which he commanded; his conduct in the action of the 3rd of May, 1747, elicited the admiration even of his enemies, and honourable mention was made of it by the French admiral. In another action, during the same year, in which Sir Edward Hawke commanded in chief, he displayed great intrepidity. On the 12th of May, 1748, his services were rewarded by his promotion to the rank of rear-admiral of the blue, and in this capacity he received orders to sail with a small fleet to Cape Breton.

In 1754, he was appointed to the command of the squadron destined to co-operate with the expedition of Colonel Clive [CLIVE, ROBERT, LORD, P. C.] in the East Indies; and soon after his arrival in that country he received his Majesty's commission appointing him rear-admiral of the red. His first exploit was the reduction of Fort Geriah, which was held by a piratical prince, who had for many years annoyed the English trade in the East Indies. This service was performed by Admiral Watson on the 13th of February, 1756. His conduct towards the wives and children of this prince, who had become his prisoner, was marked by the most courteous humanity. In the attack made by Colonel Clive on Chandernagore, a place of great strength, and the chief settlement of the French in Bengal, in conjunction with Admiral Pocock, he commanded the small fleet of only three ships of the line destined to co-operate with the land-forces. The French had prepared to resist him by sinking several large vessels in the river below the fort; but the admiral having found a safe passage by carefully sounding as he approached, directed so severe a fire upon the enemy's defences, that, seconded by Colonel Clive's batteries on the shore, the place capitulated in less than three hours (24th of March, 1757). By the capture of this fort, a large number of prisoners, one hundred and eighty-three pieces of cannon, and a considerable booty fell into the hands of the English. With this exploit may be said to end this admiral's short but successful career; on the 16th of August 1757, he fell a victim to that unwholesome climate. His death was severely felt by his companions in arms, by whom he was admired for his skill and bravery, and beloved for his moral qualities and amiable disposition. On the 18th of June, 1763, the memory of his services was consecrated by the erection of a monument in Westminster Abbey, with the following inscription: 'To the memory of Charles Watson, Vice-admiral of the White, Commander-in-chief of his Majesty's naval force in the East-Indies, who died at Calcutta the 16th of August, 1757, in the 44th year of his age. The East India Company, as a grateful testimony of the signal advantages which they obtained by his valour and prudent conduct, caused this monument to be erected.'

(*Annual Register*, Dodsley, for the years 1758 and 1763; *Lives of Illustrious Seamen*, &c., London, 1803; Smollett, Continuation of Hume's *History of England*.)

WAVRE is a town in the Province of South Brabant, in the kingdom of Belgium, situated on the river Dyle, in 4° 30′ E. long. and 50° 2′ N. lat. Wavre has about 4500 inhabitants, who cultivate tobacco, have a considerable trade in corn and cattle, and several breweries.

Wavre has become celebrated by the battles of the 18th and 19th of June, 1815, between the Prussians and the French under General Grouchy. After the loss of the battle of Ligny, Blücher had taken (on the 17th) an advantageous position with the 1st, 2nd, and 3rd corps of the army, partly to wait for the 10th corps coming from Liège, partly to effect more easily his junction with Wellington, who had engaged to maintain as long as possible the position at Mont St. Jean, while Blücher hastened to support him with the whole Prussian army. The whole army, except the 3rd corps, was already on the march, when Marshal Grouchy with a far superior force suddenly appeared and attacked the town of Wavre. General Thielmann immediately turned to meet him, but the other corps continued their march. A severe action between Thielmann and Grouchy was interrupted by the night, and renewed the following morning; when both parties, having learnt the result of the battle of Waterloo, retreated.

(Hassel, *Handbuch*; Stein, *Geographical Lexicon*.)

WAX-MODELLING. Wax has been in all ages an important agent in the art of statuary; and in the formative art generally, whether as a fine art, or for the purposes of science. In statuary it is used in making the models for the metal cast, but more formerly than at present, for now clay is frequently substituted in its place: it is however still used by silversmiths in casting cups and other cylindrical or spherical objects, especially such as are required to be kept free from the markings of joints, to avoid injury to the design or embossed work. In fine art it is used in forming images, and iconic portraits, small busts, and bassi-rilievi; and it is also very usefully and largely applied in the preparation of anatomical models, especially in pathology, and in the preparation of fruit, flowers, and many objects of natural history. Wax-modelling, when applied as above described, as a fine art, is frequently termed the ceroplastic art (κηροπλαστική; from κηρός, wax, and πλαστική, the art of fashioning into forms).

Wax was formerly indispensable in metal-casting, though when and how it was first used is wholly unknown. It may have been used for the models of solid casts even in the earliest periods, but was almost certainly used in hollow casting, which was a later invention, and which will presently be described; though of an art so entirely practical, no description can convey more than a general idea.

Different writers of different ages give various directions for the preparation of the wax to be used. Vasari, who doubtless mentions that used in his own time, recommends the admixture of a little tallow, turpentine, and pitch, with the common yellow wax, but he does not specify any particular quantities. The tallow renders it more soluble and fluid, the turpentine more adhesive, and the pitch colours it, and assists it in hardening after the operation is complete: it may also be coloured with a little red ochre in powder, which must be mixed with the wax in its liquid state. It may be made any other colour in the same way. A French mixture is—to one hundred pounds of yellow wax, ten pounds of turpentine, ten of pitch, and ten of hogs'-lard, which probably would be similar in its properties to the mixture described by Vasari. When the wax is melted, great care must be taken that it does not boil, or it cannot be repaired when cold. M. Fiquet, in his 'Art du Mouleur en Plâtre,' of which there is an abstract in Panckoucke's 'Encyclopédie Méthodique,' gives the following compound for founder's wax—to four of wax, mix one of tallow and two of Burgundy pitch (poix de Bourgogne), which when melted together are fluid and manageable. This was probably the composition used by J. B. Keller and Girardon in preparing the mould for Girardon's equestrian statue of Louis XIV., which was cast entire, or in *whole getto*. Several other mixtures were and are probably employed by different sculptors; the above however were those employed in France and Italy in the great ages of founding, when the wax method was generally in use. We may now proceed to describe the methods of its application.

Andrea Verrocchio, a celebrated sculptor of the fifteenth century [VERROCCHIO, P. C.], is said by Vasari to have been one of the first among the moderns to introduce casting from moulds taken from life, or, in Vasari's words, to bring the practice into general use—'che fu de' primi che cominciasse a metterlo in uso' (ed. 1568). These casts he made in wax and in plaster; and some writers have spoken of him as the inventor of moulding from the human figure, and others even as the inventor of casting in plaster; neither of which is said nor could have been intended to be conveyed by Vasari. Many arts have been known, and occasionally practised, before they have been applied to the ordinary uses to which they were well adapted. There is in Florence still preserved in the cathedral a cast thus formed from the head of Brunelleschi, which, as Bottari has remarked, must have been taken when Verrocchio was only fourteen years of age. And with regard to casting in plaster, if metal casts were made long before the time of Verrocchio, it is more than probable that plaster casts were also made. The first distinguished Italian founder of modern times was Andrea Pisano [PISANO, P. C. S., p. 426], who modelled the gates of the Baptistery of St. John at Florence, which were cast by some Venetian founders in 1330. The same sculptor had previously sent by Giotto a present of a bronze crucifix to Pope Clement V. (1305-1314) at Avignon, which must have been about 120 years before Verrocchio was born. This crucifix is represented as having been of excellent workmanship; it must have been fashioned consequently by an artist or artists well acquainted both with mould-making and with casting, and the idea therefore that either art can have been ever first *practised* at so late a period as Verrocchio is quite untenable. The fact of bringing artists from Venice to cast the gates of the Baptistery of St. John does not so much show that Florence was without good metal-founders, as that Venice had obtained celebrity for its artists of this class. William Austen, a celebrated English founder, was anterior to Verrocchio. [AUSTEN, WILLIAM, P. C. S.] Bell-casting, which was practised throughout the middle ages, is comparatively so simple an art that the modelling requisite in its process is of quite a different character from the modelling of works of imitative art. However, at whatever period and by whatever process the early Italians first prepared their moulds for metal-casting, they most probably in all works of consequence used wax in the preparation of the model for the casting. The antient Greeks and Romans also most probably used wax for the same purposes. There are few antient bronzes of a large size now extant; the principal of them is the equestrian statue of Marcus Aurelius before the Capitol at Rome. This monument is hollow, and was cast in two parts; and probably the antient method was not very different from that described by Vasari; some antient works were cast solid. The antients were also in the habit of making plaster moulds of objects, in fact the Greeks and Romans were more or less familiar with almost every method and contrivance known to the modern statuary. (Müller, 'Handbuch der Archäologie der Kunst,' Mechanische Technik.)

It is generally allowed that the triumph of casting in modern times was Girardon's colossal statue of Louis XIV., cast by J. B. Keller; it stood on the Place Vendôme at Paris until 1792, when it was destroyed by the French populace. The weight of the monument is said to have been 60,000 lbs., and its height, including the bronze pedestal, 21 feet. This enormous mass of metal was cast at once, or in a single *getto*. The preparation of the model and mould was on the following plan:—When the model of the statue was finished, a safe mould of plaster and brickdust was made from it, in many parts. [MODELLING, P. C. S.] Each of these parts, being marked and numbered, and removed from the model, was then oiled, and carefully filled on the inner side to a certain thickness, an inch or two, with the modelling-wax already described; the thickness depending upon the height or position of the part, the lowest parts being the thickest, for the metal is destined to fill exactly the space occupied by the wax. When all the parts of the mould were thus prepared, the whole was again put together in a pit, around a simple framework of iron bars, so as to support it firmly in each direction; the lowest parts of the mould being first placed, and the joints of the wax of the various contiguous parts being filled in, and the pieces carefully united together with melted wax with a brush, as the work proceeded. When the whole was put together, it was bound on the exterior with strong bars of iron attached to the extremities of the bars of the interior framework. The mould is now a hollow shell, with a thick coating of wax all over the interior, the whole being kept together by iron supports, inside and outside. The next step is to fill this hollow shell, through an aperture left at the top, with a composition of plaster and brickdust, which is fire-proof. This fire-proof body is termed in English a *core* (in some books written corps), by the French *noyau*, by the Germans *kern*, and by Vasari the *anima*. Air-vents must be made in the shell before the casting of the core.

When the core is fixed, the original mould or shell is taken off, and a wax model of the statue appears to the eye. The sculptor now examines his wax model, and improves it where there is occasion and repairs or makes good all imperfections. When it is perfectly finished, the preparation for the founding commences. Over this wax statue a new fire-proof mould is made of plaster, brickdust or sand, cow-hair, and horse-dung, and sometimes very fine ashes. This composition, used at first as a fine liquid plaster, is put on in many coats with a brush, and care must be taken that every particle of wax is covered with the finer plaster: each coat is allowed to dry before the successive coat is put on, and the composition may be gradually made of a coarser mixture. When this new shell or mould is of a sufficient thickness and is properly strengthened by iron bars, a coal fire must be kindled round it and be allowed to burn until the whole of the wax is burnt out, proper vents being made for its escape. This burning out of the wax is a most tedious and difficult process, lasting sometimes as much as four or even six weeks. (Söltl, *Bildende Kunst in München*, Stiglmayor, p 484.) Vasari, in his 'Introduzione,' c. xii., says the only way of knowing whether the wax is all out is to carefully weigh the quantity of wax that you put in the first place upon the mould, and then to weigh what you get out of the mould afterwards and to see that they nearly tally. If any wax is left in, there is danger of the mould bursting, independent of the hard untractable surface it gives to the metal. The quantity of wax used in proportion to the metal is as one pound weight to ten: in Girardon's statue therefore, if the weight has been correctly given, six thousand pounds of wax had to be melted out of the mould. By the quantity of wax used also in modelling, the quantity of metal required to be melted was accurately ascertained. The great difficulty and long process of melting out the wax was the cause of what is called the wax method going comparatively out of use; but it is only recently that the clay and sand modelling as its substitute has been generally established. Until 1824 Stiglmayer used the wax method; from that time the clay method. The largest single cast by Stiglmayer does not amount to one-half of the given weight of this enormous cast by Keller: it is however now no longer considered desirable to cast a monument in a single *getto*. [BRONZE, P. C.]

When the wax is at length melted out, the mould must be strengthened by brickwork, and the whole pit must be closely filled with sand. A channel is now made from the furnace, and is divided in its course into three smaller channels or ducts which lead to three openings in the now hollow mould, which is buried in the earth a little below the furnace. The vacuum in the mould caused by melting out the wax is to be filled with metal; the original iron framework, which was constructed before the casting of the core, keeps both the core and the mould in their proper places; and air-vents in various parts of the mould preclude any great probability of accident. When all is ready, the furnace is opened at a given signal, the liquid fire runs in the channels simultaneously into the mould, and that part of the work which was previously soft wax becomes perennial bronze. The cast is accomplished when the metal pours out from the vents. When cool, the mould is broken away piecemeal, and the metal is exposed. The core is then removed from the inside through an aperture made on purpose; the whole is then repaired and finished by the bronze-workers. [BRONZE, P. C.] Johann Balthasar Keller, who cast in this method the statute of Louis XIV., was a Swiss, and originally a goldsmith. He was born at Zürich, in 1638, and died at Paris, superintendent of the royal foundry, in 1720. There is a print of the statue by C. Simoneau: it was cast in 1699.

It is remarkable, says Fiquet (*L'Art du Mouleur*, &c.), that only half a century after the execution of this monument no one could be found who was capable of casting a similar monument of Louis XV. for Bordeaux; and the process of Keller and Girardon would have been lost had it not been for the Mémoire of G. Boffrand, in which it is described 'Description de ce qui a été pratiqué pour fondre d'un seul jet la Statue Equestre de Louis XIV. en 1699.' The practice of the Italian sculptors in and before Vasari's time was by far not so ingenious as the method just described. The core was not cast, but built up and gauged on an iron frame, and layer by layer as in bell-modelling, until it was within the intended thickness of the metal, the size of the model: each layer was burnt dry before the successive layer was put on. The composition of this core or *anima* was the same as that of the mould—a mixture of cow-hair, horse-dung, brickdust, and plaster. The parts of the mould taken from the original model were now well oiled and each separately filled with wax; these pieces of wax, when hard, were taken out of the pieces of mould and built up against the core, and fitted by judgment and measurement. When the whole wax model was thus built and cemented together with wax, and pins when necessary, the mould for the metal cast, as in the other process, was gradually covered over it, and, when of a proper thickness, bound and made firm with iron. The wax was then burnt out, and the cast accomplished as in the other case described. In some casts the metal is made to enter at the bottom of the mould, for being in a liquid state it will find its own level, and gradually rise to the top of the mould, which however must be below the level of the furnace.

Vasari (*Introduzione*, l. c.) describes a very simple method for casting small figures in bronze. When the mould is made, it must be reversed in water; melted wax is then poured into it, that coming in contact with the cold wet surface of the mould cools immediately, while the interior portion remains liquid; the mould must be again turned over, when the still liquid wax in the centre will immediately run out, leaving in the mould a hollow wax shell. The shell must now be filled with the proper plaster, and this constitutes the core of the object. The wax is then burnt out, and the cast is made as usual. The words used by Vasari in speaking of this art are worthy of note. The mould he calls *cappa* and the core *anima*; these words may have been in common use with sculptors, but in many cases Vasari has evidently had to invent his own language. There was no written terminology in art in his time, and doubtless the vulgar technical language of artists would have been unintelligible to the great majority of his readers, and artists themselves probably of one part of Italy would have a difficulty in understanding the technicalities of those of another part: it is more than probable that Vasari had the difficult task of inventing a great portion of his terminology: he has been followed by all subsequent writers.

It remains to treat of that department of wax-modelling termed ceroplastic. Under this term is comprehended modelling and casting in wax, though not in the manner already described. The art of casting in wax from nature was, according to Pliny (*Hist. Nat.* xxxv. 44), invented by Lysistratus, of Sicyon, the brother of Lysippus, about 300 B.C., who, he says, first of all men took plaster moulds from the face and made wax casts from them. These wax portraits became eventually very common, and especially among the Romans. It is however very unlikely that the many treasured wax portraits we read of in antient writers were made from moulds taken from the face itself. Such would be the mere resemblance of death, for they would be without eyes and otherwise void of expression. They were probably cast from moulds taken from models, though such masks may have been used in the formation of the models.

Pliny (xxxv. 2), speaking of the corrupt taste which prevailed among the Romans in his own time, regrets the good old customs of their ancestors. He says, 'Now all men think more of the material in which their likenesses are made, than of the art or the resemblance. The effigies they leave behind them are rather images of their wealth than of their persons. Thus it is that noble arts decay and perish. With our ancestors it was very different; their halls were not filled with either strange images of brass or of stone, but with the lively portraits of themselves and of their forefathers, in wax, exact similitudes.' From this it appears therefore that the Romans were in the habit of having wax images of themselves made, to be handed down to their posterity. Many writers notice and praise the custom. Valerius Maximus (v. 8. 3), alludes to the advantages of the practice by virtue of example. It was indeed a privilege to which only some were entitled. None could make them but those who had themselves or whose ancestors had borne some curule magistracy. Cicero speaks of the right of handing down your image to posterity. The number of ancestral images therefore became an object of pride and an evidence of ancient nobility, and the antiquity of a family was sometimes expressed by applying the epithet smoky to its images, 'fumosæ imagines.' (Cicero *in Verr.* vi. 14.; *in Pisonem*, 1.; and *de Leg. Agrar.* ii. 1.)

The most striking passage concerning these images is in Polybius (vi. 52), who as a Greek and a stranger would be more impressed by so peculiar a custom as he describes. He says, 'Upon solemn festivals, these images are uncovered, and adorned with the greatest care. And when any other person of the same family dies, they are carried also in the funeral procession, with a body added to the bust, that the representation may be just, even with regard to size. They are dressed likewise in the habits that belong to the ranks which they severally filled when they were alive. If they were consuls or prætors, in a gown bordered with purple; if censors, in a purple robe; and if they triumphed or obtained any similar honour, in a vest embroidered with gold. Thus apparelled they are drawn along in chariots preceded by the rods and axes, and other ensigns of their former dignity. And when they arrive at the forum, they are all seated upon chairs of ivory; and then exhibit the noblest object that can be offered to a youthful mind warmed with the love of virtue and of glory. For who can behold without emotion the forms of so many illustrious men thus living, as it were, and breathing together in his presence? Or what spectacle can be conceived more great and striking? The person also that is appointed to harangue, when he has exhausted all the praises of the deceased, turns his discourse to the rest, whose images are before him; and, beginning with the most antient of them, recounts the fortunes and the exploits of every one in turn. By this method, which renews continually the remembrance of men celebrated for their virtue, the fame of every great and noble action becomes immortal; and the glory of those by whose services their country has been benefited is rendered familiar to the people, and delivered down to future times.' (Hampton's translation.)

This wax-modelling has continued apparently from the time of the Romans until the present day. In the middle ages it was used for the images of saints and votive images. The first modeller however of this class noticed in the history of art is Orsino, the contemporary of Andrea del Verrocchio, in the middle of the fifteenth century. Vasari represents Orsino as a wax-modeller (ceraiuolo) of good repute in Florence, and that he attained, through the advice of Verrocchio, the highest excellence in his art. Verrocchio and Orsino made some interesting figures together, of which three of Lorenzo de' Medici are worthy of especial notice: they are described by Vasari as something remarkable. The conspiracy of the Pazzi in 1478 was the cause of the production of these figures: they were voted by his friends in commemoration of his escape. Orsino made, under the direction of Verrocchio, three wax images of Lorenzo of the size of life. The frameworks or skeletons of these figures were made of wood and cane, and the heads, hands, and feet were cast in wax, of considerable thickness, but hollow; they were then furnished with hair and glass eyes, and painted in oil-colours to the exact imitation of life; and were draped in clothes which had been worn by Lorenzo; to give the draperies a fixed character they were waxed. These figures were altogether so successful, says Vasari, that they appeared to be living. One of them was placed in the church of the Monacho di Chiarito, in the Via di San Gallo; another in the Servitant church of the Annunciation; and the third in the church of Santa Maria degli Angeli at Assisi. In this Servitant church were many other wax figures by Orsino, all of which were marked with an O, in which was an R, and above it a cross; but they have all long since perished. Vasari adds that few works of later wax-modellers were to be compared with those of Orsino, and complains that the art had declined. A few years however after the death of Vasari, Jacopo Vivio distinguished himself by a model on slate, in coloured wax, of Michelangelo's Last Judgment in the Sistine Chapel. It was engraved by Ambrosio Brambilla, and a particular description of it was published in Rome in 1590 — 'Discorso sopra la mirabil opera di Basso-Rilievo di cera stuccata con colori, scolpita in pietra nera, da Jacopo Vivio.'

Two centuries after Verrocchio, and one after Vasari, this art was very usefully and with the utmost skill applied by Gaetano Giulio Zummo, born at Syracuse in 1656, to the preparation of anatomical models and pathological examples. Zummo obtained a European celebrity for his two groups of figures representing the various stages of corruption of the human body and the effects of the plague. He modelled also an anatomical head at Paris, which is described in the Mémoires of the French Academy of Sciences, of 1701, the year of his death. [ZUMMO, P. C.]

The first collection of anatomical preparations which was made for the purposes of science is that of the Institute of Bologna, established by Benedict XIV. It was commenced under the direction of Ercole Lelli, but the greater part of the preparations were made by Giovanni Manzolini of Bologna and his wife Anna Morandi Manzolini. Manzolini died at Bologna in 1755, aged 55. There are some of his models in London and in many other cities of Europe. Anna Manzolini obtained still greater celebrity than her husband: she executed all or the greater part of the obstetric models in the Stanza Ostetricia of the Institute which were prepared under the direction of Dr. Antonio Galli. She also gave public lectures on anatomy in Bologna, illustrating her discourse by appropriate models. She died in 1774, aged 57. (Crespi, *Felsina Pittrice*, where there are portraits of both the Manzolini.)

There is a still more extensive and remarkable collection of wax anatomical models in the Museum of Natural History at Florence: it was established by the Grand-Duke Leopoldo, and occupies fifteen chambers. It contains the works of various artists, but the principal contributors to its treasures were Felice Fontana and Clemente Susini. The works of the earlier modellers in wax are set apart in a chamber by themselves: here are some of the models of Zummo, among which is one showing the whole anatomy of the human head, similar probably to the one made at Paris.

The Musée Dupuytren at Paris is celebrated for its morbid specimens; it is perhaps the richest pathological collection in the world. It was purchased by the University of Paris, of tho heirs of M. Dupuytren, the celebrated anatomist. Most of the principal cities of Europe have now their collections, and good wax-modellers are numerous. The Museum of University College, London, contains many excellent specimens by the late Mr. William Tuson.

In this department of modelling none but the purest wax is used, which is tho case also in all works where the wax is the final substance of the work. Different modellers use different compositions; and some allowance must be made for hot and cold weather, as what would be well adapted for summer weather might be too brittle for winter use. Some modellers use simply wax and a small proportion of Venetian turpentine; others wax, resin, common turpentine, and a littlo olive-oil; the wax being at least two-thirds of the whole composition. It is seldom if ever used pure, as in all objects to be modelled white or some colour must predominate: for instance in modelling the brain, white in powder must be mixed in the composition, and the same respect must be had with regard to the predominant colour of every object to be modelled.

No strict rules can be given for the process of modelling, as each modeller will soon acquire methods of his own, and generally speaking artists of this class object to disclose their peculiar processes, imagining it to be detrimental to their interests. However, we may speak of general principles. Nearly all wax models are cast from moulds, and the casts only in some cases require the assistance of modelling: these moulds are generally taken from the objects themselves, either in plaster of Paris or in a composition of bees'-wax, Burgundy pitch, and Venice turpentine, with a very small quantity of olive-oil. The advantage of this latter composition is, that even when cold, if properly mixed, which must be learnt by experience, the mould is elastic or flexible; and if made thin, when cut on the edges can be peeled off the cast in pieces without any danger to the cast: in taking moulds in plaster of Paris, the object moulded must sometimes be destroyed to render the mould available. Round objects must be moulded in two or more parts. Sometimes when the object is cast in the mould, the mould must be destroyed before the cast can be removed, and in destroying the mould there is danger of destroying the cast also; the *elastic* mould therefore has great advantages in such cases over the plaster mould. When only one view of an object is presented, and it is only slightly convex, the plaster mould is quite sufficient, except the object itself, as the brain, presents a very uneven and delicate surface. When the cast is to be taken from the plaster mould, the mould must be moist with water, but not absolutely wet, or the water would injure the very delicate surface, which occurs in some pathological cases: the mould may be moistened by allowing it to stand with the interior or face uppermost in a dish of water, when it will soon absorb sufficient moisture for the purpose. The mould must not be oiled when any delicate work is to be done, as the oil will dissolve the surface of the wax, and thus perhaps counteract the principal aim of the cast. The wax-composition mould must be slightly touched with a soft hair-tool with oil, to enable it to peel away afterwards without the slightest danger to the cast: being of a perfectly smooth surface, the small quantity of oil it retains is immaterial.

When the cast is made, and what they call *backed up* (that is, strengthened with a coarser composition within), the process of painting commences; but all effects cannot be given by mere colour, some morbid deposits and effects require to be expressed by adding wax of the proper colour with a hair-pencil or other tool. The colouring is done from the natural object represented, with fine hair-pencils and powder colours moistened with turpentine and tempered with a little wax; simple water is also sometimes used as the colouring vehicle. When the colouring is finished, the whole is covered with mastic varnish. In cases where the morbid effects or evidences of disease are of a distinct substance from the healthy texture, different coloured wax should be used in casting the healthy and diseased portions, and the parts may be corrected by modelling. Tho same process must be employed in modelling fruit and other objects of natural history, as in preparing anatomical models: but fruit, which is generally in full or high relief, will require piece-moulds, that is, to be moulded in several pieces, which is done half or part at a time. Flowers are not all cast; they are prepared from leaves of coloured wax made expressly for the purpose. These leaves are cut the required shape; they then, with the necessary colour and a hair-pencil, receive their local tints; and are finally joined and fashioned into the required flower. Insects are modelled by combining the two processes. In moulding objects with hair or delicate raised parts, a little oil must be carefully put over the parts, unless they are wet. Dry firm objects may be moulded without oil; the plaster must be removed as soon as it is set.

It remains yet to speak of the mode of making images. These likewise are made in various ways; but the essential process is casting. A head may be simply cast, and when the hair and eyes have been added to it, the local tints be given with turpentine and colour. This method however uses a considerable quantity of wax, and various devices have been had recourse to to save wax. One mode is to cast the pure wax thin, and to back up or fill in to a considerable thickness with a course composition of bees'-wax, resin, and cow-hair or tow; in casting images the mould may be oiled. Ordinary heads however may be made in this manner:—Let a thin block head be fashioned in a mould or otherwise, of coarse paper pulp and size; when dry it must be coloured all over with flesh-tint, the local colours being put on, a higher degree than is natural, as the colours of the cheeks, lips, and eyebrows; the whole then may be covered with wax, which must be poured over it two or three times, until the surface is well covered; its regularity may be secured by retarding the cooling of the wax and assisting it to run, by means of a hot iron or burner (called cauterium by the antients) which must be held near it until the whole has a uniform surface. The colour originally painted on the paper block will show through the wax, and the head will require but tho hair, the eyes, and a few local touches to finish it. Masks may be also dipped in wax, or the wax may be put on with a hair-tool, if the mask be kept warm; or a wax cast may be backed up or strengthened with strong paper pulp. There are however other methods of modelling wax figures, but no method can be properly explained by a verbal description; such mechanical processes must be witnessed to be understood. A detailed description of the several processes would scarcely convey a sufficient notion to one wholly ignorant, and those well acquainted with the art have no need of such descriptions: for this reason this article has been limited to mere general principles, which is as much as the general reader can require or understand.

Many wax preparations of all kinds are of course made from mere models made by the artist; and many preparations in museums, which appear to be wax, are painted plaster of Paris.

Sculptors also are in the habit of making wax models of small objects in the round, or for bassi-rilievi to be cast in metal, in the same manner and with the same tools that common clay models are made of: the same wax is used as is required for casts. [MODELLING, P. C. S.] Medals and small bronzes are generally modelled in wax. Impressions from seals, engraved gems, and cameos are taken with wax. The wax, which is prepared with a little powdered sugar-candy, turpentine, and lamp-blank, after being melted, is preserved in small cakes. These cakes when wanted aro softened by repeated pressure of the fingers, and are then compressed into or upon the seals or cameos, previously wetted, from which the impressions may be required.

WEBSTER, NOAH, LL.D., was born at West Hartford, in Connecticut, U. S., on the 16th of October, 1758, and was descended from John Webster, who, having been one of the original emigrants from Massachusetts by whom the colony of Connecticut was founded, was afterwards governor of the state in the year 1656. Noah Webster entered Yale College in 1774; in 1777 he was withdrawn for a time from his studies by joining the military service under the command of his father, who was a captain in the Alarm List, during Burgoyne's expedition from Canada; but notwithstanding this interruption he took his degree with great distinction the following year. He was called to the bar in 1781; but, instead of following the profession of the law, he engaged in that of a teacher of youth. His 'First part of a grammatical institute of the English Grammar,' published at Hartford in 1783, was the first of a number of elementary works produced by him, all of which were well received and were generally admitted to be much superior to any that his native country had previously possessed. He also however took a leading part in the discussion of the political questions of the time, both by his 'Sketches of American Policy,' published in 1784, and his other writings in support of the principles of federalism, and by the establishment in 1793 of a daily paper in New York, which still subsists under the name of the 'Commercial Advertiser and New York Spectator.' In 1798 ho removed to Newhaven, where he spent the remainder of his life. His great work, and that which has chiefly made his name known in this country, his 'New and complete Dictionary of the English language,' was begun in 1807, and the first edition was published in 1828. This work, which has been since several times reprinted, the last edition, we believe, being that of Newhaven, 1841, in 2 vols. 4to., is a performance of great labour and care, and is perhaps more precise in its explanations than any of our other English dictionaries. Its etymological portion however is more ingenious and showy than really learned or profound. Dr. Webster, whose degree of LL.D. was we believe bestowed upon him after the publication of his dictionary, died at Newhaven on the 27th of May, 1843.

(Memoir in *Gentleman's Magazine* for August 1843.)

WERNER, JOANNES, a German mathematician and astronomer, was born at Nürnberg on the 14th of February, 1468. Nothing apparently is known of his life, except that, when he was twenty-five years of age, he went to Italy, where he made some astronomical observations; and he is said to have made a series of observations on the comet which appeared in the month of April in the year 1500; from observations which he made on the positions of Regulus, *a* Virginis, and *a* Libræ, compared with those which had been assigned to the same stars by Ptolemy and Alphonso, he determined the precession of the equinoxes to be 70 minutes of a degree in 100 years, a quantity much too small: and he found the obliquity of the ecliptic to be 23° 28′.

In the year 1514 he published 'Annotations on the First Book of Ptolemy's Geography,' in which he endeavoured to explain an obscure passage concerning the projection of the celestial sphere on a plane surface; and it deserves to be remarked that in this work we find the first notice of the method of determining geographical longitudes by the angular distance of the moon from some star: he recommends, for making the observation, the *cross-staff* or *fore-staff*, a rude instrument which has long since been disused by mariners. In 1522 he published at Nürnberg, in 4to., his 'Opera Mathematica,' in which is contained a tract on conics: he also published a work on Trigonometry, in five books, containing a great number of astronomical and geographical problems.

Werner wrote explanations of the construction and uses of meteorological instruments; and it is said that he collected a number of observations with a view of discovering from them rules for determining the changes which take place in the atmosphere. He executed a machine in which the movements of the sun, moon, and planets were represented conformably to the Ptolemaic system; and he wrote a work on *The Movement of the Eighth Sphere.* He died in the year 1528.

(*Historia Astronomiæ*, by Weidler; *Histoire de l'Astronomie Moderne*, by Delambre.)

WESTERN PORT. [WALES, NEW SOUTH, P. C.]

WETHERE'LLIA, a genus of fossil fruits from Sheppey. (Bowerbank.)

WHETSTONE, GEORGE, a voluminous writer of prose and verse, lived in the latter half of the sixteenth century. Both the place and time of his birth are unknown; but he claimed kindred with Serjeant Fleetwood, the recorder of London. His history was that of a succession of misadventures. He began by wasting his patrimony in seeking a place at court: he then served abroad as a soldier, and was an eye-witness to the fall of Sir Philip Sidney at Zutphen: he was next an unsuccessful farmer; afterwards he sailed with the abortive expedition of Gilbert to Newfoundland; and, finally, returning to England, he appears to have been chiefly occupied during the remainder of his life in literary labour, which he had previously practised occasionally, and now attempted with indifferent success as a means of subsistence. He is now chiefly known as having been the author of the rude play (or rather two plays) called 'Promos and Cassandra,' which, having been printed in 1578, ranks as one of our earliest extant comedies; while it has the further interest of having the same plot with Shakspere's 'Measure for Measure.' It is reprinted in Steevens's 'Six Old Plays,' 1779. In Chalmers's English Poets is Whetstone's Life of George Gascoigne: of his other works, a curious account, with specimens, will be found in Mr. Collier's 'Poetical Decameron.'

WHITE, REV. JOSEPH BLANCO, was descended paternally from an Irish Roman Catholic family. In the early part of the last century, William White came over to Seville, in Spain, where he succeeded to the then flourishing business of an exporting merchant carried on by his mother's brother. He was raised by the king of Spain to the rank of the *noblesse*, which his posterity retained. But when after his death the business fell into the hands of his son, the house failed, and the family were left for a time with very limited resources. This son had married a Spanish lady of the name of Crespo y Neve, connected with the old Andalusian nobility; and Joseph Blanco White, commonly designated in Spain Don Jose Maria Blanco y Crespo, who was born at Seville, 11th July, 1775, was their son.

The commercial business of the family had been re-established after the bankruptcy, and Joseph was placed in the first instance in his father's counting-house. When he was about twelve years old, however, his parents complied with his own desire of allowing him to be educated for the church. In the end of the year 1799 he was ordained a priest. But a dislike to the profession be had thus chosen soon took possession of him. He came to England in March, 1810, and spent the remainder of his life in this country. The same year he set up in London a monthly periodical work in Spanish, entitled

'El Español,' which he carried on for nearly five years; and in 1814 upon its discontinuance the English government bestowed upon the editor a pension of 250*l*., which he enjoyed so long as he lived. About the same time he joined the Church of England, originally with the view of pursuing the clerical profession; but this intention he soon dropped. His religious creed after this gradually passed from evangelicalism to common orthodoxy, from that to unitarianism, then to rationalism, till at last it seems to have very nearly evaporated into scepticism. He first made himself generally known to English readers by a series of papers which he contributed in 1820 to the 'New Monthly Magazine,' under the title of 'Letters from Spain, by Don Leucadio Doblado,' and which were afterwards extended and published separately in 1822. In the last-mentioned year he set up a second Spanish Journal, 'Las Variedades,' which was published quarterly, and continued for about three years. Other separate works followed, both in Spanish and English; those among the latter that attracted most attention being his 'Practical and Internal Evidence against Catholicism,' 1825, and again 1826; 'The Poor Man's Preservative against Popery,' 1825, several times reprinted; 'Second Travels of an Irish Gentleman in search of a Religion,' (in answer to Moore's well known work) 2 vols. 12mo., Dublin, 1833. He was also an occasional contributor to the 'Quarterly Review,' to the 'London Review,' established in 1829 (of which he was the editor for the six months that it lasted), to the 'London and Westminster Review,' to the 'Journal of Education' (in an early number of which he wrote one article on the State of Education in Spain), to the 'Dublin University Review,' and to the 'Christian Teacher.' He resided occasionally at Oxford and Dublin as well as in London; and in 1839 he settled in Liverpool, where he continued till his death, which took place on the 20th of May, 1841. He left a son, who in 1845 was a major in the English army. Of White's writings probably those that will last the longest are the papers which have been published since his death under the title of 'The Life of the Reverend Joseph Blanco White, written by himself; with portions of his correspondence; edited by John Hamilton Thom,' 3 vols. 8vo., London, 1845.

WHITE LIGHT is the name generally given to the light which comes directly from the sun, and which has not been decomposed by refraction in passing through a transparent prism; it is not, however, considered as a colour of light, being rather a union of all the differently coloured rays of which common light is composed.

A white light produced by mixing together 24 parts of saltpetre, 7 parts of flour of sulphur, and 2 of red arsenic, was used for the signals employed to render visible by night the stations by which the trigonometrical survey of France was connected with that of England. This light was very brilliant, and could be seen by the naked eye in cloudy weather at distances exceeding 40 miles; but it has, since, been superseded for such purposes by other kinds of light. [DRUMMOND'S LIGHT, P. C. S.]

WILLIAM FREDERICK I., King of the Netherlands, Grand-Duke of Luxemburg, Prince of Orange Nassau, was born at the Hague on the 24th of August, 1772. His father, William V., Prince of Orange Nassau, Hereditary Stadtholder, was descended from John the youngest brother of the great William I. of Orange, and died at Brunswick, April, 1806. His grandfather William IV., the first Hereditary Stadtholder of the United Netherlands (from 1748 who died in 1751), had re-united the possessions of the four branches of the line of Nassau—Otho, Hadamar, Siegen, Dillenberg, and Dietz with his own branch, that of Dietz. His mother was Frederica Sophia Wilhelmina, daughter of Prince Augustus William of Prussia. In 1788 he made a journey to Germany, and passed some time at the court of his uncle Frederick William I. He afterwards studied for a time at Leyden.

After his marriage on the 1st of October, 1791, to Frederica Louisa Wilhelmina, daughter of Frederick William of Prussia, he, in conjunction with his brother Frederick, subsequently distinguished as a general, effected considerable improvements in the Dutch army; but many impediments were occasioned by internal dissensions, the patriots, who had been put down in 1787 by a Prussian force, secretly intriguing against the house of Orange. Some of them had taken refuge in France, and on the 1st of February, 1793, the National Convention declared war against the Stadtholder. Hoping with the assistance of the patriots, to obtain possession of the rich provinces of Holland, Dumouriez conquered Dutch Brabant, which was however recovered by the hereditary prince, who was commander-in-chief of the Dutch army, which was joined by a body of the allies, after the victory of Neerwinden on the 18th of March, which had been gained over Dumouriez by the Austrian field-marshal the Prince of Coburg. The hereditary prince then hindered the French army of the North from penetrating into West Flanders; but on the 13th of September he was attacked in his position between Menin and Werwick with such overwhelming force, that, after a most gallant resistance, in which his brother Prince Frederick, who commanded the right wing, was wounded, he was obliged to retreat behind the Schelde. Soon after this the hereditary prince took Landrecies, and then, at the head of a Dutch and Austrian army, drove the enemy beyond the Sambre: but in the great battle of the 16th of June, 1794, the French having taken Charleroi by storm and defeated the prince's left wing at Fleurus, he was again obliged, by the directions of the Prince of Coburg, to retreat. The Austrians retreated, before Pichegru and Jourdan, behind the Meuse; and the hereditary prince, with his weakened army, had no alternative but to cover the republic in connection with the army of the Duke of York. But the fortresses fell, and the frost enabled the enemy to pass the Waal on the ice, so that Pichegru entered Utrecht on the 17th of January, 1795. The party of the patriots favoured the enemy, and the stadtholder was unable to save the republic, forsaken by its allies. His sons had resigned their commands on the 16th of January, and William V., with his family and a few faithful friends, embarked at Scheveningen on the 18th and 19th for England, where the palace of Hampton Court was assigned him as his residence. His two sons returned to the Continent to arm a body of Dutch emigrants, at the expense of England, which however was dispersed again after the peace of Basle. Prince Frederick then entered the Austrian service, and died at Padua on the 6th of January, 1799.

The hereditary prince then went with his family to Berlin, where he expected a favourable change in his position, from the diplomatic influence of the Prussian court, then in alliance with France. He acquired some estates in the vicinity of Posen and in Silesia, and when his father made over to him, on the 29th of August, 1802, the indemnity in Germany allotted to him by the Recess of the Empire (Fulda, Corvei, Dortmund, Weingarten, and other places), he took up his residence in Fulda, where, in the place of the inefficient university, he established a lyceum, and appropriated the revenues of two suppressed convents to the foundation of a national hospital. After the death of his father he assumed the government of his Nassau hereditary dominions; but as he declined joining the German Confederation of the Rhine, he lost the sovereignty of the possessions of the house of Orange, which were obtained by his relations of Nassau-Usingen and Weilburg, and Murat, Grand-Duke of Berg; while Weingarten fell to Würtemberg. In August, 1806, he went to Berlin, where, as commander of a Prussian regiment, he obtained in September the command in chief of a division of the Prussian army between Magdeburg and Erfurt. After the fatal battle of Jena he followed field-marshal Möllendorf to Erfurt, and became a prisoner of war in consequence of the capitulation concluded by Möllendorf; he was allowed however to reside with his consort in Prussia. Napoleon declared that he, as well as the Elector of Hesse and the Duke of Brunswick, had forfeited his dominions; and Fulda was forced already, on the 27th of October, to do homage to the French Emperor. Corvei, Dortmund, and the county of Spiegelberg were incorporated in 1807 with the kingdom of Westphalia and the grand-duchy of Berg. Even the domains reserved to him, in the act of the Confederation, were taken possession of by Berg and Würtemberg; Bavaria did not do so, and the other princes of the Confederation promised at least to pay to him the net surplus of the revenue. William had come in the mean time with his consort and family to Danzig. When the war approached the Vistula, he desired to return to Berlin, but only his consort, who was ill, was allowed to reside there; he himself was obliged to pass the Oder, and went to Pillau. No mention was made of him in the treaty of Tilsit. He retained the possession of his estates in the grand-duchy of Warsaw, and again lived at Berlin with his family, and devoted himself to literary pursuits. In the war between France and Austria in 1809, William, with the friend of his youth and constant companion, Fagel, joined the army of the Archduke Charles as volunteers, and fought in the battle of Wagram. He then returned to Berlin, and in 1814 obtained the rank of Austrian field-marshal. Meantime, especially after the battle of Leipzig in 1813, influential men such as Hogendorp, v. d. Duyn, Limburg-Stirum, Hoop, Driel, Jonge, and others, were exerting themselves at Amsterdam, the Hague, Rotterdam, Zwolle, and other places, to effect the restoration of the house of Orange. William was at that time in England to concert measures with the British government for the support of the Netherlands. When the victors at Leipzig approached the frontiers of Holland, the inhabitants of Amsterdam rose on the 15th and 16th of November, and on the 17th the Hague declared for the prince.

This prompt resolution of the Dutch patriots to seize the opportunity of recovering their independence was attended with the most important consequences. The *prestige* of the name of Napoleon, and of the invincible power of France, was dispelled; but France still had great resources; the formidable barrier of the Rhine was not yet passed, and when that decisive step should have been taken it might be followed by an internecine war in the interior of France. The insurrection of Holland created a sensation of alarm in Paris, while the allies hailed it with joy, as an earnest of further success, and were encouraged to prosecute their military operations with increased vigour. When Captain Wautier was sent from the Hague to the head-quarters of the allies at Frankfort, he met at Münich, on the 22nd of November, the Prussian general Bulow, who being informed of what had passed in Holland, observed that this insurrection would be as advantageous to the allies as a successful campaign; and the same general, a few days afterwards, assured Baron Van Zuylen, Van Nyeveldt, and Count Bylandt, sent from Holland on a diplomatic mission, that but for this great event the allies would never venture to think of crossing the Rhine *before the return of spring*. What might have been the consequence if the allies had waited till the spring, instead of carrying the war into tho bosom of France in the midst of winter, thus leaving so much time to Napoleon, may be inferred from what actually happened in the wonderful campaign on tho banks of the Seine and the Marne in 1814, in which Bonaparte displayed all the extraordinary resources of his fertile genius.

As soon as William learnt what had passed, he embarked on the 28th of November, and landed at Scheveningen on the 29th. He was received with acclamations by the people of the Haguo on tho 30th, and on the 2nd of December at Amsterdam, where Kemper and Scholten, the commissioners of the provisional government, had issued on the 1st of December a proclamation, announcing 'Holland is free,' and 'William I. the sovereign Prince of this free country.' The prince gratefully assented, and declared that a constitutiun must guarantee the rights and liberties of the people, and secure them against all encroachments. Twenty-three fortresses were still in the hands of the French, who were encamped near Utrecht, but the army of the allies, and the volunteers, who were called to arms, occupied the country. William hastened the arming of the people, and appointed a commission to draw up a constitution, which was accepted on the 29th of March, 1814, by the deputies of the people, and then sworn to by the prince. He had already taken possession of his hereditary dominions in Germany, before tho end of 1813; hereupon the congress at Vienna decided that Belgium and Liege, together with the Seven United Provinces, should be formed into one kingdom, and on the 16th of March, 1815, the prince was proclaimed at the Hague as King of tho Netherlands and Duke of Luxemburg. But he was obliged to cede to Prussia his hereditary possessions in Germany for Luxemburg, which after the 22nd of May, 1815, belonged to the German Confederation, and which he now raised in May to the rank of a grand-duchy.

The union of so many provinces, the inhabitants of which, though of the same origin, differed very much in manners, customs, and religious doctrines, made a change in the constitution necessary. A commission, consisting of an equal number of Dutch and Belgians, was appointed to make such changes as were requisite. After the king had approved of this draft of a constitution, it was laid before the States-general and deputies from tho southern provinces, and finally proclaimed on the 26th of August. In 1814 the king founded the military order of William, and in 1815, after the battle of Waterloo, the civil order of the Belgian Lion, and on the 21st of June, 1816, joined the Holy Alliance. He resided alternately at Brussels and the Hague. On the 17th of May, 1816, a Dutch fleet, under Admiral Van der Capellen, joined the British fleet, under Lord Exmouth, in the Bay of Algiers, and compelled the dey to conclude a treaty, by one article of which all Christian slaves were to be restored to liberty.

In the interior of the kingdom, a want of harmony between the inhabitants manifested itself on several occasions, which, but for the moderation and firmness of the king, might even then have led to serious dissensions: the unbounded influence of the Roman Catholic clergy, even over the higher classes in Belgium; the mutual aversion of the Belgians and the Dutch, and the dissatisfaction of the latter with the long residence of the court at Brussels; divisions in the northern provinces between the friends of the old republican system and those of the new or monarchical system—all tended to produce discontent, which was kept within bounds only by confidence in the character of tho king, and the mild conciliatory principles of his government. In the foreign relations the government, in the main, followed the British system. The marriage of the Prince of Orange to the Grand-Duchess Anne of Russia improved the connexion with that empire, but subsequently weakened the interest taken by England in the affairs of tho Netherlands. Some differences had arisen with Prussia, with which kingdom a closer union was however caused by the marriage of Prince Frederick to the Princess Louisa, daughter of the King of Prussia, on the 21st of May, 1825.

The union with Holland and various commercial treaties with foreign powers had given an extraordinary impulse to the manufactures and commerce of Belgium, especially of the cities of Antwerp and Ghent, but the government could not succeed in blending the Dutch and the Belgians into one nation. Their mutual aversion was manifested with great acrimony in the church, in the army, and even in the assemblies of the States general. The intolerance of the Roman Catholic clergy, encouraged by the pope, who even excommunicated the Jansenist bishops of Utrecht, Haarlem, and Deventer, who had taken the oath of allegiance to the king, and the prohibition of the French language in all judicial proceedings, created great irritation in the southern provinces (so that it was found necessary to modify it in several points); and besides these important differences respecting religion and language, there were several financial points in which the interests of the northern and southern provinces clashed; and which, notwithstanding several very beneficial measures, could not hinder the final separation of the two parts of the kingdom.

The union of Belgium and Holland had subsisted for fifteen years. The cities, the manufactures, the commerce of Belgium, had attained the highest degree of prosperity, but nothing could conciliate the refractory spirit of the Belgians with the phlegmatic character of the Dutch, nothing could conquer the aversion of the people of Brabant and Liege, founded on differences in manners, religion, and language, from Protestant Holland. The July Revolution of 1830 in France revived the old mutinous pride of the Belgian cities, and a rising of the mob in Brussels, on the 25th of August, 1830, commenced the revolution which separated the northern and the southern provinces. In consequence of a second insurrection in Brussels, on the 20th and 26th of September, conflicts arose between the 6000 troops, commanded by Prince Frederick, and the armed insurgents, commanded by foreign officers, which ended in the retreat of the Dutch. Meantime the king, yielding to the desire of a Belgian deputation of the 30th of August, had assembled the States-General at the Hague on the 13th of September to discuss with them the question of a separate administration, and an alteration of the fundamental law. The two chambers were in favour of it, but the insurgents, supported from Paris hy the Propagandi, contended for a total separation, which already existed in fact, when the five powers, Great Britain, France, Austria, Russia, and Prussia, imposed a cessation of arms on both nations, and, by the protocol of the 4th of November, 1830, recognised the independence of Belgium. This is not the place to inquire into the motives which induced four of the great powers, instead of exerting themselves to maintain and defend the bulwark which they had themselves erected as a security against the future encroachments of France, to unite with France in demolishing their own work. But justice requires us to acknowledge that the conduct of William I. on this great and trying occasion was such as was dictated by honour, good faith, and regard for the interest of all, and far from prejudicing the rights or legitimate interests of any government, it entitled him to the esteem and gratitude of all the cabinets of Europe.

King William protested, on the 12th of July, 1831, against the eighteen articles presented by the great powers, particularly against that which proclaims the freedom of the Scheld. Holland, with extraordinary enthusiasm, resolved to have recourse to arms; not to obtain a re-union with Belgium, which it did not wish, but for the assertion of its rights. On the 2nd of August the Prince of Orange, at the head of 70,000 men, crossed the Belgian frontier; Turnhout and other places were taken; one Belgian army was defeated near Hasselt on the 8th of August, and again near Louvain on the 10th; but a French army advanced by forced marches, and the English and French ambassadors at the court of Brussels negotiated an armistice, according to which the Prince of Orange evacuated Louvain on the 14th, and his army retired to its position before the war. A treaty in twenty-four articles was then proposed by the London Conference, which was acceded to by Belgium, but rejected by King William. Russia, Prussia, and Austria likewise wished some articles unfavourable to Holland to be modified, but France and England had recourse to measures of coercion. England blockaded the coast of Holland, an embargo was laid on the Dutch ships, and the citadel of Antwerp taken on the 24th of December, 1832, after a memorable siege by a French army of 70,000 men. This did not immediately lead to peace between Holland and Belgium, but a suspension of arms was effected on the 21st of May, 1833.

The London Conference resumed its difficult task; many important questions remained to be settled: an interminable series of protocols ensued; William did his utmost to delay the conclusion of these negotiations, in hopes of some turn in his favour, and hostilities between Holland and Belgium were on the eve of recommencing at the end of 1838, and were prevented only by the remonstrances of the Conference. At length, induced chiefly by his financial embarrassments, William gave way, and, on the 4th of February, 1839, signed the twenty-seven articles, modified to his disadvantage; and the definitive treaty was concluded on the 19th of April, 1839, by the plenipotentiaries of the Netherlands and Belgium, and of the five great powers.

But though Holland was now wholly separated from Belgium, there was great excitement in the Dutch Chambers in 1839. They hoped for favourable financial laws and judicious reforms; instead of which proposals were laid before them for a loan of fifty-six millions of florins. The loan was rejected on the 20th of December, and the budget on the 23rd; a loan of only six millions was granted, and the budget voted for six months only. At the next meeting of the States-General, in March, 1840, the king caused several modified projects of law to be laid before them; in consequence of which the civil list was fixed at one million and a half of florins; and it was resolved to vote the budget for two years only instead of ten as hitherto. But notwithstanding this endeavour of the government to satisfy the people, the discontent with the king and the ministers increased. The king's passion for the Countess Henrietta d'Oultremont, a Roman Catholic lady, excited the general indignation of the people, so that he declared on the 25th of March, 1840, that he renounced his projected union with her. This affair, and the discovery of an extensive conspiracy in Belgium, in which the Dutch appeared to be concerned, and finally the financial difficulties of the state, induced the king solemnly to resign the government on the 7th of October, 1840, into the hands of his son William II. Under the name of Count of Nassau, with an immense private fortune, he fixed his residence at Berlin, where, on the 17th of February, 1841, he married the Countess d'Oultremont, and died on the 7th of November, 1843. He left his large property to his family, besides a gift of ten millions of florins to the Dutch treasury.

(Baron de Keverberg, *Du Royaume des Pays Bas*, vol. iii. 8vo., La Hague, 1834; Brockhaus, *Conversations Lexicon*, 1846; *Mémoires tirés des papiers d'un homme d'état;* Mr. Chad, *Narrative of the Revolution in Holland*, London, 1814.)

WILLIAMS, DANIEL, D.D., a Protestant Dissenting minister of the Presbyterian denomination, was born at Wrexham, in Denbighshire, in the year 1644. The disadvantages of his early education were compensated by the natural energy of his mind, and by his diligence. He was one of the first of the new generation who entered the Christian ministry after the ejection of the Nonconformists in 1662; and at the age of nineteen he was regularly admitted as a preacher. His first years in the ministry were passed in preaching in several parts of England, though the times were so unsettled that there was little prospect of his continuing his labours without hazard. This circumstance, however, did not deter him from remaining among the Nonconformists, though his talents and his prudence would have enabled him to enter the church-establishment with a fair chance of advancement. As, in these days, more religious liberty was granted by the government in Ireland than in England, Mr. Williams repaired to the sister-country, and unexpectedly received an invitation to become chaplain to the Countess of Meath, which he accepted. Some time afterwards he was settled over a respectable congregation in Wood Street, Dublin. Here he remained nearly twenty years, and filled his station with great credit, being at the same time much respected by the Irish Protestants in general. During his residence in Dublin, he married a lady of an honourable family, with a considerable fortune. Towards the close of the reign of James II., his warm opposition to Romanism exposed him to some danger; and he consequently came to England in 1687, and settled in London. On occasion of the proposal of an address upon the king's dispensing with the penal laws, Mr. Williams firmly took his stand with the opposition. He 'never would,' he said, 'concur in laying down his liberty at his majesty's feet;' and his views of the question prevailed in the conference of dissenting ministers. He now became the patron of those Irish Protestants who fled to England from the violence of Tyrconnel; assisting them himself, and procuring for them the sympathy and aid of the public. He rejoiced greatly in the Revolution of 1688; and was often consulted on Irish affairs by King William. In 1700 he went to Ireland on his own private business, and to visit his friends, by whom he was warmly received, and his services in the cause of Protestantism were even acknowledged by some who had been prejudiced against him. About the period of this visit he had settled as a pastor in Hand Alley, Bishopsgate Street. Here he continued twenty-seven years. He was most esteemed by Mr. Richard Baxter, on whose death, in 1691, Mr. Williams was chosen to succeed him at the Merchants' Lecture at Pinners' Hall. The Antinomian controversy created parties among the Dissenters connected with this lecture, and Mr. Williams rendered himself obnoxious to those who advocated the tenets of Dr. Crisp, the avowed champion of the Antinomian doctrines. A secession took place, and another Tuesday lecture was established at Salters' Hall. On this occasion, Dr. Bates, Mr. Howe, and Mr. Alsop, who had been among the lecturers at Pinners' Hall, retired with Mr. Williams. When Dr. Crisp's works were reprinted, Mr. Williams, by request, wrote his 'Gospel Truth Stated and Vindicated;' a work of which Mr. Alsop, in his 'Faithful Rebuke,' says, 'It is fairly written, rationally argued, exactly methodized, and piously designed.' Mr. Stephen Lob having charged this work with Socinianism, an appeal was made on both sides to Dr. Stillingfleet, then Bishop of Worcester, and to Dr. Edwards of Oxford, both these learned persons being regarded as masters in that controversy; and they both acquitted Mr. Williams of the charge. In his 'End of Discord; wherein is demonstrated that no doctrinal controversy remains between the Presbyterian and Congregational Ministers fit to justify longer divisions,' he distinctly states the opinion of the 'Orthodox, the Socinian, and the Antinomian' on the doctrine of the 'satisfaction of Christ,' and he adheres to the views of the first. So great was the heat occasioned by the Antinomian controversy, that we are informed that Mr. Williams's enemies, being foiled in impugning his opinions, endeavoured to misrepresent his character by arraigning his morals. So completely however did he triumph over the charges brought against him, that, after spending eight weeks over the affair, the committee of dissenting ministers in and about the city, reported to sixty of their body, who met April 8th, 1695, 'That it is the unanimous opinion of the united ministers that Mr. Williams is entirely clear and innocent of all that was laid to his charge.' His whole conduct throughout this painful trial appears much to have increased the attachment of his congregation, as well as his general estimation by the public. Having been now for some time a widower, Mr. Williams married Mrs. Backstead, a widow lady of great excellence, and with a considerable estate.

Diligent as was Mr. Williams in his attention to the pastoral office, he was a man of great public spirit. So long as opposition availed, he strenuously opposed the 'Occasional Conformity Bill,' and the Irish Sacramental Test Act, in the reign of Anne. He was a great promoter of the union between England and Scotland, which took place in 1707. In 1709 he received a diploma of D.D. from the universities of Edinburgh and Glasgow, at the same time with Dr. Oldfield and Dr. Calamy. Anxious for the honour and usefulness of his order, he was very desirous that all the candidates for the dissenting ministry should have at least a part of their education at one or other of the Scottish universities, as they were excluded by the subscription from the English; but his scheme for this purpose did not meet with encouragement, which proves that he was in advance of the age among his contemporaries. Towards the close of the reign of Queen Anne, Dr. Williams became apprehensive respecting the safety of the Protestant succession, from tne measures of the prime minister, the Earl of Oxford; and he remonstrated on the subject with that statesman, with whom he had formed a previous acquaintance. It happened, not long after, that a copy of a letter which Dr. Williams had written to his friends in Ireland on Lord Oxford's measures fell by accident into the hands of a lawyer who was under obligations to Dr. Williams, but who immediately took the letter to his lordship, who, already displeased with the doctor for the counsel which he had volunteered, now never forgave him. On the accession of George I. in 1714, Dr. Williams had the honour of presenting the address to his majesty, at the head of the London dissenting clergy of the three denominations; and from this time it has been usual for this body to go to court on similar occasions, it being one of the bodies who are received on the throne, and by their committees in the royal closet. Dr. Williams's health had by this time visibly declined for a year or two, though he still continued the exercise of his ministry. At length, after a short attack of asthma, he died on the 26th of January, 1716, in the seventy-third year of his age, and was buried in Bunhill Fields. In his funeral sermon, Dr. Evans, who had been his co-pastor for eleven years, ascribes to him 'a copious invention, a penetrating judgment, a faithful memory, and vigorous affections, which were cultivated by much application to study.' His moderation was shown by his desire for a comprehension at the Revolution, on condition of a free toleration to such dissenters as would not be included. His great conscientiousness and his unusual readiness to forgive injuries are also mentioned to his praise. He was accustomed to deliver a lecture to young people on Christmas-day, which was attended by vast audiences from all parts of the town. His discourses and treatises extend to six volumes 8vo., and have been collected and published at different periods: the last volume consists of Latin versions of several of his treatises, translated for the benefit of foreigners, agreeably to the instructions of his will. He also directed that his treatise entitled 'The Vanity of Childhood and Youth' should be rendered into Welsh for the use of schools, and printed often for the benefit of the poor.

Dr. Williams bequeathed the bulk of his estate to benevolent and useful objects. Having provided for his widow, he left donations to the Society for the Reformation of Manners; for the education of youth in Dublin; for an itinerant preacher to the native Irish; to the poor of the Wood Street congregation in Dublin, and of that in Hand Alley in London; to the French refugees; to the poor of Shoreditch parish; to assist poor ministers and students; to several ministers' widows; to St. Thomas's Hospital; to the London workhouse; to the Society for promoting Christian Knowledge in Scotland; for the support of two preachers to the Indians; and for the maintenance of charity-schools in Wales. He also left estates to the university of Glasgow, which at present furnish six handsome exhibitions to students for the ministry among Protestant dissenters in England, who are to be nominated by his trustees. The last grand bequest in his will was four the establishment of a public library in London. For this purpose he had bought Dr. Bates's collection of books for between 500*l.* and 600*l.* to add to his own. He directed his trustees to erect a suitable building, the site for which was purchased by them in 1727, in Red-cross Street; and the library was opened in 1729. All persons may obtain admission on application to one of the trustees. Since the library was established, very considerable additions have been made to it by legacies, as well as by contributions in money and books. It contains upwards of 16,000 volumes; and in 1841 a new catalogue was made, in two volumes; the second volume contains tracts and sermons which had never been catalogued before.

Dr. Williams's library will be memorable in future time as the scene of preparation for many of those noble struggles for civil and religious liberty which have issued in the improved social position which dissenters from the established church now enjoy. The large room in which the deliberations of the united ministers of the three denominations were carried on for many years, while striving for an equality of civil and religious rights, is adorned with a magnificent collection of the portraits of the nonconformist fathers, and of their more immediate successors. It is well known however that the lapse of time brought with it great changes in the doctrinal opinions of at least one of the three bodies, though still retaining its original name. So long as there was common ground of sympathy on which all could meet to redress common grievances, all things went on with harmony. The differences were felt on both sides to be great and momentous, but they were not brought into question: other objects intervened, and the three denominations continued to be a political body aiming at a great social object, rather than a religious union. But scarcely had their united efforts brought about the repeal of the Corporation and Test Acts when differences arose, and the want of religious sympathy in the sections of the body began to show itself. The controversy respecting Lady Hewley's charity at length severed the alliance which had lasted for a century. The Unitarian members, who formed the great majority of the Presbyterian body, seceded from the three denominations on the 4th of March, 1836, and the orthodox Presbyterians, few in number, alone remained in the connexion. The government considerately yielded to the seceding party the right of addressing the throne separately under the name of the Presbyterian denomination; and the Congregationalists, the Baptists, and the remaining orthodox Presbyterians are still known and recognised by the government as the 'Three Denominations,' whose meetings are now held in the Congregational Library, Blomfield Street.

(Dr. Williams's *Works;* Calamy's *Continuation;* Bogue and Bennett's *History of Dissenters; Congregational Magazine* for 1836.)

WILSON, DR. THOMAS, a noted statesman and scholar of Queen Elizabeth's time, was the son of Thomas Wilson of Stroby, in Lincolnshire. He was educated at Eton and at King's College, Cambridge, and afterwards became tutor to the two sons of the Duke of Suffolk. In 1551 he published 'The Rule of Reason, containing the Art of Logic;' and in 1553, 'The Art of Rhetoric.' Both works were frequently reprinted in the course of the century, and both have received much commendation from modern critics; the latter in particular being held to give the author a title to be considered as the earliest critical writer in the English language. Full specimens of it are given by Warton. On the accession of Queen Mary, Wilson found it convenient to retire to the Continent. He took the degree of doctor of laws at Ferrara; but, on proceeding to Rome, was apprehended by the Inquisition, and is said to have been put to the torture; the grounds of charge being said to have been found in the works he had published. On the death of pope Paul IV. (1555), the discontented populace of Rome broke open the prison of the Inquisition; and Wilson was one of those prisoners who then escaped. On Elizabeth's accession he returned to England, was immediately taken into the public service, and rose rapidly from place to place. He was at first master of requests, and master of St. Katherine's Hospital, and private secretary to the queen: in 1576 he was sent as an envoy to the Low Countries; and in 1577 he was appointed one of the secretaries of state, and afterwards became a dean of Durham. He died in 1581.

WILSON, ALEXANDER, was born at Paisley, in Scotland, July 6, 1766. His mother died when he was ten years of age, and his father, embarrassed with the charge of a young family, soon married again. In 1779 Alexander was bound apprentice to a weaver for three years, on the expiration of which he worked about four years as a journeyman weaver, and then abandoned the loom, and spent nearly three years as a pedlar. From an early age he had been cultivating a talent for poetry which he imagined himself to possess, and in his excursions for the sale of his wares endeavoured to procure subscriptions for a volume of his poems, but without success. The volume was never published, but verses and single poems were published in newspapers and separately. 'The Laurel disputed,' a poem on the respective merits of Ferguson and Ramsay, be recited before a literary society in Edinburgh, and published there in 1791. In 1792 he published anonymously his 'Watty and Meg,' which some at first ascribed to Burns, to the no small gratification of Wilson. His poetry however made no impression on his countrymen in general, and he resolved to emigrate to the United States of North America.

On the 14th of July, 1794, Alexander Wilson landed at Newcastle, in the State of Delaware, with only a few shillings in his pocket, and immediately proceeded to Philadelphia. He was employed for a few weeks by a copper-plate printer; he then resumed successively his former occupations of weaver and pedlar, but afterwards became a land-measurer, and ultimately turned schoolmaster, and pursued his new avocation at different places in Pennsylvania and New Jersey. At length, in 1802, he made a contract with the trustees of a school at Gray's Ferry, on the river Schuylkill, in the township of Kingsess, about four miles from Philadelphia, and here he became acquainted with Mr. Bartram, the botanist and naturalist, whose gardens were always open to him, and whose conversation stimulated and improved the taste for natural history which his turn for observation and his rambling life had developed. Here too he became acquainted with Mr. Lawson, the engraver, who gave him instruction in drawing, providing him with landscapes and sketches of the human figure, but with little promise of his becoming a draftsman, till Mr. Bartram proposed a trial of birds, in which he succeeded beyond the expectation of his friends; and from that time the ruling passion of his after-life was brought into play. Writing to a friend in Paisley, in June, 1823, he says, 'Close application to the duties of my profession, which I have followed since Nov., 1795, has deeply injured my constitution; the more so, that my rambling disposition was the worst calculated of any one's in this world for the austere regularity of a teacher's life. I have had many pursuits since I left Scotland—mathematics, the German language, music, drawing, &c.,—and I am now about to make a collection of our finest birds.' In October, 1804, Wilson, accompanied by two friends, set out on a pedestrian journey to the Falls of Niagara. They reached the Falls, and satisfied their curiosity, but were overtaken by the snows of winter on their return. One of his companions remained with his friends near the Cayuga lake, the other availed himself of a conveyance; but Wilson walked on with his gun and bundle, through trackless snows and uninhabited forests, over mountains and along dangerous rivers, and reached home at the beginning of December, after a journey of 1257 miles, of which he walked 47 the last day. All the time he could spare was now devoted to the examination of birds, and making drawings of them in colours. In 1806 Mr. Bradford, bookseller, of Philadelphia, being about to publish a new edition of Rees's 'Cyclopædia,' engaged Wilson as assistant editor. Soon afterwards he explained to Bradford his views of a large work on American ornithology, and the bookseller undertook the publication.

Wilson was assiduous in attention to his duties as assistant-editor, while at the same time he prosecuted the great undertaking which had become the favourite object of his ambition with an enthusiasm which was characteristic of him. At length, in Sept., 1808, the first volume of the 'American Ornithology' was published. From the date of the first arrangement a prospectus had been put in circulation, in which the nature and intended execution of the work were specified, but no adequate idea had been formed of the book which was in preparation, and when the superb volume made its appearance the American public were alike astonished and delighted. It was in folio, with plates carefully engraved from Wilson's own drawings, coloured after nature, and with admirable letterpress descriptions; the price was 120 dollars. In the course of September, 1808, Wilson journeyed eastward and northward, and during the winter went through the southern States, exhibiting his book and endeavouring to obtain subscribers. He visited in fact every town within 150 miles of the Atlantic coast, from the river St. Lawrence to St. Augustine in Florida. He received much praise, but got few subscribers. Wilson however was not depressed.

The second volume was published in 1810, and soon afterwards he set out for Pittsburg on a journey to New Orleans. From Pittsburg he descended the Ohio by himself in a skiff. He started on the 24th of February, and on the 17th of March moored his boat safely in Bear Grass Creek, at the rapids of the Ohio, after a voyage of 720 miles. His hands had suffered a good deal in rowing. He had made excursions from the banks of the river, as he proceeded, with his gun and drawing materials, in search of new species of birds, of which he made drawings and wrote descriptions on the spot where he shot them. He afterwards walked from Louisville to Lexington, 73 miles, and on the 4th of May set out from Nashville for St. Louis through the wilderness on horseback, with a loaded pistol in each pocket, a loaded fowling-piece belted across his shoulders, a pound of powder in his flask, five pounds of shot in his belt, and some biscuits and dried beef. On the fourteenth day he arrived at Natchez, in Mississippi, after a journey through swamps and across rivers, which had nearly killed both his horse and himself. The other volumes of his work were brought out in succession, with astonishing rapidity and regularity; the number of his subscribers increased, and before his death included perhaps every royal personage in Europe. In 1812 he was elected a member of the American Philosophical Society. In 1813 he published the 7th volume. He had completed the pictorial materials for the 8th and 9th when he was carried off by an attack of dysentery in his forty-eighth year. He died August 23, 1813, at Philadelphia. The 8th and 9th volumes were completed and published in 1814 by Mr. George Ord, who had been his companion in many of his exploring expeditions. Mr. Ord supplied the letter-press descriptions for these two volumes, as well as a biography of Wilson in the 9th. Three supplemental volumes were afterwards supplied by Charles Lucian Bonaparte, folio, 1825-1828.

Wilson's pictorial representations of the birds are considered to be of great excellence. His descriptions are not only technically accurate, but exceedingly clear and graphic in whatever relates to their motions and characteristic habits. It is a delightful book. The mind is so much absorbed with the images and scenes as to be hardly conscious of the act of reading.

Wilson was about five feet ten or eleven inches in height, handsome and vigorous, but rather slender. He was always distinguished by the neatness of his dress and appearance. He was a man of the strictest honesty and the most scrupulous regard for truth; social, affectionate, and benevolent, but somewhat irritable under contradiction and critical objection. He was never married.

(*Memoir of Wilson*, annexed to the *American Ornithology*, by Alexander Wilson and Charles Lucian Bonaparte, in *Constable's Miscellany*.)

WOLF-FISH. [Anarrhicas, P. C. S.]

WOLFSBANE. [Aconitum, P. C. S.]

WOOD, DECOMPOSITION OF. [Timber, Preservation of, P. C.]

WOO'DSIA, a genus of ferns, having circular sori, with an inferior involucre, divided at the edges into numerous capillary segments.

W. ilvensis is one of the rarest of our British ferns; it is found in only two localities in Europe, one in Wales, and one in Scotland. It takes root in the fissures of rocks and in the bleakest part of mountainous places. The fronds are elongated, the pinnae triangular, with deep lobes, the rhizoma tufted. There are varieties of this species, which are by some writers considered as distinct species, but Mr. Babington thinks this division unnecessary.

(Babington, *Manual of British Botany*; Newman, *British Ferns*.)

WOOLFE, JOHN. [Gandon, P. C. S.]

WORMWOOD. [Artemisia Absinthium, P. C. S.]

WOUNDING. [Maim, P. C.]

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VOLUME II.

X.

XANTHIAN MARBLES. These interesting marbles, which will shortly be opened to the public in the apartments built expressly for them on the western side of the British Museum, are likely to form one of the most attractive portions of the British collection of antiquities. They consist of a large collection of sepulchral marbles of various ages, which were first made known to the European public by Mr. (now Sir Charles) Fellows, who discovered them in 1838, when performing a tour through Asia Minor. They were all found in or near Xanthus, the antient capital of Lycia, a small country on the southern coast of Asia Minor. [ANATOLIA, P. C. S.] Xanthus is an antient town, and was built on the river of the same name (now Etchen-Cháï), at the distance of seventy stadia, or nine or ten miles, from its mouth. The first mention of the Xanthians in history is in the first book of Herodotus, c. 176, where he describes the capture and destruction of their city, in the middle of the sixth century B.C., by Harpagus, the general of Cyrus. Herodotus says that the Xanthians, after burning their wives and children, were all destroyed by the soldiers of Harpagus. He continues, that those who inhabited the city in his time were all foreigners except eighty families, who were absent on a foreign expedition. He says nothing of their monuments. Five centuries later nearly a similar fate happened to them when they were besieged by Brutus: the city was destroyed, and only one hundred and fifty Xanthians were left, says Plutarch, and this against their will. Many of the monumental buildings of Xanthus must have perished in this second destruction: it was however again restored, as is evident from the Greek inscriptions and the state of its ruins when discovered by Sir C. Fellows. These different conquests will in some way account for the various characters of its monuments and inscriptions.

The origin of the Xanthian collection of marbles may be briefly described. In 1839 the attention of men of letters and artists, both in England and in other countries, was called to the subject by the following publication and its illustrations:—'A Journal written during an Excursion in Asia Minor,' by Charles Fellows, 1838. In this account the remains of Xanthus were represented as of a very early age, and portions of its walls as Cyclopian. The ruins were in many places covered with inscriptions, many in a perfect state, but in an unknown language, which Mr. Fellows represented as resembling in appearance the Phœnician or Etruscan. Many of the ruins, the rock tombs, were described as resembling those of Persepolis. The ruins consist of walls, temples, tombs, triumphal arches, and a theatre, and are situated in a site 'extremely romantic, upon beautiful hills, some crowned with rocks, others rising perpendicularly from the river, which is seen winding its way down from the woody uplands, while beyond, in the extreme distance, are the snowy mountains in which it rises.' These picturesque ruins are covered with sculptures, and their elegant designs, says Mr. Fellows, evince the talent of the Greeks; and the highly poetical subjects of the bas-reliefs, some of them blending in one figure the forms of many, probably to describe its attributes, are also of Greek character.

The account of these ruins attracted more attention than their discoverer expected, and soon after the publication of his first journal, he made, in 1840, a second journey to Lycia, to give a more satisfactory account of his discoveries. The results of this journey appeared in 'An Account of Discoveries in Lycia, being a Journal kept during a second Excursion in Asia Minor,' by Charles Fellows.

In consequence of the more accurate and satisfactory account in this work, and the representations of various persons to the Government, of the advisability and practicability of transporting some of these Xanthian remains to England and preserving them from further destruction, an expedition was fitted out in the autumn of 1841 for the purpose, and permission being obtained from the Sultan for their removal, a portion of the Marbles was deposited in the British Museum in 1842. In 1843 a second expedition was sent out, and the remainder of the Marbles arrived towards the end of the following year. The Marbles comprise four tombs and many fragments of other monuments, and the whole will be shortly opened to the public, partly arranged in the Museum as they were originally found by Sir C. Fellows. The tombs have been named, from their sculptures, the Winged-chariot Tomb, the Harpy Tomb, the Chimæra Tomb, and the Lion Tomb: the first two were found entire, the others in fragments. These two entire tombs, which it is contemplated to reconstruct, are the principal marbles of the Xanthian collection. One, the Winged-chariot Tomb, is a sarcophagus, entirely of white marble, and stood on the side of a hill. The marble being finely worked, the polish has greatly assisted in its preservation from the effect of the atmosphere. The roof is somewhat grey, and the fractures of the lower parts are tinged with the red tint which white marble assumes after long exposure to the weather, and in places with yellow blended with brown. On the top or *hog's mane* is a hunting scene; some figures are running, others are on horseback galloping, with spears in their hand, and mantles blown by the wind, chasing a stag and a wild boar, which has turned to attack the pursuer. All the figures, though small, are, in the opinion of Sir C. Fellows, well formed and finished. On each of the sloping sides of the roof are two stones projecting about a foot, as found on all these tombs, but which upon this are carved into lions' heads crouching on their paws. Upon one side of the roof is a group, in which a warrior carrying a shield is in the act of stepping into his chariot, which is of the early simple form, with wheels of four spokes only; the driver is leaning forward, with his arms stretched out, holding the reins and a whip or goad; four beautifully formed horses, prancing in various attitudes, are attached to the car. A nearly similar chariot and horses are carved on the other side of the roof, varying only in the attitudes of the figures. In the upper panels at the ends or gables are traces of small carved figures. On one side of the tomb (of which a sketch is given in the 'Journal' of 1838), under two lines of Lycian characters, is a group of figures, which, beginning from the left, is thus described by Sir C. Fellows:—'A finely formed figure in a simple robe, his hands folded before him, and with a head of bushy hair, stands as if in attendance behind the chair or clawed seat of the principal figure, who, clothed in rich folded drapery, with short hair, sits in the attitude of a judge, with one arm somewhat raised; before him stand four figures: the first is mutilated, but appears similar to the second, who has long bushy hair, confined round the head, and looking like a wig; his attitude is that of a councillor pleading for the others; the loose robe falls gracefully from one shoulder, and is thrown over, so as almost to conceal one arm; two other figures, differing only in having the hair shorter and the arms hanging down, stand apparently waiting the decision of the judge, and complete the well-formed group.' The word or name Paiafa is inscribed over the judge.

At the end, on a larger scale, are two figures of warriors, clothed with short mantles, and girdles of armour round their loins, above petticoats reaching nearly down to their knees. The back-ground of this bas-relief contains a long but, from mutilation, illegible inscription: it is copied in the Second Journal. On the opposite end of the tomb are two other figures of the same size; one, clothed in a loose robe, stands in a commanding attitude fronting the spectator, with an arm raised over the head of a naked figure, also standing. (Second Journal, p. 166, where both ends are engraved.)

On the second side of the tomb, under a single line of inscription, is an animated battle-scene: 'men on horses are fighting with others on foot; all have helmets, and those on foot have shields; some fight naked, others with a loose shirt or blouse descending below the thighs, and confined by a belt round the waist. The horse of the principal figure is ornamented with, and the rider has, a kind of armour to protect his legs.'

The groups upon the two sides of the tomb are three feet six inches high by nine feet in length. The height of the whole tomb, including the base, is about twenty feet, or twice its width at the sides. The interior was quite exposed; it had been broken open in all its parts. In style of architecture it is the imitation of a wooden structure.

Upon the other or Harpy tomb, a high square pedestal which was near the theatre at Xanthus, are some very curious bas-reliefs. (First Journal, p. 232, and Second Journal, p. 170, where they are engraved.) On the four extremities of the north and south sides are four figures of similar design; the head is that of a female, the breast is exposed, and the body, which terminates with the trunk, has wings and a tail like a pigeon's; from under the wings comes a bird's claw, clasping the legs of a child, which is carried in the bosom of the figure. The tomb has acquired its name from these figures, which resemble the Harpy of the antients. They are all flying upwards and outwards from the middle of each group. In the middle of the south side, seated on an elegant chair, is a small figure wearing a loose robe, with a long stick resting on his shoulder, and two round objects in his hands. A female figure draped, but much mutilated, is presenting a pigeon held by its wings. In the middle of the north side is an old man with a peculiarly pointed beard, seated on a stool, in front of which, by his side, is what appears to be a pig; he also has loose drapery, and a stick resting against his shoulder and held in his hand; before him is the figure of a warrior delivering up his armour: in one hand he holds the helmet, in the other a shield. On the middle of the east side an old man is also seated in a chair, likewise with a long stick resting against his shoulder; in one hand, which is raised, he holds what appears to be a small bird towards his face, and before him a child or youth is presenting a cock; behind the child are a figure with one hand raised, and a dog looking back up into the face of the figure: behind the chair of the old man are two female figures, one holding down by her side some small object in her hand, the other holding likewise some small object up before her face. On each extremity of the west side is seated a female in a chair, looking towards each other; next to one of these females, who has a patera in her hand, towards the middle, is, more than half way up, and on a very small scale, a cow suckling its calf; beneath the cow and calf is an opening in the tomb, which may have been intended as the doorway into the tomb; next to the opening, and looking towards the other female seated in the chair, are three females standing, similarly attired in loose drapery and in similar attitudes, each holding some small object down by their sides, and with the other hand raising a cup or other object to the mouth; the seated figure on this side is similarly occupied. They have all low head-dresses; some the tiara, others wreaths or plaited hair with tresses hanging down behind. The figures are about three feet high, and he four compartments, about nine feet in length, form the top of the tomb, and are elevated about twenty feet above the ground upon a square pedestal of grey stone, and roofed with two flat stones of a similar material; the bas-reliefs are in white marble. There is no inscription on this tomb, which, from the flying figures carrying off the children, is supposed to allude to the story of Pandarus, King of Lycia; these figures are the harpies carrying away the daughters of Pandarus: Homer, *Odyssey*, b. xx. (Second Journal, p. 170.)

Close to this tomb was another similar tomb of the same dimensions, entirely covered with Lycian characters. These Xanthian tombs extend over several miles of country.

The walls of the city are extensive and massive; Cyclopian is blended with Greek architecture; and several gateways with their paved roads still exist. In the walls of the acropolis many beautifully wrought marbles are built in as materials, without any regard to their sculpture. Lions, warriors, chariots, and horses are to be traced in many fragments, and birds like our game-cocks fighting. On the site of a small temple Sir C. Fellows found a frieze about ten or twelve feet long and one in width, representing a series of fifteen small dancing figures with flying drapery. There were the ruins of many small temples in the neighbourhood: Sir C. Fellows considered the sculptures to be Greek. He says however of the ruins generally—'Xanthus possesses some of the earliest archaic sculpture in Asia Minor, and this connected with the most beautiful of its monuments, and illustrated by the language of Lycia. These sculptures to which I refer must be the work of the sixth or seventh century before the Christian era, but I have not seen an instance of these remains having been despoiled for the rebuilding of walls; and yet the decidedly more modern works of a later people are used as materials in repairing the walls around the back of the city and upon the acropolis; many of these have Greek inscriptions, with names common among the Romans. The whole of the sculpture is Greek, fine, bold, and simple, bespeaking an early age of that people. No sign whatever is seen of the works of the Byzantines or Christians.'

Many Greek inscriptions upon pedestals are built into the walls, which, says Sir C. Fellows, are mostly funereal, and belong to an age and people quite distinct from those of the many Lycian remains. Among the many inscriptions copied by Sir C. Fellows, at Xanthus, is a Lycian inscription of 250 lines taken from an obelisk. (Second Journal, p. 168.)

Many of these fragments of sculpture built into the walls of the acropolis are now in the Museum; they are also engraved in the Second Journal of Sir. C. Fellows. The construction of the chariots and the costume of the figures of some pieces are of an early age. The forelocks of the horses are tied in a peculiar way, similar to those of some horses in a bas-relief at Persepolis: the whip of the driver of a chariot, as well as his costume, are in the Persepolitan sculptures the same as in the Xanthian specimens. The horses have also their interest; some resemble the subjects seen upon antique gems: the lion and the bull also are represented as prominent objects in these Lycian sculptures. Many of the Greek inscriptions, already mentioned, appear to be subsequent to the Roman conquest of Asia, and some are of the time of the emperors.

None of them are of any service in pointing out the date of the various sculptures. They are translated in an 'Appendix to the Journal of the Second Excursion of Sir C. Fellows,' by Mr. Hermann Wiener. Few of them are however quite perfect. The same work contains an Essay on the Lycian Alphabet and Inscriptions, by Mr. Daniel Sharpe. The sculptures and ruins of Cadyanda, Myra, Limyra, Tloss, and other places in Lycia, appear to be equally interesting as those of Xanthus.

There are in the British Museum fragments of and casts from some of these marbles, as those of Tloss, Telmessus, Pinara, Myra, and Cadyanda. With the collection are also drawings and paintings of the original sites of the various ruins and marbles, and of some of them entire models as they were first found by Sir C. Fellows in 1838. There is likewise a panoramic view of Xanthus with all its ruins, taken from the acropolis by Mr. George Scharf, who accompanied Sir C. Fellows on his expedition: there are also drawings of the operations of the excavators. In this panoramic view is a group of fragments of peculiar interest. These fragments are now in the Museum, and as they appear all to belong to the same monument, and few pieces are wanting to complete it, a restoration of the whole has been attempted, and it will form one of the most striking features of the collection. It consists of a small amphiprostyle temple of the Ionic order, on a lofty stylobate pedestal without a base, but above a plain lower basement. It measured in height nearly 30 feet above the basement, and as much in length. The stylobate, being rather more than half the height of the whole, is ornamented with the bas-reliefs, and has a cornice with a deep egg-and-tongue moulding. The height of the columns, of which there are four at each end, is ten feet; and between and on the outer sides of these columns are altogether ten figures, five at each end, upwards of five feet in height, but much mutilated. The pediments were ornamented with sculpture, and three smaller statues stood on the acroteria at each end. All the fragments were found except some of the pediment sculptures. The sculptures of the stylobate, or upper ornamented basement, are complete in both their series, though all the figures are mutilated, and there is but one head entire: this is on the socle, or in the lower series, and has on a Phrygian cap. The bas-reliefs of the socle represent a battle between Greeks and Asiatics, and are about three feet high; those of the frieze above, or upper series immediately under the cornice, are smaller, and represent the storming of a city.

This interesting monument, which appears to have been wholly without inscriptions, is considered by Sir C. Fellows and some others to be a monument raised in commemoration of the capture of the city by Harpagus. There is however nothing whatever in the monument itself to support the supposition. From the style of the sculptures it is a work of a much later age; the statues are evidently, from the peculiar and masterly character of their draperies, of an age subsequent to the marbles of the Parthenon. There is also no parallel in the description of Herodotus with that part of the frieze which represents a Persian or Phrygian satrap or general receiving a deputation or giving audience to some aged men. The soldiers also who are ascending the ladder to enter the town are without shoes, and appear to be Greek. In alluding to the victory of Harpagus, Herodotus speaks rather of the self-destruction of the Xanthians than of the capture of the town. The Xanthians, having destroyed their wives and children, sallied out, and were all put to the sword. The monument is more likely to commemorate the recovery of the city from the Persians: it is a Greek and not a Persian work. The fallen Persian of one of the pediments also shows that the Persian is the defeated, not the victorious party. That the monument is a commemoration of some victory is evident from all its parts.

If this monument can be explained into a monument to Harpagus, it must have been executed about 150 years after the event commemorated; for though it may be hazardous to fix the time of any monument from the style of its workmanship, there is not much rashness in pronouncing when it was not executed; and there is evidence in the design and workmanship in this monument to show that it was not executed until after the time of Phidias and the completion of the Parthenon, or certainly not earlier than about 400 B.C., and probably considerably later. After a certain time, when mastery has superseded hesitation in design and unskilfulness of execution, the former hardness and littleness of detail and cramped stiffness of attitude are replaced by freedom and facility, with everywhere the evidence of a skilful expression of what was required. The journeymen also by whom such marbles are executed, long accustomed to the easy mastery of the models of a finished age, themselves acquire peculiar characteristics of execution; touches given with little trouble, but by which much is accomplished; grown old in mastery, they become careless and free to extravagance in their execution. All these evidences are in this Xanthian monument: the draperies of the mutilated female statues combine the highest mastery in design with the utmost facility of execution.

Besides the works above quoted on these marbles, Sir C. Fellows has published a pamphlet entitled 'The Xanthian Marbles, their acquisition and transmission to England,' 1842. Their inscriptions are already incorporated in the 'Corpus Inscriptionum Graecarum,' by Aug. Boeckh and J. Franz, in the first part of the third volume of the Transactions of the Academy of Sciences of Berlin for 1844. Some corrections are ventured upon by the editors of this edition, especially in an inscription on a stele or column described as erected to a son of Harpagus, who was a celebrated boxer. (*Kunstblatt*, 1845, p. 326.)

XANTHIDIUM. Some of the minute organic bodies in the chalk and flint of England are referred to this genus of Infusoria, but perhaps without sufficient reason. (Mantell.)

XAVIER, FRANCIS, SAINT, was born at the castle of Xavier, in Navarre, on 7th April, 1506. His father, Don John do Jasso, was counsellor of state to the King of Navarre, and his mother, Maria Azpilcueta, was heiress of the two illustrious houses of Azpilcueta and Xavier. Francis was the youngest of a large family of children, the eldest of whom bore the surname of Azpilcueta, and the others that of Xavier. Under the paternal roof he received all the advantages of a careful education. His devotion to study, and the talents which he manifested, induced his parents to send him at tho age of eighteen to the Collège de Sainte Barbe, at Paris. It was there that he first became acquainted with Ignatius Loyola, and thenceforward to the time when he set out on his missionary labours, the history of Xavier is intimately blended with that of Loyola and his disciples. [JESUITS, P. C.; LOYOLA, P. C. S.]

In 1538, he joined Ignatius Loyola at Rome, where he actively assisted him in the furtherance of his great design of associating a body of devoted men for the special service of the Church of Rome. While in that city, he exercised the functions of the ministry in the church of St. Lawrence in Damaso, and attracted to it large multitudes by his zeal and talents. Among them was a Portuguese of the name of Govea, who had been sent to Rome on a mission of importance by King John III. In his communications with the king he had expressed himself in terms of high commendation of the new society which had lately sprung up under Loyola; and had suggested the propriety of selecting missionaries from among them to plant the standard of the faith in the Portuguese colonies of Asia. Influenced by these representations, the king dispatched an order to his ambassador at Rome to obtain six members of that society, who might be willing to devote themselves to missionary labours. Two only however could be spared, and Simon Rodriguez, a Portuguese, and Nicholas Bobadilla, a Spaniard, were selected by Loyola. As he was about to set out on his journey to Lisbon, Bobadilla fell sick, and Francis Xavier joyfully received the command of his chief to become his substitute. Having previously obtained the benediction of the Pope, Paul III., on himself and his holy enterprise, he left Rome in company with the Portuguese ambassador, on 15th March, 1540. Their journey by land to Lisbon was long and tedious. As they passed through the town of Pampeluna, which was only eight leagues from the castle of Xavier, he was pressed by the ambassador to take leave of his mother, who was still living, and his other friends and relations, whom it was probable he might never again see. In the excess however of his zeal for the prosecution of the purpose to which he had devoted himself, he declined availing himself of the opportunity, fearing, as he said, that the transient pleasure of a last farewell might leave too lasting an impression of melancholy on his sacred enterprise.

Xavier and his companions arrived at Lisbon towards the end of June. After a stay of eight months in Lisbon, on 7th April, 1541, Xavier embarked on board a vessel, which carried Don Martin Alphonso de Souza, governor of the Indies, but unaccompanied by Rodriguez, who had been persuaded by the king to remain in Portugal. After a voyage of five months, they arrived at the coast of Mozambique in Africa, where they wintered, and at Goa, the Portuguese seat of government in the East Indies, on 6th May, 1542.

On landing, the first visit of Xavier was to the hospital; his next to his spiritual superior, the bishop of Goa, to whom he presented the briefs of Paul III., and implored his sanction and blessing on his missionary enterprise. He had scarcely commenced it, when he made the painful discovery that the doctrines in which he was anxious to instruct the infidels, were openly contradicted by the life and example of the greater part of the Christian residents in Goa. To their spiritual reformation therefore he directed his first endeavours; going from street to street, with a bell in his hand, he summoned every inhabitant to send him his children and slaves, in order that they might receive Christian instruction. Having secured his influence over the young, he exerted himself in his ministrations to expose the prevailing vices, and to present the remedies which religion affords. From the Christians, his zeal extended itself to the infidels, whose temples he caused to be destroyed, and churches to be erected on their site. His labours were speedily rewarded in Goa by a marked reformation among the inhabitants. After a residence of six months in that town, he left it to visit the coast of the pearl fishery, which extends from Cape Comorin to the isle of Manar. He there found that, although a large proportion of fishers had been baptized in the Christian faith, they had, for want of instruction, retained the vices and superstitions of heathenism. In order to give them that instruction, he laboured for some time most assiduously in acquiring the Malabar language. His first preaching among them was attended with extraordinary success. After a stay of fifteen months on this station, he returned to Goa for the purpose of procuring assistants to his work; with them he returned, in 1544, to the fishers of the pearl coast, and left several of them in different parts, to prosecute the labours which he had begun. He then proceeded to the kingdom of Travancore, where, in one month, as he states in his letters, he baptized ten thousand Indians. Xavier then visited Malacca, a place at that time of considerable trade, and to which merchants from every part of Asia were in the habit of resorting. He arrived there on 25th September, 1545, and, according to his custom, took up his residence at the hospital, where he devoted himself to the service of the sick, without neglecting the principal object of his mission, which was to instruct the people. A large number of converts from among Mohammedans, Jews, and others, was the result of his labours. While at Malacca he was joined by three other Jesuit missionaries, whom Ignatius Loyola had sent to co-operate with him. In company with them, on the 1st January, 1546, he set sail for the islands of Banda, and, it is said, became the happy instrument of the conversion of the entire crew of the vessel which carried him. From thence he proceeded to the island of Amboina, where he baptized a large number of the inhabitants; he then preached the Gospel in other islands, and, having made a considerable stay in the Moluccas, he brought over great numbers to Christianity. Xavier then returned towards Goa, visiting on his voyage the islands where he had planted tho faith: he arrived at Malacca in 1547. After leaving Malacca he made some stay at Manassar, near Cape Comorin, and afterwards passed over to the island of Ceylon, where he converted the King of Candy and several of his subjects; on the 20th May, 1548, he returned to Goa. At Malacca, he had met with a Japanese exile, named Auger, of noble birth and high station in his country, whom he had instructed in the faith, and induced to accompany him to Goa. The description given by this Japanese of the state of his native islands determined Xavier on making them the next object of his missionary labours. Having baptized Auger, with two of his domestics, and given him the more Christian name of Paul of the Holy Faith, he set out with him from Goa on this difficult enterprise. After making a short stay at Malacca, he embarked on board a Chinese vessel, and arrived on the 15th August, 1549, at Cangoxima, in the kingdom of Saxuma, in Japan. [JAPAN, P. C.]

The chief difficulty he had to overcome in this new ission was his ignorance of the Japanese language. Xavier, uring his voyage, had, by means of his convert, acquired me little knowledge of it, which was increased by his stay of forty days at Cangoxima, and which was sufficient to enable him to translate into it the Apostles' creed with a short exposition. The little progress, however, which he made in it proved a serious hindrance to his success, as appears from the letters he sent home. Through his companion, he was introduced to the King of Saxuma, who gave him a favourable reception, but declined hearing him on the subject of religion. In the hope of finding a more suitable field for his missionary exertions, he left Saxuma, and proceeded to Firando, the capital of another small kingdom. He was there allowed freely to exercise his ministry, and numerous conversions were the fruits of it: in that city he baptized more infidels, in twenty days, than he had done at Cangoxima in a whole year. Encouraged by this success, he left these converts under the care of one of the Jesuits who had accompanied him, and set out for Meaco, the capital of the whole empire and the residence of its ecclesiastical chief. [JAPAN, P. C.] On his way thither he visited Amanguchi, the principal town of the kingdom of Naugato, where he was allowed to preach in public and before the king and his court, but with little success. After a month's stay in that city, he continued his journey towards Meaco. Though it was the depth of winter, and the rugged roads, difficult at all times, were now rendered almost impassable by drifts of snow and mountain torrents, yet, thinly clad and barefoot, he journeyed onwards, resigned and cheerful. He arrived at Meaco in February, 1551, having been about two months on his journey. There his mean appearance and wayworn garments proved a subject of offence to the inhabitants; accustomed to the gorgeous rites and pompous ceremonial of their own religion, the priests, whose influence was paramount in that city, could not see in this humble person the ambassador of the Most High. Though rejected with contumely, Xavier did not abandon his holy purpose, but returned to Amanguchi, where he provided himself with a rich suit and a retinue of attendants, and thus attired presented himself before the court. This harmless device produced the desired effect; he obtained the protection of the king, and preached with so much success, that he baptized three thousand persons in that city. These converts he left to the care of some Jesuits who had been the companions of his journey; and, accompanied by two Japanese Christians, who, rather than renounce the consolations of the religion he had taught them, had cheerfully suffered the confiscation of their property, he departed from Amanguchi, in September, 1551, and, on the 20th of November following, embarked to return to India, having remained in Japan two years and four months. This mission was, for upwards of a hundred years after the death of Xavier, successfully continued by the Jesuits. [MISSIONS, P. C., vol. xv., p. 267.] On his voyage he made some stay at Malacca, chiefly for the purpose of concerting measures with the governor of that place for the prosecution of a mission to China. A serious obstacle to it was the law which forbids strangers, on the severest penalties, to enter that country. To remove it, it was agreed between Xavier and the governor of Malacca that an embassy should be sent in the name of the King of Portugal to establish a commercial treaty, and that Xavier should join it. On his return, however, to Malacca, he found the new governor, who had arrived there during his absence, opposed to the projected embassy, and, after many unavailing entreaties to procure his compliance, he was obliged to embark alone for his intended mission on board a Portuguese vessel bound for the island of Sancian, near Macao, in China, a place where the Chinese were permitted to traffic with the Portuguese merchants. On arriving there, the merchants of Sancian endeavoured to dissuade him from his design of prosecuting his journey farther, and strongly represented to him the danger. Xavier however was not to be deterred; he provided himself with an interpreter, and entered into an agreement with a Chinese merchant to land him by night on some part of the coast. This plan also was frustrated by the Portuguese residents of Sancian, who feared that this attempt to infringe the laws might be visited upon them by the vengeance of the Chinese authorities. While thus disappointed in his fondest hopes, he fell seriously sick. His sufferings, which were most acute, were aggravated by the inattention and want of skill of those around him; in the midst of them however he displayed a cheerful countenance and a holy resignation. He died December 2, 1552. His remains were brought over to Malacca on the 22nd of March, 1553, where they were received with the greatest honour; they were afterwards transferred to Goa, and deposited in the principal chapel of the church of Paul, on the 15th of March, 1554. The memory of Francis Xavier was consecrated by a ceremony known in the church of Rome by the name of Beatification, by the Pope Paul V., in 1619, and he was canonized as a Saint by Gregory XV. in 1622. In 1747, John V. King of Portugal, obtained a brief of Benedict XIV., which conferred on him the title of patron and protector of the East Indies. His festival is observed by the Church of Rome on 3rd of December.

The following works are all that Francis Xavier has left:—1, a Collection of Epistles, in five books, Paris, 1631, in 8vo.; 2, a Catechism; and, 3, 'Opuscula.'

(Alban Butler, *Lives of the Fathers, Martyrs, and the other principal Saints*, vol. xii. p. 29-40, Derby, 1846: in this biography there is an error in the date both of his beatification and canonization; *Biographie Universelle*, tome li.; the article 'Xavier' in this work is by Léguy; Fabre, *Continuation de l'Histoire Ecclésiastique de Fleury*, livres cxxxv., cxxxix.-cxli., cxliv.-cxlviii.; *Lettres édifiantes et curieuses, écrites par des Missionnaires de la Compagnie de Jesus*, 40 vols., Paris, 1832, vol. xxvii., a work of great curiosity and interest, and not sufficiently known in England; *Pen. Cyclo.* art. 'Missions;' the statement made in it that Xavier was canonized by Urban VIII. is erroneous, but it is true that this pope first gave him the title of the Apostle of the Indies. The Life of St. Francis Xavier has also been written in Latin, by Turselinus, Rome, 1594; in Italian, by Orlandino, Bartoli, and Maffei; and in French, by Bouhours, a work which was translated into English by Dryden in 1688.)

XULIONOSPRIONI'TES, one of the fossil fruits of Sheppey. (Bowerbank.)

XYLO'PIA, a genus of plants belonging to the natural order Anonaceae. It has 6 petals and numerous stamens; the calyx from 3- to 5-lobed, the segments ovate, conaceous, and acute; the ovaries distinct and numerous; the ovules ascending in one row attached to the central angle; the carpels indefinite, ovate, compressed, indehiscent, stalked, and from 1- to 4-seeded.

X. longifolia is a tree 70 feet high, the leaves oblong, acuminated, silky, and shining beneath, revolute at the margin, especially near the base. The peduncles are from 2 to 4, axillary and smooth; the three outer petals oblong, linear, acuminate, silky, brownish, externally white, and excavated in the inside; the three interior ones linear, white, red at the base, 3-cornered at the point.

X. glabra is a tree native of Jamaica and Barbadoes. The branches are smooth and scarcely dotted; the leaves oblong, ovate, and smooth, on very short stalks. The peduncles are 1-flowered, solitary or in pairs. The calyx is smooth, trifid, with very obtuse lobes; the carpels smooth. The flower-buds are oblong, pubescent on the outside. The wood, bark, and berries of this tree have an agreeable bitter taste, similar to that of an orange-seed.

All the species of this genus require a stove-heat. They grow best in sandy loam and peat, and ripened cuttings will root in sand under a hand-glass in moderate heat.

(Don, *Gardener's Dictionary*; Lindley, *Flora Medica*.)

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Z.

ZAMI'TES, a genus of fossil Cycadeous plants from the oolitic, wealden, and cretaceous formations (Presl.) synonymous with Mantellia and Brongniart.

ZEILA is a town and harbour in Africa, at the western extremity of the Gulf of Aden, not far from the Straits of Bab-el-mandeb. It is situated in 17° 45′ N. lat. and 43° E. long. The harbour is small and shallow, so that even small vessels must anchor at a distance of nearly half a mile from the beach. The town is enclosed by walls now in ruins. The houses, with the exception of eight or ten, which are built of stone, are either of wood or reeds, or of both these materials. Some guns planted on the wall from the land side are a sufficient protection against the Somaulis, who inhabit the surrounding country. The population is stated not to exceed five hundred souls. All families are engaged in trade, Zeila being one of the harbours by which the inhabitants of Hurrar carry on a commercial intercourse with Arabia. Three cafilas arrive annually from the interior, especially from Hurrar. They bring to Zeila slaves, both male and female, large quantities of gum and myrrh, coffee, jowari, ghee, and ostrich feathers, also some grain, especially millet, wheat, and beans. Most of these articles are sent to Mocha, and at present probably also to Aden. In return they take back blue and white coarse cloths, Indian piece-goods, European prints, silks, silk thread, shawls, red cotton yarn called shumlah, beads, zinc, copper-wire, frankincense, and Austrian dollars. Zeila is subject to the Pasha of Egypt, by whose authority the Dolâh of Mokha nominates the Emir Zeïla, who pays an annual tribute of 300 dollars, and keeps a garrison of seventy soldiers, armed in part with matchlocks.

(Isenberg and Krapf, *Journals detailing their proceedings in the Kingdom of Shoa*; Barker, *Report on the probable Geographical Position of Harrar*, in *London Geogr. Journal*, vol. xii.)

ZEMAUN, SHAH. [SHAH ZEMAUN, P. C.]

ZINC, *Medical Properties of.*—In the purely metallic state, zinc produces no effect on the human system, but its combination with oxygen is sufficient to invest it with considerable power over the organs, both those with which it comes into direct contact and some remote ones, especially the nervous centres. Its local action is that of an irritant, astringent, and desiccative, while its remote action is that of a tonic and antispasmodic. Its emetic properties are less than those of the sulphate or acetate, unless it meets with acids in the stomach. In this way it is rarely employed. It is for its remote effects, when taken in small long-continued doses, that it is valued. While it has the properties common to all tho metallic antispasmodics, it is distinguished by its power of restraining inordinate action of the nervous system; being calming and soothing. The brain and the function of sensation appear to feel less of its influence than the spinal chord. Hence the nerves of motion, and the functions of the circulation and respiration, are chiefly acted upon; it produces its effects speedily, but they quickly disappear when given in such doses as can be safely administered. The long-continued use of it seems to produce a dryness and induration of the frame, which if carried to excess is dangerous, but the lesser degree of which is in all probability the source of the utility of this medicine, by diminishing the mobility of the system, irregularities in the circulation, and sudden congestions of blood, being the immediate causes of attacks of epilepsy and hysteria, the diseases which are most benefited by oxide of zinc.

In spasmodic affections of the chest, such as asthma, angina pectoris, and palpitation of the chest, when these do not proceed from organic derangements, oxide of zinc is often serviceable, especially when combined with conium. In the cramps of the stomach to which habitual drunkards are subject, it is very useful.

Impure oxide of zinc is called tutty. It is sometimes used externally as a dusting powder, as a mild absorbent, on excoriations, and to heal chaps and cracks in the skin. It is also used as an ointment. Pure oxide of zinc forms an ointment of much value where a mild astringent is needed, especially in the chronic inflammation of the cyelids.

Carbonate of zinc when impure is termed calamine; this after being subjected to divers processes, is called *prepared* calamine. The only use made of it is to form an ointment, which is most useful as an application to burns, excoriations, and superficial ulcers.

Sulphate of zinc is in small doses a very valuable astringent, tonic, and antispasmodic; in larger doses it is a very certain and speedily acting emetic; and in very large doses it is poisonous. It is the most useful emetic in cases of narcotic poisoning, as it is not so apt to inflame the stomach as tartarized antimony: but the stomach-pump is preferable to either.

The tonic effects are best seen in affections of the mucous membranes. In the suffocative catarrh of aged persons, and the extreme defluxions on the chest after influenza, sulphate of zinc affords a valuable remedy: it must be given in small doses, as the sudden suppression of the secretion may cause inflammation. The use of the solution as an injection requires the same caution.

Acetate of zinc is possessed of nearly similar properties, but in a weaker degree; and as an injection, seems in some cases entitled to a preference.

Chloride of zinc, called also butter of zinc, is a powerful escharotic or caustic; this action results from its strong affinity for albumen and gelatine, which principles it abstracts from the living tissues, and so forms an eschar. Its powers in this way have been taken advantage of to destroy parts affected with malignant diseases, such as cancer and lupus, and to remove naevi materni, or mother-marks. In none of these is it to be resorted to unless they are very superficial. Deep-seated cancer of glands can scarcely be removed by it, but other forms are often successfully treated by it. (Walshe *On Cancer*, p. 219.)

Cyanide or cyanuret of zinc is a powerful antispasmodic and tonic. No medicine is so potent in allaying irritability of the stomach attended with great debility. The dose must be small and often repeated. Valerianate of zinc has lately been much recommended as a remedy against tic-douloureux and other nervous affections. Where the patients can tolerate the repulsive odour and persevere in its use, it often proves very serviceable.

Zinc pans have been much recommended for use in dairies, as the milk speedily coagulates in them, and the quantity of cream is great: but if the milk become sour while in them, the acid acts upon the zinc, and forms unpleasant, though perhaps not poisonous compounds. Upon the whole, white porcelain vessels, kept thoroughly clean, are the best material for milk-vessels.

ZI'NGIBER OFFICINA'LE:—(GINGER), *Medical Properties of.* The native country of this plant seems unknown, though Goebel asserts that it is Guinea. It is however extensively cultivated in China, Java, and the East and West Indies. From the cultivated plant alone is the ginger of commerce procured. Of this there are two varieties, the black and white; but some writers affirm that these are the produce of two distinct species, while others ascribe the difference of appearance to diversity of treatment after the rhizome is dug up. The rhizome or root-stock is perennial, but it is only that of a young plant, or the annual shoots from an old one, which are met with in commerce. When first dug up, the colour internally is red. Those procured the first year are used fresh, or preserved in sugar, and constitute the sweetmeat known as *preserved ginger*. This, when sent from the West Indies, is in small, round, tender pieces; when from the East, larger, flat, and stringy portions: the former is preferred.

Black ginger is stated to be the rhizome dug up, scalded in hot water, and dried in the sun. White ginger is also scalded, and then scraped to free it from the rind before it is dried, which last operation is said to be effected by artificial heat, but probably mostly by the sun. Both kinds are very liable to the attacks of an insect: to prevent these attacks the rhizomes are dipped in a solution of lime; the white particles of which often adhere to the surface. To cause black ginger to resemble the white it is bleached, after its arrival in this country, in a solution of chloride of lime, or exposed to the fumes of burning sulphur. This impairs the activity of the article.

Ginger occurs in commerce in pieces termed *races*, of various shapes, but generally flattish, branched, lobed, or palmated, rarely more than four inches long. The unscraped has a wrinkled epidermis; the scraped is devoid of this covering. Jamaica ginger, which is most esteemed in this country, occurs in races larger, rounder, and thinner than the other kinds; externally of a yellowish white, internally of a yellower hue. The taste is agreeably aromatic and pungent, but this is lost with age, so that old pieces are worthless, as are also portions which have been digested in alcohol to form *essence of ginger*. Ginger when chewed excites a flow of saliva; the powder applied to the nostrils causes sneezing. The quantitative analysis of 100 parts of ginger has been given by Bucholz:—

Pale yellow volatile oil	1·56
Aromatic, acrid, soft resin	3·60
Extractive soluble in alcohol	0·65
Acidulous and acrid extractive, insoluble in alcohol	10 50
Gum	12·05
Starch (analogous to bassorin)	19·95
Apotheme, extracted by potash	26·00
Bassorin	8·30
Woody fibre	8·00
Water	11·90
	102·31

Morin's analysis yields also acetic acid, acetate of potash, and sulphur; while the ashes give numerous metallic salts and alkaline salts.

The volatile oil is of a pale yellow, lighter than water; taste at first mild, then hot. The soft resin, obtained by digesting the alcoholic extract of ginger first in water, then in æther, and evaporating the etherial tincture, is not quite analogous to the principle *zingiberin*, procured by Beral, and by him termed *peperoid*. This last is got by submitting ginger directly to the action of sulphuric æther. Beral recommends many preparations of this principle, but, except from their smaller bulk, it is difficult to perceive what advantage they possesses over common ginger and its preparations. Ginger is an aromatic stimulant of considerable power. The effects are greater on organs with which it comes into direct contact than on remoter ones. Thus, when chewed, it is a powerful sialogue, and relieves tooth-ache, rheumatism of the jaw, and also relaxed uvula. When received into the stomach, it promotes digestion in languid habits, and relieves flatulent colic. Gouty subjects are much benefited by it, and for such persons no form is more beneficial than that of preserved ginger taken at dessert after a mixture of viands. But it has the disadvantage of impairing the flavour of the wine taken at the same time.

The action of ginger on remote organs is greatest on the mucous membranes. Hence the lungs are markedly excited in the relaxed and suffocative catarrh of old people. The mucous membranes of the urino-genital organs are also excited by it in languid habits; many feeble females receive much advantage from the domestic preparation termed ginger-tea. Some headaches of a sympathetic kind, originating in irritation of the intestinal canal, are often relieved by it. A poultice of scraped ginger, to which warm water has been added, forms a substitute for a mustard poultice, and often relieves headache when applied to the forehead. Ginger-beer is often a grateful beverage in summer heat, but with some persons it disagrees; this is owing to the sugar, for if made without it, it agrees with such persons well. Lemon-juice, when taken with sugar, often disagrees, as for example with pancakes. The lemon-juice alone is most wholesome.

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THE END.

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