

of St. James, where he was accredited as Russian ambassador. She soon became as conspicuous in London as she had been in Berlin, her diplomatic manœuvres aiding not a little her husband, as they did also Pozzo di Borgo and Gentz, who came to London between 1812 and 1814 on a special mission from the Austrian government. In 1815 she was one of the most prominent of the many distinguished persons who attended the congress of Vienna, and many of her intrigues there were said not to have been exclusively of a political nature. The princess of Lieven, the princess Zanaïde Volkonski, and the grand duchess of Oldenburg (sister of Alexander I.), were the great rivals for beauty and genius in Viennese society, and they were called "the three graces." From that time until 1834, when the prince was recalled to St. Petersburg, Mme. Lieven held a leading position in the highest political and social circles of London, where she competed eagerly for the honors of superior diplomatic skill with Talleyrand, then for a time French ambassador in England, and more particularly with his accomplished and crafty niece the duchess of Dino. Her saloon in London was a curious laboratory in which she endeavored to color and shape all political elements in accordance with the autocratic system of government, of which Russia was then the chief exponent. No sooner did a public question of English or European interest arise than the princess applied all the many resources of her cunning and plotting disposition, in order to derive from it some benefit for her imperial master, or to engraft upon it Russian political idiosyncrasies. During the agitation in England in regard to the Grecian struggle for independence, she was on the side of the Philhellenists, not from any sympathy with liberty, but with a view of strengthening Russia by weakening Turkey. She was active among those who conspired against the establishment of Belgium as an independent kingdom. Her talents and blandishments were duly appreciated in London society, but she was too fond of political intrigue and agitation to command the full confidence of English statesmen. Castle-reagh, Canning, and many of the most eminent men of Great Britain, however, were among her intimate acquaintances. With a view of giving the tsesarevitch (the present emperor Alexander II.) the benefit of the instruction and the society of a lady of Mme. Lieven's vast experience, she and her husband were recalled to St. Petersburg in 1834. The prince was appointed governor of the young Alexander, but his office was almost nominal, and for some time his wife discharged his functions as tutor as efficiently as she had acquitted herself of his duties as ambassador. He however accompanied the tsesarevitch on his travels in southern Europe, while the princess, who had been previously appointed lady in waiting of the empress, remained attached to the Russian court. In 1835 she had the misfortune to lose two of her children, respectively aged 13 and 8. Afflicted

by this calamity and yearning for a change, and at the same time for a more independent social atmosphere, she established herself in Paris in 1837, where she took up her residence in the hôtel Talleyrand, the large and beautiful mansion inhabited formerly by that minister, from whom its name is derived. After the death of her husband, which occurred during his visit in Rome, Jan. 10, 1839, she continued to reside in Paris, where her house became a great social focus during the reign of Louis Philippe. She was on peculiar terms of intimacy with M. Guizot, with whom she had become acquainted in London. She has been often called the Egeria of that statesman; but while the associations which mythological traditions establish between the nymph of that name and the Roman lawgiver Numa were believed to have been matrimonial as well as political, the relations between the adroit Russian princess and the austere French legislator were understood to be based solely upon mutual friendship and strong political sympathies; and the report circulated shortly before her death of their private marriage was not credited. The saloon of the princess of Lieven in Paris was for many years a favorite resort of the chief political, literary, artistic, and social celebrities of that metropolis, and the motley assembly of persons who congregated there included almost all phases of society, from the stately prime minister down to the sprightly comedian. Hence it became one of the fountain heads of the political and fashionable gossip of Paris. Thiers and Molé, the representative of Metternich's policy, Count Apponyi, and the constitutional Spanish statesman Martinez de la Rosa, Lord Granville and Gen. Cass, Lord Lyndhurst and Mr. Bowring, Mme. Thiers and Mme. de Flahaut (the British Baroness Keith), politicians, diplomatists, and ladies of all parties, met at the receptions of the princess; and the principal business of the Russian embassy was done in her boudoirs. With correspondents and acquaintances in every part of Europe, and with her great control over society, she obtained a mass of political and personal information which she forwarded to her friends in Russia. She was on terms of personal friendship with almost every eminent statesman of her time, excepting Lord Palmerston, who distrusted her influence, and of whom she became accordingly an unrelenting enemy. After the revolution of Feb. 24, 1848, she removed to London, but returned to Paris during the presidency of Louis Napoleon, and resumed her receptions in the hôtel Talleyrand, when, beside Guizot and the duke of Noailles and many of the other old attendants upon her reunions, Count Morny, Persigny, Fould, and other notabilities of the new régime, soon united there in social intercourse. Her saloon, however, possessed no longer the cosmopolitan prestige which distinguished it in former times, and was regarded as the headquarters of the Orleans party, although the princess herself professed to keep aloof from all political agitation. After the proclamation

of the empire, she was introduced at the court of Napoleon III., and for some time preceding the Crimean war her saloon became again of great political importance, the princess aiding the Russian ambassador Count Kisseleff in keeping the court of St. Petersburg informed of the progress of events. After the outbreak of the war, however, when Kisseleff and the principal Russian residents of Paris went to Brussels, the princess also spent some time in that city, and was visited there by her faithful friend M. Guizot. In Jan. 1855, she sought and received, under the plea of ill health, permission to return to Paris, where she lived in the utmost retirement until after the restoration of peace in 1856, when her hotel was again thrown open to her numerous friends. Early in Jan. 1857, her health began to fail; but she was in full possession of her mental powers to the last moment. She was a Protestant in faith, and previous to her decease had a long interview with M. Cuvier, a Protestant minister of Paris. Her death-bed was attended by her eldest son Prince Paul, by her nephew Count Benckendorff of Stuttgart, and by M. Guizot. She left a large fortune and a remarkable collection of valuable jewelry.—The princess of Lieven was one of the most active diplomatists of modern times. Her knowledge of history, literature, and languages was extensive; she wrote and spoke the French language with great elegance and facility. Her memoirs would undoubtedly throw light upon many of the diplomatic transactions of the last 50 years; but the announcement which appeared soon after her death, that she had left them in a state of preparation for publication, seems to have been premature, although it is well known that a great mass of political correspondence and documents is contained among her papers.

LIFE INSURANCE. See **INSURANCE.**

LIFE PRESERVER, a contrivance brought into general use within the last 30 or 40 years as a means of preserving persons from drowning. It has been made by act of the U. S. government and of some of the states a necessary article of furniture of steamboats, each boat being required to keep at hand a certain number proportionate to her passenger capacity. Life preservers have been made of various forms and materials, the object in view being to furnish a very buoyant article that can be readily and securely attached to the upper part of the person, or seized and held by those in the water. Pieces of cork have answered this purpose, being conveniently shaped for fitting to the body and provided with cords for attaching them fast. Hollow vessels of wood or tinned iron, made air-tight, and shaped so as to serve on board the vessel as seats, have been much used. In one form the seat is made double, and opening on hinges forms a rectangular float in the centre of which is an aperture sufficient to admit the body of a man, his arms hanging over the sides. Bags of caoutchouc, so made as to be readily filled with air by blowing into them, and shaped for fitting round the neck

or body, have also been largely employed for life preservers; and in other forms they have been made into vests, shirts, and jackets, which, constantly worn on board the vessel, could when occasion required be distended with air, giving great buoyancy to the person wearing them.

LIGHT (Sax. *liht*, allied to Lat. *lux*, and Gr. *λυκη*, a shining), a name given, first, to the yet unknown physical agent or cause of the illumination and visibility of bodies in nature; secondly, to the condition of bodies while acted on by such cause; and thirdly, to the sensation arising from the reception of its influence upon the sensitive portion of the eye. Important as is the part which light plays in the physical universe, and familiar as are its manifestations, we can as yet speak with certainty only of its phenomena and their laws. But these very facts have served in all ages to render the subject one of peculiar interest to philosophical minds; and many theories of the nature of light have accordingly been proposed, some of which will presently be named. All natural objects are obviously divisible into two classes: those which originally give forth or emit light, and those which do not. The former are self-luminous, or, as commonly termed, luminous, and are spoken of as sources of light; the latter are commonly said to be non-luminous. Most bodies on which light from a luminous source falls become for the time capable of impressing the retina in the same manner, though not in so intense a degree, as the original source; bodies in this state are said to be illuminated, and in truth they are rendered temporarily luminous. The great and incessant sources of light are the bodies which we now term suns—the centre of our planetary system, and the fixed stars. All solid substances, heated to about 977° F., begin to emit light, and are then said to be incandescent. The light, at first a dark red, becomes successively bright red, yellow, bluish, and white, its brilliancy at from 2000° to 3000° becoming quite insupportable to the eye. Liquids and gases require a higher temperature before incandescence begins. Simple flame is incandescent gas; but the bright flames of illuminating gases, coal, wood, &c., are rendered so by the presence in them of ignited solid particles, usually of carbon. The incandescent or ignited state is produced by heat only; but the cause of the heat may be chemical action, electricity, friction, or compression. Certain minerals, after exposure to the sun, emit light in the dark; wood and some animal substances, as the bodies of fish in certain states of decay, give out light unaccompanied with sensible heat; and many living bodies, as glow-worms, similarly emit light; these cases will be treated in the article **PHOSPHORESCENCE**. A new source has lately been found in the conversion of dark radiations to light, for which see **FLUORESCENCE**. Thus the direct sources of light may be grouped in 4 classes—suns, incandescence, phosphorescence, and fluorescence; although the third of these includes cases which

are probably quite unlike, and may require a further analysis. The visibility of the sun and stars, and of remote objects on the earth, proves the great distance to which, and freedom with which, either the agent producing light or its effect is transmitted through space. A space or body which offers no obstruction to the passage of such effect, is a free or perfect medium for light; any body which intercepts a portion only of the light, is an imperfect medium. The interplanetary spaces are assumed to be examples of the former, water and glass of the latter; and the latter kind of medium may be either homogeneous throughout its extent, or heterogeneous. That, in a homogeneous medium, the luminous effect is propagated always in straight lines, is a truth derivable from many simple observations, and one which was understood by Euclid and the followers of Plato. The emission of light from a luminous body thus tends to occur in all directions in straight lines, and is termed radiation. The lines of luminous action or effect are what we term rays; so that these are not necessarily distinct and individual objects having the form of needles or straight filaments, as often conceived of, but merely the places of certain lines in space joining a luminous with lighted points. A collection of these lines, parallel, forms a beam of light; of lines separating as they advance, a divergent pencil; approaching as they advance, a convergent pencil. Any highly perfect medium for light is said to be transparent or diaphanous; and the property of such a medium is termed diaphaneity. Bodies through which objects are indistinctly visible are said to be semi-transparent; those through which only a glimmer of light is received, showing the places but not the characters of objects on the further side, translucent; and those through which no perceptible light passes, opaque. Thin plates of clear and well polished glass, or ordinary layers of air, are almost perfectly transparent; but with increase of thickness of any such medium, more light is intercepted, and the transparency of the entire depth lowered. Ground glass, oiled paper, polished horn, and gold leaf are good examples of translucency. As the effect of increased depth of medium, the sun's rays are much less powerful when coming to us from the horizon than when from the meridian. Bouguer has calculated that, at a depth of 700 miles, the atmosphere would become totally opaque to solar light, as water is at a depth of about 700 feet. The conclusion is that absolute transparency and absolute opacity are alike unknown to us; hence that all bodies, at least in certain degrees of tenuity, are media which transmit a portion of the incident light, and intercept another portion. But when rays from a luminous source strike the surface of a body in any degree opaque, and which is not absolutely rough and black, a portion of the incident light, greater or less, is returned from such surface. In proportion as the surface is polished, a larger portion of light, which proceeds back at an angle bearing always a fixed re-

lation to that of the incidence, is returned. In proportion as the surface is rough, and at the same time approaches a light color, or white, a larger portion of light is returned in an entirely different manner; in this latter case, every point of the surface impinged upon becomes a centre from which light having the color of the object radiates in all directions, as from a self-luminous body. In proportion as an illuminated body is both light-colored and smooth, at least up to a tolerable degree of polish, it returns more light of both the sorts now named; but though the two kinds of rays are thus in certain directions intermixed, their effects are not so. The light returned at a definite angle, and whose resiliency is due to polish of the arresting surface, always shows in that single direction images of the object from which the incident rays proceeded, and that are perfect in the ratio of the quantity of light thus returning. The light radiated from every point of the illuminated surface, and in all directions, never shows images of its source, but always renders visible the illuminated object itself. The former set of returned rays, moreover, have always the color of the light from the original source; the latter have always the proper color of the illuminated body. Thus, in all respects, these two kinds of returned rays are found, by the observation of the daily phenomena of light, to be radically different; and this difference Arago and others have experimentally verified. (See COLOR.) It is customary, in most or all treatises and books upon this subject, to say that the two kinds of returned light are thrown back from the illuminated body in essentially the same manner. That portion returned at a definite angle is commonly said to be regularly reflected; that portion which is radiated in all directions is said to be irregularly reflected; the explanation of the difference in the results being that, in the former case, the beams and pencils are returned in their proper relations to each other; in the latter, shivered or splintered by the roughness of the surface on which they had impinged, and scattered in all directions. This explanation is not satisfactory; it is not sufficient to account for the radical difference of the results. Light reflected, upon any supposition or in any manner, must be, after as before reflection, the light of the original luminary or source, must have the colors of that light, and can only show images of the source from which it proceeded. So long as it rebounds from a surface, it can show us no qualities of that surface, but only its own; just as echoed sounds never in themselves convey to us the qualities of the echoing surface, but always those of the original bell, voice, or other source of sound; the surface impinged on, when too much broken, returning nothing at all. But the experiments showing that the light by which illuminated objects are visible is light polarized by refraction, and hence has emerged through the surface of the visible object, instead of being reflected from it, are conclusive. As, of two pianos or viols near each

other, when one is forcibly struck, the accordant strings of the other are thrown into agitation, and so reciprocate or reproduce (not reflect) the original sound; so, when light falls upon any body not so highly polished as to return it all by reflection, or as a mirror (and no bodies do this perfectly), some portion of the light enters among the superficial molecules of the body, is arrested by them, at the same time exciting an agitation among them similar in character to, though less in degree than, that of the original luminary, and the molecules thus agitated become temporarily new centres of radiation, throwing off their own, not reflected light, in all directions. It is only necessary further to suppose that the molecules have by their constitution the ability to respond only to agitations of rays of a certain color or colors. Here, again, we have an exact parallel in sounds; for if, of two instruments containing each a complete octave, all the keys of one were forcibly struck at once, all the keys of the other would together reciprocate (the case of bodies that in sunlight appear white); while, if the second instrument comprised but some portion of an octave, only the keys present could respond (the case of bodies that in sunlight appear colored). All visible objects, then, and to the exact extent of their visibility, are such because they are for the time luminous; the difference being that luminaries proper and incandescent bodies are originally and permanently light-giving during the continuance of certain conditions, while the objects they illuminate are thus rendered secondarily and temporarily luminous.—We are now prepared to understand the ways in which light falling on media or bodies is disposed of.

1. In the degree in which the body is both opaque and polished, the impinging rays are caused to rebound, returning at a definite angle; *i. e.*, the light undergoes reflection.
2. In the degree in which, with a polished or otherwise favorable surface, the body is transparent, the rays enter and pass through it (transmission). Under peculiar conditions, this transmitted light is bent from its path (refraction); or decomposed into elementary colors (dispersion); or it becomes endowed with peculiar relations called polarities, in respect to media or surfaces it may afterward impinge on (polarization). For the laws of these several phenomena, see OPTICS, and POLARIZATION.
3. In the degree in which the body is opaque, or its surface is unpolished, or both, the original light enters and disappears within the body; it undergoes extinction. This result, when the light is not reëmitted, but lost as such, is commonly termed the absorption of light; but, unless understood as a swallowing up of the luminous energy in the work or effects it can produce, the term is not well chosen. The obvious idea of absorption is that of the action of a porous body in absorbing liquids and gases. But, unlike the case of these latter substances, the light taken in by a dark object does not remain in it as light; all we know is that it disappears within the body—it is extinguished

as light. And yet it is not lost, as no form of energy can be; but in disappearing, it gives place to one of two classes of results. So far as the molecules of the extinguishing body are fitted to reciprocate the energy or agitation it tends to impart to them, they are affected accordingly, becoming new centres of agitation, and of radiation of light, by which the body then becomes visible in all directions; this is secondary luminosity. But so far as, owing to the character of the molecules, or their relation to the colors in the rays they receive, they cannot thus reciprocate and reëmit the incident light, this is extinguished as light, and made to reappear in some other form, as that of heat in black and dark bodies, and in other cases, probably, that of electricity, or chemical affinity. Striking confirmations of these views are found in the facts that the most transparent media, as pure glass, become highly opaque and visible by simply grinding and roughening their surfaces; and that no body can be seen of a color that is not in the light falling on it; so that an object that in ordinary lights is of a fiery red, illuminated only by a pure blue light appears black.—As a consequence of the general straight-lined propagation of light, the space on the side of an opaque body opposite to any luminary must be in respect to its rays left in darkness, thus forming a shadow. The term shadow is commonly applied to the darkened spot on any light screen or surface, from which by an intervening opaque body the light has been intercepted. But in truth, such dark spot or figure is always a mere section of the true shadow, and owing to the cutting of the surface showing it in some direction across the axis of the true shadow. The latter, whenever the luminous surface is very small, compared with the size of the intercepting body, is always in effect a frustum of a cone, or regular or irregular pyramidal figure, whose apex is the luminous point, its lesser base a cross section of the opaque body, and its larger base found either on the screen already mentioned, or lost in space. The form of the darkened figure thus cast is of course determined by that of a cross section of the object. When the luminary is larger than the opaque body, the figure in space from which all light of the former will be excluded is conoidal or pyramidal, having its base at the section of the obstructing body, and its apex in space where the rays from opposite sides of the body meet beyond it. When the surface of the luminary is somewhat extended, there will be a belt of space surrounding the complete shadow, from which light from some but not all parts of the luminary will be intercepted. This partially lighted space, when made evident on any screen or surface, is called the penumbra; the middle or darkest portion, the umbra. In the case of the moon's shadow cast on the earth, the partial shadow, being in fact a hollow cone enclosing the complete one, becomes manifest on the earth's surface as a partially lighted ring surrounding one of complete exclusion of the sun's direct rays. (In re-

spect to fringes bordering shadows, see **DIFFRACTION OF LIGHT**.) The depth of a shadow cast where a single light is present is judged by contrast; and it is therefore pronounced intense in the inverse ratio of the intensity of the light surrounding it. Light, emanating from a point or minute luminous surface, follows the same law of decrease with distance as all other forces radiating from a point; namely, the intensity at any distance is in the inverse ratio of the square of the distance. Consequently, if two lights of unequal brilliancies can be placed at such distances from a screen that, falling on different parts of it, the shadows they cast, or the illumination they give, become of sensibly equal intensity, then it follows that, within the limits of error necessary to vision, the two lights have illuminating powers that are to each other in the direct ratio of the squares of their respective distances from the screen; and hence, other qualities being also considered, their relative values for purposes of illumination are readily found. If the two sources of artificial light, placed at distances of 8 and 4 feet respectively from a screen, cast separately equal shadows or illumination on parts of the screen, then, other things being equal, the value of the latter is $\frac{1}{4}$ that of the former. This is the fundamental principle of photometry, or light-measuring; and any contrivance for carrying into effect such comparisons is called a photometer. Of these there are several forms in use; among the earliest are those of Rumford, in which the shadows cast are compared, and of Ritchie, in which the two eyes, looking into separate compartments of a box something like that for holding stereographs, see each a portion of a screen illuminated by one of the two lights only, and thus pronounce when the two reach equal brilliancy. But in all these simpler expedients there are sources of error, especially that arising from differences of color in the two lights, which readily deceive the eye in respect to the mere fact of equal or unequal intensity. To obviate these difficulties, photometers polarizing the light before examination have been devised, but probably none are as yet absolutely correct. Perhaps the most correct, as well as convenient and simple of the common forms, is that recently suggested by Bunsen. A disk of paper 4 or 5 inches in diameter is rendered translucent, save a spot in the middle about an inch across, by saturation with paraffine or stearine dissolved in oil of turpentine or naphtha. This disk is placed directly between the two lights, and so as to slide along a scale showing their respective distances. Placed so that the intensity of the two lights is unequal, a difference in the apparent brightness of the oiled border and the opaque centre is seen from either side; but when slid to that point at which the two illuminations become sensibly equal, all parts of the disk have, and upon either side, the same apparent brightness. Of course, all intensities found by use of these instruments are comparative merely. The actual light a body will cast on a given surface

depends not only on the absolute intensity of any unit of the luminous surface, and on distance and transparency of intervening media, but also on the whole extent of luminous surface. Thus is explained the far greater illuminating power of our sun, which has a sensibly large surface, than that of any fixed star, which, owing to remoteness, dwindles to a point; and of the sun itself, the light from the central part is much more intense than that from the margins of the disk. The most intense of artificial lights, that of charcoal points under the action of a powerful galvanic current, and that of lime in the flame of the oxyhydrogen blowpipe, are much inferior to that of the solar beam at the earth's distance. The latter, as calculated by Wollaston, exceeds that of 5,500 wax candles of ordinary power at one foot from the lighted surface.—The notion of the ancients, that the propagation of light is instantaneous, was first disproved by Roemer, a Danish astronomer, in 1676, by observing that the eclipses of Jupiter's moons appeared about $8\frac{1}{2}$ minutes later when the earth was in that part of her orbit most remote from the planet than when nearest to him; and he accordingly calculated the velocity of light at about 192,000 miles per second. From the fact of aberration of light of the stars as received at the earth, and by a comparison of the amount of this aberration with the known velocity of the earth, Bradley in 1725 deduced the rate of light as 195,000 miles per second. Perhaps the most accurate result obtainable from these methods is that which gives the velocity as 191,500 miles per second. In 1850 Foucault, by means of a turning and of stationary mirrors, and Fizeau, by means of two telescopes so placed that the image of a light formed at the focus of one became the object viewed through the other, experimented with a view to determine the time occupied by light in passing over known distances at the surface of the earth; and their results agree very closely with each other, and with that already given.—Various theories have been presented in respect to the nature of light and the method of its propagation, only two of which have prominently occupied the attention of the scientific world. The earliest of these, now commonly termed the corpuscular theory, and, from at least an indirect adoption of it by that philosopher, the Newtonian, seems due to the Pythagoreans, who taught that vision is performed by means of particles or films emanating from the surfaces of visible objects and entering the eye. The rival theory, at that early day, of the Platonists, that vision is due to the emanation of an influence or power from the eye, has been long since abandoned. Franklin urged against the corpuscular theory some of the objections that are most fatal to it; as, that the momentum of particles flying with such a velocity should be greater than that of a 24 lb. ball discharged from a cannon, while yet they do not drive before them the smallest dust, and penetrate transparent bodies in all directions; the consequent diminution of the sun

with loss of attractive power, and of the balance of the solar system; and it might be added, the impossibility of giving to so minute particles any such velocity. But the corpuscular theory requires that light entering a denser medium should, by the attraction of the latter, be accelerated in its course; while by showing experimentally that the contrary is true, and that light is retarded within the denser medium, Arago, Foucault, and Fizeau have severally given to this theory its final disproof. The theory of light now most generally received is that developed by the distinguished Dutch philosopher Huyghens, and proposed by him in a treatise written in 1678, and published in 1690. According to this, the undulatory theory, light is propagated by means of pulses or waves of disturbance, undulations, originated in some way at the surface of luminous bodies, and spreading on every side with its known velocity; these undulations taking place in the substance of an extremely rare and tenuous, but highly elastic medium, termed ether, which is supposed to pervade all space, as well as all bodies, or at least those which are transparent. The undulations are supposed to be of the kind termed transverse, that is, like water waves, occurring across the course of propagation; the beam of white solar light to be a compound or sheaf of rays, not only of the different primary colors of the spectrum, but also of actinic and calorific rays, all existing in it actually or potentially, each distinct kind of ray, indeed, having a distinct refrangibility only in virtue of a certain fixed rate of vibration and length of the corresponding light wave; and, if luminous, having a certain effect upon the eye which we recognize as a distinct color. Thus, refrangibility, dispersion, and color are all explained by wave length; and this is determined by the colors proper to transparent films of known thickness. (See COLOR.) According to the calculations of Young, the following are the lengths of undulation, in fractions of an inch, of the several colors, and the consequent number of undulations per second:

Colors.	Wave lengths.	Undulations per second.
Extreme red.....	.0000926	452,000,000,000,000
Red.....	.0000256	477,000,000,000,000
Orange.....	.0000240	506,000,000,000,000
Yellow.....	.0000227	535,000,000,000,000
Green.....	.0000211	577,000,000,000,000
Blue.....	.0000198	622,000,000,000,000
Indigo.....	.0000185	653,000,000,000,000
Violet.....	.0000174	699,000,000,000,000
Extreme violet.....	.0000167	727,000,000,000,000

All the ordinary phenomena of light admit of a satisfactory mathematical explanation in accordance with this theory; and the same may be said of most of the observed phenomena of a more peculiar character, as those of diffraction, double refraction, and polarization; and some very curious predictions deduced from it have been experimentally found to be true. Indeed, by many of the authorities of the time in optics, it is considered as firmly established; and it has been characterized as, after that of universal

gravitation, the most comprehensive and happy of all the hypothetical generalizations of physical science. On the other hand, the necessity of perfect continuity of the ethereal medium throughout space, and the immense elasticity or resistance to compression required by a medium that shall transmit undulations at such speed, with the consequence of a retardation of the heavenly bodies in their orbits, which has not been well made out in fact, are still considered by many as serious objections to the theory. To obviate some of these, Rankine of Glasgow has proposed an oscillatory theory of light, in which the medium is not supposed continuous, but as made up of separate particles at considerable distances from each other, having opposite polarities on their opposite sides, and by a wave of rotations of which (*i. e.*, a reversal of polarities propagated through them successively) the influence we term light is transmitted. This theory, in effect, by allowing space between the particles, abandons the necessity of a medium. Thus, the nature of light is still enigmatical. But we venture to express the belief that it will yet be found that nothing is gained by the assumption of an ether, nor of any medium or projected particles, filling all space, and so, on any theory yet advanced, necessitating an immense waste of light-producing energy, in spaces where, no matter being present, no effect of light can appear. It is certain that, in vacuity, light is never originated or detected; that mere space can neither become luminous nor be illuminated. Thus, all we know of light, either as cause or effect, is as a something connected with and manifested through matter. The undulatory, not less than the corpuscular theory, has materialized the conceptions of physical philosophers, and so has tallied with the tendencies of the time. But let only a new idea be arrived at of forces as something capable of acting from a distance, and over unoccupied spaces, as is at least obviously true in the cases of gravitation, magnetism, and electricity, and it will then follow that, without cumbersome intervening machinery, the energy of the sun or of a fixed star can, by a sort of luminous induction, excite light upon the presented face of the earth and objects upon it; which light, when thus excited, although it is an affection of the matter by which it is shown, may still exist by undulations in that matter, as the air or bodies; and may in these media, and not in a supposititious one, obey all the well ascertained laws of the undulatory theory.

LIGHT, ABERRATION OF. See ABERRATION.

LIGHT, ZODIACAL. See ZODIACAL LIGHT.

LIGHTFOOT, JOHN, an English biblical commentator, born at Stoke-upon-Trent, Staffordshire, in March, 1602, died at Munden, Hertfordshire, Dec. 6, 1675. Having completed his education at Christ's college, Cambridge, he was ordained, and became chaplain to Sir Rowland Cotton, a celebrated Hebrew scholar; but his anxiety to improve himself in rabbinical learning induced him to remove to the vicinity of London, where he could have ready access to

libraries. In 1642 he was appointed minister of St. Bartholomew's in London, and a member of the assembly of divines sitting at Westminster. In 1643 he preached before the house of commons, and in the same year was made master of Catharine hall, Cambridge. In 1655 he was chosen vice-chancellor of the university. At the time of his death he was engaged on the "Harmony of the New Testament." The first collected edition of his works appeared in 1684; the best edition of them is that of the Rev. J. R. Pitman (13 vols. 8vo., London, 1822-'5).

LIGHTHOUSE, a structure from the top of which a light is shown at night as a direction or warning to mariners. Lighthouses are necessarily situated on headlands, isolated rocks or sands, and pierheads; and from the benevolence of their design, and in many instances from the boldness of their construction, they have always been objects of interest independently of their use to mariners. We propose to treat the subject under the following divisions: 1, materials and mode of construction; 2, method of illumination; 3, auxiliary safeguards to navigation; 4, history and statistics. I. *Materials and Mode of Construction.* The materials used in the construction of lighthouses are wood, stone, brick, cast iron, and wrought iron. Stone, brick, and iron are the most important, and are used exclusively in all large lighthouses. The most noted lighthouses in the world are built of stone; and in northern climates, where the first cost is not the great consideration, stone should be exclusively used. The form of all stone lighthouses approaches more or less the frustum of a cone or pyramid. They are sometimes built to include the keepers' apartments, but more usually they merely contain the staircase and cleaning and watch rooms, with a receptacle for the oil butts. In all cases where large lighthouses are built of this material, the masonry should be of the best cut stone with hydraulic cement mortar. The first cost should never be so limited that this principle cannot be fully carried out. The same principle applies to brick lighthouses, which should be built of the best and hardest bricks, laid in hydraulic cement mortar. The interior walls of all lighthouses should be as separate as possible from the outer walls, in order that there may be a free circulation of air between the walls. The dryness of the inner wall is insured by this arrangement, without which all large masses of masonry like large lighthouses must be constantly damp. The inner wall must of course be firmly tied to the outer shell by masonry or iron ties. Cast iron lighthouses were first erected by Mr. Alexander Gordon, an English civil engineer. Two were constructed in England, and were erected on the islands of Bermuda and Jamaica. From the fact that every part of the structure can be completed at the workshop, cast iron lighthouses answer admirably for positions at points remote from large centres of manufactures, and are gradually coming into use. Several lighthouses of this kind have been

erected at various places on the coasts of the United States. They require a lining of brick, the weight of which prevents oscillation or swaying, while its low conducting power of heat hinders the deposition of moisture on the well room of the stairs, which would otherwise be occasioned by the difference of temperature between the inside and outside of the tower. To further this latter object space is also left for a current of air to flow between the iron and brick. Another kind of iron lighthouse is the wrought iron pile lighthouse. The lower ends of the iron piles are fitted with large cast iron screws where the foundation is sand, and the piles are screwed to a firm bearing, or these ends are sharpened, and the piles are driven into the rock or hard ground by an ordinary pile driver, until they come to a firm bearing upon cast iron disks which bear upon shoulders forged on the piles. The number of piles depends upon the plan of the structure, which may be square, hexagonal, or octagonal. The foundation having been placed, the structure, which is of wood or boiler iron, firmly braced to the piles, and connected with them by iron castings, is easily built upon it. This kind of lighthouse was first built in England; the screw pile was patented about 1836 by Mitchell, and is called Mitchell's screw pile. It was introduced into the United States about 1845, and has since been used in the construction of many important lighthouses on the coast. Experience has shown that iron pile lighthouses are not suitable for foundations in water in climates where much ice is formed. The ice, moving in large fields, bends and sometimes breaks the piles, and, by forming upon the piles themselves, makes the bulk of the structure so large that the effect of the waves upon it is very much increased. On this account it is not likely that iron pile structures will be much used north of Chesapeake bay. But on the southern coasts they have been found particularly adapted to the necessities of the service, and about 30 of this class of structures, resting upon screw piles and iron disks, now exist in the United States. Their annual cost for repairs is very small, a yearly coat of paint being all that is needed to keep the exterior in good order. They are particularly suited for bays and sounds in the southern waters, where light vessels have been in use until the present time. As these vessels become in need of repairs, they are withdrawn, and a screw pile lighthouse is built upon the site, at a cost not much exceeding that of the repair of the vessel, but with an annual expense of maintenance less than one half of that of the vessel.—Lighthouse towers are generally surmounted by parapet walls, which vary in height from 8 to 7 feet, according to the order of the light. Upon the parapet wall is placed the lantern in which the illuminating apparatus is contained. The lantern is a glazed framework made of brass or iron, and varies in dimensions from 6 feet in diameter and 4 feet in height to 12 feet in diameter and 9 feet in height. It

is a regular polygon, and can be made of any number of sides, depending upon the various circumstances to be considered. It is surmounted by a dome constructed of copper or iron, which is generally lined with some other metal to prevent condensation of moisture. A ventilator is placed upon the top, from which the heated air escapes, and registers are inserted near the bottom of the lantern to enable the keeper to regulate the supply of fresh air at will. Upon the convenience and proper construction of the lantern the efficiency of the lighthouse in a great measure depends. II. *Method of Illumination.* The materials which have been used for the illumination of lighthouses are: 1, wood and coal; 2, candles; 3, oil; 4, gas. Wood and coal were the first fuels used for lights. They were first burned as beacon fires on headlands, and afterward, as the necessity of increased elevation was felt, the fire was placed at the top of a tower. It is not known that any other method of illumination for lighthouses was used until about 1760, when Smeaton commenced the use of wax candles in the Eddystone lighthouse. Another lighthouse built by him on Spurn Point about 1774 was arranged for illumination by coal, which fact shows that the use of wax candles had not become general at that date. Tallow candles were afterward used at the Eddystone. Some of the English and Scotch lights consumed coal as late as 1816, and several on the coasts of Sweden and Norway were illuminated with this material as late as 1846. The vast improvement made in lamps by the use of the Argand burner and glass chimney made a complete revolution in the lighthouse systems of the world. (See ARGAND LAMP.) The parabolic reflector with this burner was introduced into lighthouses gradually from 1785, when the first apparatus of this kind was erected in the Cordouan lighthouse. In the United States the first lighthouses were lighted with tallow candles, and solid-wicked lamps, suspended from the domes of the lanterns by iron chains. The lamps were in shape and in principle like the old-fashioned links. The Argand burners and reflectors were adopted in 1812, and were used until 1852, when the general introduction of the lens system commenced. Since the adoption of Argand lamps in lighthouses, oil has been used as the combustible. In Europe the vegetable oils have been generally used. These are olive, and rape seed or colza. Great Britain however uses sperm oil as well as colza, though the latter bids fair to supersede it. Various other oils, animal and vegetable, have been tried with more or less success, but hitherto none but the sperm among the animal oils, and the colza among the vegetable, have come up to the requirements of lighthouse illumination.—Attempts have been made to use gas in lighthouses. Difficulties have been found in getting the proper shape of flame for deviation by the illuminating apparatus; and the uncertainty of the supply where the gas is made at the lighthouse is another objection, and one so serious that a full

supply of oil has had to be kept at the station for fear of accidents to the gas apparatus. In a few cases gas has been introduced into lighthouses near towns supplied with it. These, however, have been small lighthouses, and the examples are from the nature of the case rare, and cannot be extended beyond harbor lights. In one case in the United States a lighthouse is lighted with natural gas. There is little doubt that oil will be eventually superseded by gas or the electric light, but in the present state of the gas manufacture it seems impossible to make a burner that will give the proper size and shape of flame for the large orders of lights. No metal but a very refractory one can bear the immense heat developed by 4 cylindrical concentric flames, the largest of which is $8\frac{1}{2}$ inches in diameter; and the expense of making burners of such a metal would be very great. As an economical question it is doubtful whether gas should be substituted for sperm oil. The first cost of the gas apparatus for a large lighthouse is heavy, and the annual expense of repairs is also large. It is probable that the efficiency or brilliancy of the light would not be augmented by the change from oil to gas, as the lights fitted with Fresnel apparatus now show as far as the curvature of the earth will permit. In a lecture delivered March 9, 1860, before the royal institution, Prof. Faraday spoke of the light produced by electricity as being especially adapted for lighthouses on account of its intensity, while it occupied at its source no more space than a common candle. The voltaic battery, however, presented difficulties which rendered its use for this purpose impracticable, but from which the magneto-electric apparatus was found to be free. A large apparatus of this character, worked by a two-horse steam engine, had been employed for 6 months at the South Foreland lighthouse, which produced such an intensity of light that it was often seen from the opposite coast of France. Prof. Faraday anticipated that, if the expense of this mode of illumination did not prove too serious, it would be adopted in many situations where intense light is required. Experiments have been made upon coal oil with reference to its use in lighthouses, but it is not feasible to make the flame of this oil of the proper size and shape for deviation by the large lenses, in the present state of knowledge on the subject. The difficulty appears to be that the immense heat of so large a flame sets free a great amount of carbon which passes off unconsumed as smoke, and covers the apparatus and glass of the lantern with a thick coating of black. Until means can be devised for the consumption of this excess of carbon, coal oil cannot be used.—The illuminating apparatus is either catoptric by reflectors, or catadioptric by lenses. The latter method of illumination has been fully described in the article FRESNEL. In the catoptric method, which was universally used until within the last 10 years, the light from each lamp is so deviated by a reflector that it emerges from the lantern, a beam, or nearly a beam, parallel to

the horizon. The earliest known instance of a reflector being used for this purpose was in the Cordouan lighthouse, in the bay of Biscay. With the introduction of the Argand burner its use became more common. The reflectors at first were plaster moulds made of the proper form, upon the interior surface of which were fastened facets of plane silvered glass. They came into general use in Europe in the early part of the 19th century. The best form of reflector is the paraboloid of revolution with its axis horizontal. The reflector is made of copper, and its inner surface is covered with silver, and is highly polished. The flame of the lamp has its centre in the focus of the reflector, and the rays emerge from the surface of the reflector nearly parallel. They are not entirely parallel, because the surface is necessarily imperfect, and the source of light cannot be a mathematical point. The small divergence, instead of being a defect, is in reality a benefit, for without it the beam would always have a diameter equal to that of the edge of the reflector, and would be of little practical value. In fixed lights, the reflectors are fastened to circular iron frames, and are placed in horizontal tiers in the lantern. There is a lamp for each reflector, and it follows that the greater the number of lamps the more uniformly the light is distributed around the horizon. The reflectors vary in their sizes. The double ordinate at the lips is about 11 inches in the smallest, and 21 inches in the largest size. Some have been made larger, but they have never been in general use. In a revolving reflector light, the reflectors are generally arranged so that the axes of all of them on one face are parallel, and there are 2, 8, or 4 faces, the number depending on the desired interval between the flashes. The frame upon which they are placed is made to revolve by a clockwork arrangement moved by a weight. It is evident that the flash produced by one of the faces will be brighter than the light of a fixed reflector light, because the eye will receive at once rays from several reflectors, while in the case of a fixed light it only receives them from one. This is the reason why revolving lights are always brighter than fixed lights. The lamps used with reflectors are what are commonly called fountain lamps. They are fitted with Argand burners, about $\frac{1}{4}$ inch in diameter. The introduction of the Fresnel or dioptric method of illumination of lighthouses has superseded the reflector system, so that reflectors are now only used as range lights, or on light vessels, or in lighthouses built with too little money to permit the purchase of a lens. The first cost of a lens of the first order is 4 times as great as that of 20 reflectors, which is the greatest number placed in a lighthouse. III. *Auxiliary Safeguards to Navigation.* These consist of light vessels, beacons, fog signals, and buoys. Light vessels are vessels moored to point out dangers or show the entrances of channels, turning points, &c., by exhibiting a light at night. They are strong, and built for riding easily at anchor, and are

well manned, to provide against accidents to which their exposed positions render them peculiarly liable. The lighting apparatus is contained in a lantern which at night is hoisted to the masthead. It consists of lamps and reflectors like those described above for lighthouses, except that they are smaller. The lamps are hung on gimbals, so that their positions may be affected as little as possible by the motion of the vessel. Some of the light vessels of the United States are in positions exposed to the full force of the Atlantic, and one moored off the Nantucket New South shoal is 22 miles from the nearest land. On account of the great expense of maintaining light vessels, and the little dependence that can be placed on them as signals when they are most needed, they are only placed near dangers which it is impossible to point out by lighthouses.—A beacon is a structure of stone, iron, or wood, placed upon the shore or upon a rock or shoal in the water to designate a danger. Beacons are built at points where lighthouses cannot be built, or which are not of sufficient importance to justify the constant expense of keeping up lighthouses or light vessels, but which nevertheless require to be pointed out.—A fog signal is an aid to navigation placed on board a light vessel or near a lighthouse to give warning to vessels in time of foggy or thick weather. Bells are the most common signals, and when placed on light vessels they are very efficient. When, however, they are placed near lighthouses, as the shore is generally between the bell and the vessel to be warned, the roar of the surf is likely to drown the noise of the bell, so that in such cases they are inefficient, and can only be heard when the vessel is close to the lighthouse, often too close to avoid the danger. Whistles have been experimented upon, but hitherto with little success. The noise is much more acute, and can be heard above the surf further than that of a bell; but the power required to sound the whistle can only be furnished by a steam engine, requiring fresh water and the services of an engineer. The former requisite it is impossible in most cases to furnish, and the latter requires more expense than would be justifiable except in the cases of very important lights. These are most generally the cases where fresh water in sufficient quantities cannot be obtained. Experiments have been made with Ericsson's hot-air engine, and it is not improbable that something feasible may be obtained from it.—Buoys are anchored in the water to mark rocks, shoals, and other dangers. They are of various kinds, such as nun, can, and spar buoys, &c. A nun buoy is in shape like two equal cones brought together at their bases; it is made like a barrel with staves and iron hoops, or, as is often the case in the United States, it is made of boiler iron. A can buoy is nearly conical in shape, and is moored at its vertex. A spar buoy is a spar anchored at one end. Buoys are painted of different colors to indicate upon which side they must be passed.

The colors are fixed by law of congress in the United States. Thus a red buoy must be left on the starboard hand by a vessel entering a harbor from sea, and a black buoy must be left on the port hand. A buoy with red and black horizontal stripes may be left on either hand. The side of a channel upon which a buoy is placed is sometimes indicated by the kind of buoy. Thus nun buoys may be placed on the starboard side of a channel, and can buoys on the port side. IV. *History and Statistics.* Little is known of the early history of lighthouses, but sea lights are mentioned by Homer in the *Odyssey*, and they are also referred to in the Greek poem of Hero and Leander. These must have been merely fires kindled upon headlands. The most noted lighthouse in the world for size and antiquity was the Pharos of Alexandria. This building was the frustum of a square pyramid surrounded by a large base, the precise dimensions of which are not known. It was commenced by the first Ptolemy, and was finished about 300 B. C. The style and workmanship are represented to have been superb, and the material was a white stone. The height was about 550 feet; and it is stated by Josephus, who is the most trustworthy writer on the subject, that the light, which was always kept burning on its top at night, was visible about 41 miles. It was probably destroyed by an earthquake, but the date of its destruction is not known. Enough is known, however, to make it certain that this tower existed for 1,600 years. The island upon which it was situated was named Pharos, and the structure took its name from its site. To this day the French word for lighthouse is *phare*, and the Italian and Spanish *faro*.—One of the most remarkable modern lighthouses is the tower of Cordouan, which was commenced in 1584 and finished in 1610 by Louis de Foix, a French architect and engineer, the construction having occupied 26 years. It is situated on a ledge of rocks in the mouth of the Garonne or Gironde, in the bay of Biscay. The ledge is about 8,000 feet long and 1,500 feet broad, and is bare at low water. It is surrounded by detached rocks, upon which, according to Belidor, who gives a detailed description of it, the sea breaks with terrific violence. There is but one place of access, which is a passage 300 feet wide where there are no rocks, and which leads to within 600 feet of the tower. The foundation is the frustum of a circular cone whose lower base is 135 feet in diameter, and is built solid of cut stone to a height of 16 feet, a space for a cellar and water cistern 20 feet square and 8 feet deep having been left in the centre. The upper base of the frustum is 125 feet in diameter. On the E. side is a stone staircase by which access to this upper base is gained. The tower springs from this level. A parapet wall about 11 feet thick at the top is built entirely around the upper base of the foundation to a height of 12 feet. Between this wall and the tower are the apartments of the keepers. The tower rises from

the base to a height of 115 feet, and is 50 feet in diameter at the base; it diminishes in diameter as it ascends. The apartments of the tower are highly ornamented, and were not intended for occupation by the keepers. There are 4 stories, all of different orders of architecture, and adorned with busts and statues of kings of France and heathen gods. The material is stone. The basement or lower story appears to have been intended as a store room; the 2d story is called the king's apartments; the 3d is a chapel, and the 4th consists of a dome supported by columns, a kind of lower lantern; above this was originally a lantern formed of a stone dome and 8 columns. The total height of the tower from its base to the upper point of the lantern dome was 146 feet, and from the rock 162 feet. In the upper lantern a fire of oak wood was kept burning at night for about 100 years, when, in 1717, the fire having weakened the stone supports by calcining them, the upper lantern was taken down and the light was kept up in the lower lantern. As it did not show well there, an iron lantern was erected in 1727 above this, in the place of the old stone lantern, and coal was used for fuel instead of wood. It is worthy of remark that the upper part of this lantern contained an inverted cone, the base of which was the base of the lantern dome. The surface of the cone was covered with tin plates, thus forming a rude reflector which utilized a part of the light, which without it would have been lost. This was in all probability the first attempt made in a lighthouse to deviate the rays of light so as to throw to the horizon those which would have been lost in the upper parts of the atmosphere. The Cordouan lighthouse is also notable from the fact that the first Fresnel lens manufactured was placed in it in 1823.—The Eddystone lighthouse is the most distinguished in the world, both on account of the difficulties attending its construction, and the fact that it is the type of all structures of the kind which have since been erected. The Eddystone rocks are in the English channel, about 14 miles S. S. W. from the port of Plymouth, and being in the fairway of all vessels coasting along the S. shore of England, the attention of the government was directed to them at an early day. They are a cluster of gneiss rocks about 600 feet long from N. to S., with detached rocks covering about the same distance from E. to W. The highest part of the rock upon which the lighthouse is placed is about 16 feet out of water at low water of spring tides. The first lighthouse erected upon them was commenced in 1696 and finished in 1699 by Henry Winstanley, an architect. The accounts of its construction are vague, but it is supposed to have had a solid circular and polygonal stone base 12 feet high and 24 feet in diameter, upon which was built a fantastic structure of wood which had the appearance of a pagoda. The height from the rock to the base of the lantern was about 75 feet. The lantern

was glazed. This building stood until Nov. 1703, when Mr. Winstanley went to the lighthouse with a party of workmen to make some repairs. On the 26th of the month a terrible storm arose, and not a remnant of the lighthouse nor a trace of its inmates was ever seen afterward. The fact that a lighthouse could be made to stand on the Eddystone having been demonstrated, soon after the destruction of Winstanley's building another was built by a person named Rudyerd. It was commenced in 1706 and finished in 1709. It was an exceedingly ingenious combination of wood and iron, and showed great advances in the art of engineering. The form was the frustum of a circular cone. It was built up nearly solid for a height of 27 feet above the rock, the filling consisting of courses of cut stone alternating with courses of squared timber. The outside casing was composed of 72 oak posts or up-rights, the lower ends of which were fastened to the rock by heavy irons which were let into lewis holes. This is the first recorded application of the lewis for this use. The lantern was glazed. This building stood well with some repairs of the woodwork until Dec. 1755, when it was destroyed by fire. The fire commenced in the lantern in the early part of the night, and the keepers retreated from room to room until they reached the rock. Early in the morning they were brought to the shore, as the weather happened to be good enough to permit a boat to land on the rock. In 1756 Smeaton was selected to rebuild the Eddystone. He determined to use stone for the material, and the shape of the trunk of a large tree as his model. The stones of a course were to be joined by dovetailing, and the different courses were to be connected by stone dowels. The upper surface of the rock was to be cut in horizontal steps, so that every course would rest upon a horizontal bed. The general form of Smeaton's structure is the frustum of a cone, or more strictly that of a solid of revolution formed by revolving a vertical plane bounded on one side by a concave curve around a vertical axis. The elevation, or a vertical section of the tower, impresses the most unpractised eye with the idea of great strength. The diameter of the lowest partial course is 32 feet, and that of the first or lowest entire course is 26 feet. The diameter of the course under the coping is 15 feet, and the whole height of the masonry is 77 feet. The tower is surmounted by a parapet wall 6½ feet high and 8½ feet in internal diameter. The combinations to obtain the greatest strength in this tower by dovetailing, cramping, dowelling, and by the use of hydraulic mortar, have never been surpassed. The experiments made by Smeaton on hydraulic cements in connection with the construction of this work were particularly valuable, and are quoted to this day. The erection of the lighthouse was, on account of its position, the difficulty of access to its site, and the fact that Smeaton had determined to build it of stone,

attended with the greatest difficulties. The genius and energy of the engineer triumphed over all obstacles, and the work was finished in 1759. It has stood for 100 years, a monument of the skill of its designer and builder, and an example to all engineers.—Another noted lighthouse structure is the Bell Rock lighthouse off the E. coast of Scotland. This rock is situated in the German ocean, 11 miles from the Scottish coast, on the N. side of the frith of Forth, and nearly opposite that of Tay. It is about 427 feet long and 230 feet broad, but the vicinity is dangerous over an area of about 1,400 by 800 feet. The rock is a reddish sandstone, and the part upon which the lighthouse is built is 12 feet below high water of spring tides, the rise of these tides being 16 feet. The lighthouse is built principally of sandstone found on the mainland in the vicinity, the outer casing of the lowest 30 feet being of granite. It was commenced in 1807, and was finished late in 1810. The designers were Messrs. Rennie and Robert Stevenson, and the constructor was Mr. Robert Stevenson. The difficulties of the erection of this lighthouse were nearly as great as those encountered by Smeaton in his work, but the large size of the rock gave it an advantage, and Smeaton's experience was made useful by Stevenson in its construction. The form is similar to that of the Eddystone. The diameter of the bottom course is 42 feet, and that of the course just below the cornice 15 feet. The stone work is 102½ feet high, in which height is included that of a parapet wall, octagonal in plan, which surmounts the tower. This wall is 6 feet high, and its sides are 5½ feet long. Upon it the lantern is placed. The account of the erection of this lighthouse, written by Mr. Robert Stevenson, and published in 1824, is an exceedingly interesting work, and contains an accurate history of the Scottish lighthouses. It has been of the greatest assistance to engineers who have been engaged on similar works since its publication.—Another important lighthouse, notable on account of the difficulties of its construction, is the Skerryvore lighthouse off the W. coast of Scotland. The Skerryvore rocks are situated about 11 miles S. W. of the island of Tyree, and 50 miles from the mainland. They are in the track of large vessels bound from the Clyde and Mersey (Glasgow and Liverpool) around the north of Ireland, and many wrecks have taken place upon them which have never been reported. The necessity of a lighthouse to warn vessels off these rocks had long been apparent, and in 1814 authority was given to erect one. Nothing was done until 1834, when a survey was made. The result of this survey was the discovery of a solid gneiss rock 160 feet long and 70 feet wide, upon which it was determined to erect the lighthouse. Mr. Alan Stevenson, a son of the constructor of the Bell Rock lighthouse, succeeded his father as engineer of the commissioners of northern lights, and to him was committed the difficult task of the erection

of the Skerryvore lighthouse. The form chosen for the tower is a shaft surmounted by a belt and capital, upon which is the parapet wall. The shaft is a solid of revolution formed by revolving a rectangular hyperbola about its asymptote. The diameter of the lowest course is 42 feet, that of the top course 16 feet, and the whole height is 138 feet. The tower for a height of 26 feet is solid. Immediately above the solid part the walls are $9\frac{1}{2}$ feet thick, and they gradually diminish from this thickness to 2 feet. The material is granite, and the tower is surmounted by a bronze lantern in which is placed a Fresnel lens of the first order, showing a revolving light. The work was commenced in 1839, and the light was first shown in Feb. 1844. An accurate and detailed account of the construction of the work has been written and published by Mr. Stevenson, which is valuable not only for the description of this particular work, but because it contains a dissertation on the Fresnel system of lighthouse illumination, written with great attention to detail, and entirely scientific, beside a succinct history of lighthouses. The work may be regarded as a text book on lighthouse construction and illumination, and is full of valuable information and excellent hints to persons interested in the subject.—A cast iron lighthouse for the Great Isaac's rocks, near Bermuda, was completed in 1856 by the Messrs. Griswolds of London, by order of the English admiralty. The tower is 120 feet high from the base to the plane on which the lantern is to rest, and 150 feet to the top of the lantern. At the base the tower is 25 feet in diameter, and at the top 14 feet. One of the great peculiarities of the construction is that the 155 large cast iron plates of which it is composed are not placed horizontally round the tower, as heretofore in erections of a similar kind, but in what is technically called "break joints;" i. e., the plates, so to speak, are dovetailed and wedged the one into the other, in such a manner as to form a perfect column, and equal in strength in all its parts.—Other noted lighthouses have been erected upon the coasts of Europe, but those described are all whose constructions have been given in detail and published to the world. Some on the coasts of France are as bold in their execution and as difficult in their construction as any noticed above. But those already described are types of all others.—Many of the lighthouses in the United States are unsurpassed by any in the world, and are of exceedingly difficult construction. The most noted is that of Minot's Ledge off the coast of Massachusetts, now in course of construction. This rock is the outer one of a ledge lying off the town of Cohasset. It is situated about 8 miles E. S. E. of Boston light, and is a projecting point very dangerous to vessels coming into Boston from seaward. Should these vessels have a N. E. wind, and by any chance miss the entrance to the harbor, they would be almost certainly cast away on these rocks were there no signal placed there to warn them off. It is about $1\frac{1}{2}$ miles from the nearest land, and at

low water the highest part of the rock (a circle about 25 feet in diameter) is bare. The rise of spring tides is not far from 12 feet, so that no part of the rock is ever uncovered more than a few minutes. The difficulties of erecting a lighthouse on this rock cannot be exaggerated. The attention of commercial men and mariners was drawn to the dangers of this point many years ago, and in 1847 an appropriation was made by congress for the construction of a lighthouse on the rock. It was determined to erect an iron pile structure, at the top of which was to be the keepers' dwelling, and this was to be surmounted by the lantern enclosing the illuminating apparatus. The plan of the work was an octagon, the side of which at the base was $9\frac{1}{2}$ feet, the diameter of the circumscribing circle being 25 feet. Iron piles 10 inches in diameter where they leave the rock were inserted 5 feet into it, at each angle of the octagon and at its centre. These were firmly braced and tied together by wrought iron braces. At a height of 55 feet above the highest point of the rock the heads of the piles were firmly secured to a heavy casting. Above this casting the floor of the dwelling was placed. The structure was finished in the autumn of 1849, and stood until April, 1851, when it was carried away by one of the most terrific storms that has ever occurred on the Atlantic coast. All of the iron piles were twisted off at short distances above their feet. One cause of the destruction of this lighthouse is supposed to have been a hawser which was fastened to the top of the structure at one end, the other being anchored in the sea. The waves after leaving the lighthouse would strike the hawser, and the effect of the blow was transmitted to the pyramid with very great leverage, causing a tendency to oscillate. Another cause was the ice which froze to the piles, and thus increased the extent of surface exposed to the action of the sea. In 1852 congress appropriated money for rebuilding the lighthouse, and a design was originated by the lighthouse board and approved by the secretary of the treasury early in 1855. The design is for a granite tower in the shape of the frustum of a cone. The base is 80 feet in diameter, and the whole height of the stonework is 88 feet. The lower 40 feet are solid. The remainder of the tower is made up of keepers' apartments, store rooms, and the parapet, which encloses the pedestal of the lens apparatus. The stones of the courses are dovetailed in the securest manner, and the courses are fastened to each other by wrought galvanized iron dowels, 3 inches in diameter. The work was commenced early in the season of 1855, and an idea of the difficulties to be overcome may be formed from the fact that although every moment in which it was possible to work upon the rock was taken advantage of, it was not until the last part of the season of 1857 that any stones were laid, the whole of the intervening time having been taken up in levelling the foundation bed. In the season of 1857 four stones were laid, in

1858 six entire courses were laid, and in 1859 the whole of the solid portion of the structure and half of the remainder, making a total height of 60 feet, were placed. It is presumed that the lighthouse will be ready for illumination by the end of the season of 1860.—The early history of lighthouses in the United States is involved in obscurity. All built prior to 1789 were ceded to the federal government by the respective states near the time of the adoption of the federal constitution, and the records of the erection and maintenance of the lighthouses before that date are buried among the archives of the several states. It is known, however, that the ports of Portland, Portsmouth, and Newburyport, Cape Ann, Boston, Plymouth, Nantucket, Newport, New London, New York, the capes of the Delaware, the capes of the Chesapeake, the port of Charleston, and the mouth of the Savannah river were all lighted before 1789. The buildings were generally rough stone or wood towers surmounted by large iron lanterns. With one or two exceptions they have all been rebuilt. They were generally of small height, and the illuminating apparatus was of the rudest description. A new impulse was given to lighthouses in the United States about the year 1845, when a commission consisting of two officers of the navy was sent abroad to examine the lighthouse establishments of European governments. About the same time Mitchell's screw pile was introduced into the country, and the style of reflectors and lamps was much improved. The buildings too were more substantially erected, and more attention was paid to the principle that the light should be brought to the horizon, which when reflectors were first introduced was lost sight of almost entirely. About the year 1852 the general introduction of the lens or Fresnel system of lighthouse illumination was commenced, and all the lighthouses of the United States are now (1860) furnished with this apparatus. (See *FRESNEL*.) Under the lighthouse board the principle has been adopted of building all first class lighthouses of fire-proof materials. Although under this system the first cost of the structure is large, an insignificant outlay only is necessary for repairs. The same system obtains in the smaller lighthouses when the amount available for their erection will permit it, but in harbor and pierhead lights light wood or iron structures are erected, which can be rebuilt at a small cost in case of serious damage. On June 30, 1859, there were 491 light stations on the coasts of the United States, including the Atlantic, Pacific, gulf, and lake coasts, and the shores of the various bays, sounds, and rivers. There were 576 lights shown at these stations. Of the 491 light stations, 48 are light vessels which show 64 lights; the remainder, 443, are lighthouses which show 512 lights. The expenditures on account of the maintenance of the lighthouse establishment for the fiscal year ending June 30, 1859, were nearly as follows:

Lighthouses	\$594,083 99
Light vessels	211,910 14
Buoys and beacons, &c.	126,998 77
Total	\$932,992 90

The number of buoys and beacons in the waters of the United States is between 5,000 and 6,000. The buoys must be shifted, cleaned, and painted every season, and those which are in exposed positions are frequently carried away by heavy seas or ice. The cost of keeping these aids to navigation in an efficient state is no small item in the annual expense of the establishment.—In all governments except that of the United States, commerce is directly or indirectly made to pay for the expense of the lighthouse establishments. In Great Britain a tax is laid upon every vessel, domestic or foreign, that uses the particular light which is to be supported. In some countries a light due is levied, which is constant whether one or more lights have been used by the vessel. In others, as France for instance, a harbor due or tax is levied, with the proceeds of which the lights are kept up, but the necessary amount is appropriated from the public treasury. The tax is always a severe exaction and restriction upon commerce, and it is to be regretted that foreign governments do not in this instance follow the example of the United States, which supports its lighthouse establishment without any tax upon vessels, domestic or foreign. The foreign vessels reap the benefit of our policy, but do not return the favor to United States vessels. In Great Britain the lights are in charge of three corporations. Those of England are under the Trinity board; those of Scotland and the adjacent islands are under the commissioners of northern lights; and those of Ireland are under the Dublin ballast board. These corporations determine as to the erection or discontinuance of lights in their respective jurisdictions, have entire control of the *personnel*, fixtures, and expenditures of the establishment, and determine the tax to be laid upon vessels which pass or use the lights. The funds raised by this tax are devoted to the annual maintenance and improvement of the lights, though in the case of the Trinity board a part of them may be used for the maintenance of pensioners belonging to the board. In its original construction it is believed this board had nothing to do with the general lighthouse system of England. In France the lighthouse establishment is governed by a mixed board of officers of the *corps des ponts et chaussées*, naval officers, and scientific civilians, and is presided over by the minister of public works. The expense of the maintenance of the establishment is paid by the imperial government, but, as before stated, a tonnage tax is laid upon all vessels, the proceeds of which are expended in the construction and repair of piers, breakwaters, lighthouses, &c. In the other countries of Europe the lighthouse establishments are all connected with the governments, and are managed in various ways. In Russia, Sweden, Denmark, Belgium, and the states bordering upon the

Mediterranean, they are generally under the charge of the navy departments. In the United States the establishment is under the control of a board, the organization of which is given in the article *FRESNEL*. The secretary of the treasury is *ex officio* president of this board, and its decisions are in all cases subject to his control. The lighthouse establishment is therefore a branch of the treasury department, and its annual expenses are estimated for by that department. For the proper administration of the affairs of the establishment, the coasts of the United States are divided into 12 lighthouse districts. To each of these districts is assigned an inspector, who is detailed from the officers of army engineers and the navy. These inspectors have the control of the operations of the establishment in their respective districts (with the exception of the appointment of light keepers), and correspond directly with the lighthouse board. They are furnished with schooners in which they make quarterly inspections of the light stations in their districts, and which are also used for taking care of buoys. They are required to make annual reports of the condition of their districts, in which are embodied their recommendations of new lights, &c., for the action of the lighthouse board. The construction of new lighthouses and important repairs of old ones are carried on under the direction of officers of the two corps of army engineers, who are detailed for this service. The routine duties of the lighthouse board are carried on by two secretaries, one of whom is an officer of the navy, and the other an officer of one of the corps of army engineers. Meetings of the lighthouse board are held quarterly, and intermediate meetings are also held for the transaction of any business that may be brought before the board by the action of the treasury department. The meetings are held at Washington, where the office of the board is situated.

LIGHTNING, the illuminating flash produced by a discharge of atmospheric electricity, either between two clouds, or between a cloud and the earth, exhibited in various forms. That known as sheet or heat lightning, especially in summer evenings, when the air is moist, appears in frequent flashes around the edges of clouds. It is usually unaccompanied with the noise of thunder; and its brilliant displays are watched without fear of injury from the stroke, as this kind of lightning appears to have little tension. In another form the lightning is seen in the fierce tempest darting in zigzag lines across the dark clouds, dividing into one or more forks, and frequently striking toward the earth, and rarely from this to the sky. Moving between the clouds and the ground, its line is sharp and well defined; and though visible, according to Arago, not the millionth part of a second, the direction of its motion is distinctly perceived. Upon the surface of the earth it follows the best conductors, or sometimes chooses instead the path of least resistance, taking a

direct course rather than a tortuous one along good conductors. Bad conductors interposed in its way are violently shattered or thrown about, and men and beasts are instantaneously killed by the fatal stroke. The flash is accompanied with loud reports of thunder, which, commonly succeeding the lightning by a short interval of time, designate by the length of this interval the distance of the seat of the discharge from the observer, the sound reaching the ear at the rate of about 1,125 feet per second, while the flash may be considered as coming to the eye without perceptible expenditure of time. Still another form of lightning is occasionally witnessed in fiery balls or globes, which move through the atmosphere toward the earth, and are seen for several seconds.—Of the nature of lightning the ancients knew nothing. Its disastrous effects were associated rather with the terrific sound of the thunder than with the flash, and the ancient Greeks and Romans attributed them to the thunderbolt hurled by Jupiter to the earth. The Hebrews often represented them as direct exhibitions of divine wrath, and frequently in the Old Testament, as in Job xxvii. and xxviii., the thunder is spoken of as the voice of the Lord. Even the earlier electricians did not suspect the identity of lightning and electricity. The abbé Nollet in 1746 first drew attention to the similarity of effects exhibited by thunder clouds and the prime conductor of an electrical machine. Winkler next argued that the principle of the powers of each was identical. Franklin established the fact first by enumerating in a clear and methodical manner the various points of resemblance, and the similar effects produced by each, and finally by actually conducting the lightning to the earth in his well known experiment with the kite in Philadelphia. This was on June 15, 1752. Dalibard also in a garden at Marly, on May 10 of the same year, following the suggestions of Franklin, obtained electrical sparks from an iron rod 40 feet high, which he had erected for testing the presence of electricity in the atmosphere, and electric jars were actually charged from this source. Buffon on the 19th day of the same month obtained similar results at Montbar. These experiments were regarded with the highest interest by scientific men, and were repeated variously modified in different parts of Europe. Prof. Richman of St. Petersburg, July 26 (Aug. 6), 1753, while explaining to a companion the construction of an electrometer attached to his conductor, was struck and instantly killed by what appeared to be a ball of blue fire as large as a man's fist, that was seen to leap from the insulated conductor to his head, a space of about a foot. A red mark was left on his forehead, his shoe was burst open, and his clothing slightly singed. His companion was benumbed and rendered senseless, and the door case and door were torn apart by the shock. M. Romas, to whom the French academy of sciences awarded the merit of inventing the electrical kite more than a year before it was employed by Franklin, construct-

ed a kite 7 feet 5 inches high, and 8 feet in its greatest width, with a surface of 18 square feet. A copper wire was wrapped around the string to increase its conducting power, and this was made to terminate in an insulating silk cord, near which an iron tube was placed to receive the electricity. The kite being raised to a height of 550 feet on the approach of a storm, the iron conductor became so highly charged that electrical sparks were obtained, and shocks of great violence. As the storm increased, flashes of fire darted to the earth accompanied with explosions, and straws that happened to be on the ground were attracted alternately by the string and the ground, their movements being accompanied by electrical flashes and constant explosions. Such are the experiments by which the electrical nature of lightning was established, and the thunder proved to be the noise which accompanies the electrical discharge. This sound may be prolonged as it is reflected in echoes by the clouds; or, as suggested by Sir John Herschel, it may come in successive impulses to the ear, as brought from an instantaneous discharge that extends for miles along a line directed away from the observer. So the terrific sudden crash may be the result of a flash occurring all round the observer with no great difference of distance from him in the points of the discharge. Not only was the electrical condition of the atmosphere during thunder storms thus established, but in 1753 the abbé Mazens, by means of a wire 870 feet long attached to a steeple at Maintenon, proved that electrical action is excited in clear, dry, and especially hot weather, at all hours between sunrise and sunset. From a multitude of observations made by Cavallo, Read, De Saussure, and others, it appears that the atmosphere is almost always positively electrified in relation to the surface of the earth, and the higher the stratum of air the more decidedly positive is its electrical condition. The source of atmospheric electricity is traced by Lavoisier, Laplace, Volta, and De Saussure to evaporation from the surface of the earth, the effect of which is to convey one kind of electricity upward with the vapor, leaving the other with the fluid. But, as shown by Pouillet in 1823, this effect does not take place unless the evaporation is accompanied with chemical decomposition, as when it occurs from saline mixtures, from the surface of heated iron, which becomes oxidized, and more especially when the vapor proceeds from the leaves of growing plants. Combustion also is a source of atmospheric electricity, as is seen upon a large scale in the constant flashes of lightning that sometimes play around the summits of volcanoes during their eruptions. The rushing of currents of wind past each other, or against opposing objects, also generates electricity by the friction it occasions. The descent of the rain drops develops negative electricity in the air, and the same effect is observed in the vicinity of waterfalls, the air for several hundred feet distant being filled with negative electrici-

ty. To this cause is probably to be attributed the highly excited condition of the atmosphere during thunder storms, and the frequent alternations then observed of positive and negative indications. However the electrical condition of the clouds is produced, the surface beneath assumes the opposite electrical state, the stratum of air between acting like the insulating glass plate between two metallic surfaces; and when at last the attraction between the two opposite electricities becomes too strong for the interposed medium to resist, they rush together, producing the disruptive discharge accompanied with the flash and report. With a good conductor passing from the cloud to the earth the electrical equilibrium would be silently restored, as a Leyden jar is quietly discharged by connecting its inner and outer surface with a wire pointed at each end. But if an imperfect conductor is interposed, the electricity seeking to follow this may produce the most violent effects, and these are exhibited at the points where the continuity of the conductor is imperfect or interrupted. This is well illustrated in the common experiment with the model of a house loosely put together and furnished with an interrupted rod, through which an electrical shock is conveyed. The effect is to throw the model into pieces; but when the same experiment is tried upon a complete rod, the discharge takes place without violent action. Sir W. Snow Harris also illustrates the effect of an interrupted conductor by scattering bits of gold leaf upon paper, and passing along them an electrical discharge, sufficient to burn the gold and blacken the paper. But it is observed in this experiment that only those bits are burned, and the portions of them only, which lie along the line of most perfect conduction or of least resistance; the paper too will be nowhere blackened except on this line. Similar phenomena are observed upon a large scale in almost every instance of a house being struck by lightning. The path of the electrical current is traced along the best conductors, and as the lightning passes from one to another the most destructive effects are observed in these breaks. Imperfect conductors lying near are shattered to pieces or scattered about, and the effects of intense heat are developed where the current is most obstructed. The animal system offering a good conductor, the lightning leaves more imperfect ones to pass by this on its course, and thus men and beasts are frequently struck when standing near projecting objects, as trees, that present themselves as convenient mediums for the re-establishment of the electrical equilibrium.—Franklin, having satisfied himself of the identity of lightning and electricity, was not long in drawing from his discovery practical results of immense importance in protecting buildings from the stroke of lightning; and he thus announced in his "Poor Richard's Almanac" for 1753 his invention of the lightning rod,* the description

* From a passage found among the fragments of Ctesias (*Photii Bibliotheca*), it would seem that some knowledge

being nearly as complete and exact in all essential particulars as could now be given after the experience and trials of more than a century: "*How to Secure Houses, &c., from Lightning.*" It has pleased God, in his goodness to mankind, at length to discover to them the means of securing their habitations and other buildings from mischief by thunder and lightning. The method is this: Provide a small iron rod (it may be made of the rod iron used by the nailers), but of such a length that one end being 8 or 4 feet in the moist ground, the other may be 6 or 8 feet above the highest part of the building. To the upper end of the rod fasten about a foot of brass wire, the size of a common knitting needle, sharpened to a fine point; the rod may be secured to the house by a few small staples. If the house or barn be long, there may be a rod and point at each end and a middling wire along the ridge from one to the other. A house thus furnished will not be damaged by the lightning, it being attracted by the points, and passing through the metal into the ground without hurting anything. Vessels also having a sharp-pointed rod fixed on the top of their masts, with a wire from the foot of the rod reaching down round one of the shrouds to the water, will not be hurt by lightning." Various modifications in the construction of the rod have since been proposed, and copper has been advantageously substituted for iron, as in those planned by Sir W. Snow Harris for the use of the ships of the royal navy. These protectors are in bands of copper, overlapping each other so as to break joints, and are let in to the after side of each mast. They pass down to the keel, and are continued through this by copper bolts into the water; they also connect with copper bands laid under the deck beams and continued through the side of the ship. Harris also made conductors for buildings of copper pipes firmly screwed together, and furnished at top with a pointed extremity $1\frac{1}{2}$ feet long and $\frac{1}{4}$ inch in diameter. The tubes for a given amount of metal expose the greatest surface, and thus furnish the maximum capacity of conduction of the electrical current. Copper moreover conveys the current more freely than iron in the proportion of 12 to 2 $\frac{1}{2}$. This is an important feature, inasmuch as, having no measure of the power of the current that may strike the rod, we should provide one of sufficient size for any stroke. An iron wire may be entirely inefficient, and melt beneath the electrical current, or this may be divided and bound off to other more or less perfect conductors near the rod. It is this inefficiency or imperfect construction of rods in use that has led many to question the value of any metallic conductors, and even to imagine that they all serve to attract lightning, and thus increase the danger. Their office is that of conductors of the electrical current, as the bed of a river presents

was possessed by the ancients, 400 years before the Christian era, of the effect of iron rods in averting the lightning. The writer in this passage makes mention of a fountain in India, from the bottom of which was obtained a kind of iron, which being set in the ground averted clouds, hail, and lightning.

itself for the flow of the aqueous current. Each may act as a safety valve to its respective current when this is impelled with unusual violence; and in case of obstruction to either disastrous consequences may ensue. Iron rods loosely jointed together, and perhaps rusty in the joints, furnish a bad conveyance for the electrical current; and if not continued down into moist ground, and there branching out, the passage of the electricity into the earth may not be so free as by other conductors in the building itself. Wrought iron rods are commonly used in the United States on account of their greater cheapness. They should be at least $\frac{1}{4}$ inch in diameter, and in as long pieces as is practicable. The joints that cannot be avoided should be very securely fitted, so that the two ends are brought into close contact, and touch each other for several inches in length. The branching terminations in the ground may very well be filled around with charcoal, which is a good conductor, and also protects the rod to some extent from rusting. The points at the top may be protected from rust by gold leaf, and the whole rod may be painted with black paint having lampblack for its chief ingredient. A good rod may be secured without danger to the building by wooden clamps with iron fastenings, or even with iron staples. Glass insulators are useless, for when wet by the rain they become conductors. It is recommended by some persons, that as the greatest number of thunder storms come from the N. W., the conductors should be placed on the side of the building exposed to their first approach. But it is particularly important that every prominent elevated point of a large building should be protected by its own rod, and it is well to connect all the rods together, and to have two or more stems running into the ground. It is very uncertain how large an area a rod of given height can protect. Different French electricians have variously rated it as a circular space of radius from one to three times the height of the rod above the highest point to which it is attached; but little confidence can be placed in these conclusions. The opposite electricities, the concurrence of which produces the discharge, are far from being uniformly distributed through the atmosphere, and their point of rushing together may not be in any way under the influence of a rod directed into the air in its vicinity. The position of the excited masses may be favorable for a lateral discharge, and such have been known to pass horizontally through the atmosphere long distances, and to strike with destructive violence objects lying in their path. And as evidence of the protecting influence of a single point not reaching to any considerable distance, a case is cited of the foremast of a ship being struck, causing serious damage to the vessel, when the mainmast was provided with a conductor. Hence the importance of points upon the rods along the salient parts of buildings they are designed to protect. By the great multiplication of conductors the accumulation of opposite

electricities in quantities sufficient to produce destructive discharges is prevented; and thus it is that houses in cities are rarely struck, or vessels where many are lying together in the docks. So where large quantities of iron are stored or are kept in use, as on board steamboats and iron buildings, the electrical equilibrium is usually maintained by the silent influence of many conductors. Isolated houses are more commonly the objects of the lightning stroke; and it is observed that particular localities are subject to be repeatedly struck at different periods; other spots are singularly free from such visitations. The parts of buildings most exposed are the most prominent and elevated points, though the lowest, even the cellar, is by no means exempt from the first shock, when the discharge proceeds from the ground upward. Chimneys from which hot and rarefied air is ascending into the atmosphere, and barns stored with new hay, the vapors from which also produce warm ascending currents, are especially liable to be struck. These currents generating electricity disturb its equilibrium, and produce circumstances favorable for the disruptive discharge. By open doors and windows a similar effect may be produced, and hence the danger of placing one's self near them in thunder storms. It is prudent for persons in a building to avoid being near a chimney or the walls, or in close proximity to metallic bodies, along which the lightning may find the readiest path. The greatest safety would be found, as stated by Franklin, in lying in a hammock suspended by silken cords in the middle of a large apartment. Insulation by placing one's self upon feather beds, or any poor conductor, is also a protection, not however complete unless the head is covered by some non-conducting substance. A silk dress is thus but a slight protection, if the head is exposed near a wall or chimney, and the feet are placed near some other conducting body. Out of doors it is dangerous to take shelter under trees, or to stand near hay stacks, or even by rivulets of water, the effect of which is in some measure to disturb the electric equilibrium.—One of the most useful works for reference on this subject is the treatise of Sir W. Snow Harris "On the Nature of Thunder Storms, and on the Means of Protecting Buildings and Shipping against the Destructive Effects of Lightning" (London, 1843).

LIGNE, CHARLES JOSEPH, prince de, an Austrian general and French writer, son of Claude Lamoral II., viceroy of Sicily, and descended on his mother's side from Mary, queen of Scots, born in Brussels, May 29, 1735, died in Vienna, Dec. 13, 1814. He was a member of one of the most eminent princely houses of Europe, which is related to the Arenbergs, Chimmays, and other eminent families, and which was settled in Hainault as early as the 11th century. His father and grandfather had both been field marshals of Austria, and he entered his father's regiment as ensign in 1752. In 1756 he became a captain, and distinguished himself

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during the 7 years' war. At the battle of Hochkirch in 1758, he displayed such bravery in capturing a difficult position as to obtain the rank of colonel. He was made major-general in 1765, and lieutenant-general in 1771. He was present in 1770 at the interview between Joseph II. and Frederic the Great, and gave a graphic description of it in his correspondence. During the Bavarian war of succession, he commanded the advance guard of Marshal Loudon. The peace which followed gave him leisure to repair the defects of his early education, and with this object he travelled in Switzerland, France, and Italy. His celebrity for bravery and the fascination of his manner, added to remarkable powers of conversation, brought him into intimate literary relations with Voltaire, Rousseau, La Harpe, and Frederic the Great. In 1779 he visited the French court at Versailles, and was treated with great distinction. In 1782 he was sent on diplomatic business to Russia, where Catharine II. loaded him with favors and gave him a large estate in the Crimea. In 1788 he was appointed general of artillery by Joseph II., and charged with a special mission to Prince Potemkin, then besieging Otchakov; and in the following year, at the head of an Austrian corps, he had an important share in the taking of Belgrade by Loudon. He lost favor at court in consequence of his son's participation in the rebellion of the Low Countries against Austria in 1790; and although he obtained the rank of field marshal by regular promotion in 1808, he was never restored to active service. The last years of his life were passed chiefly in literary pursuits. His property had been confiscated by the French, but he recovered part of it in 1813. He resided in Vienna during the congress, and said of it: "The congress does not advance, but it dances; when all its other amusements shall be exhausted, I will treat them to the spectacle of a field marshal's burial." His works are nearly all included in his *Mélanges militaires, littéraires et sentimentales* (32 vols. 12mo., 1795–1811), and in his *Œuvres posthumes* (6 vols. 8vo., Vienna and Dresden, 1817). The former series Mme. de Staël abridged in two interesting volumes entitled *Lettres et pensées* (Paris, 1809).—EUGÈNE LAMORAL, prince of Aublise and of Épinay, a Belgian statesman, grandson of the preceding, born in Brussels, Jan. 28, 1804. He was for many years Belgian ambassador in France and Italy, and has been president of the Belgian senate since 1852. He has been married three times. His eldest son, Prince Henry, married in 1851 Marguerite, Countess Talleyrand-Périgord.

LIGNITE. See BROWN COAL.

LIGNUM VITÆ. See GUALAUM.

LIGNY, a village of Belgium, near Charleroi, which has given its name to the battle fought there between Napoleon's army and the Prussians under Blücher, on June 16, 1815, two days before the battle of Waterloo, and almost simultaneously with the engagement on the neigh-

boring spot of Quatre Bras, in which the duke of Brunswick fell. A short time before the commencement of the action at Ligny, the duke of Wellington met Blücher there, and foretold the defeat which was speedily to follow. After a desperate resistance, the Prussians were driven with a heavy loss from their position at Ligny. In spite of his disastrous defeat, however, Blücher maintained his communication with the English and made good his retreat, and no beaten army ever rallied quicker. The French general Girard fell at Ligny.

LIGUORI, or LIGORIO, ALFONSO MARIA DE, a saint of the Roman Catholic church and founder of the congregation of the Most Holy Redeemer, born at Marianella, near Naples, Sept. 26, 1696, died in Nocera, Aug. 1, 1787. He belonged to a noble family, and was bred to the profession of the law, in which he attained the most flattering success; but having from childhood been remarkable for piety, he resolved in 1722 to embrace the priesthood, and devoted himself to the instruction and reform of the more ignorant and vicious classes of the population, particularly in country places. Struck with the importance of securing a body of ecclesiastics who should give themselves specially to this work, he founded at the hermitage of Santa Maria de la Scala in 1732 a congregation to which he gave the name of the Most Holy Redeemer. It met with opposition, but the energy and patience of Liguori overcame all obstacles, and procured its approval by the holy see. In 1762 Pope Clement XIII. raised Liguori to the see of Sant' Agata dei Goti, which he governed for 18 years, when at the age of 79, being deaf, almost blind, and afflicted with a painful malady, he resigned and retired to one of the houses of his congregation, where he ended his days. In theology he was a warm opponent of Jansenism and rigorism. In an age of pomp, luxury, general relaxation of morals, and growing infidelity, he was remarkable for his profound contempt for all exterior show, for the extreme austerity of his life, his apostolic zeal, and activity in reforming abuses. He was highly esteemed by the kings of Naples, the bishops and cardinals of his time, and the popes. The veneration of the people for him, especially in his old age, was unbounded. He was canonized by Gregory XVI., May 26, 1839. His statue has been placed in St. Peter's, and he is one of the patron saints of Naples, where he is highly honored. He left a number of theological and devotional works, which are much esteemed in the Roman Catholic church. The most celebrated are: *Theologia Moralis* (Naples, 1755); *Directorium Ordinandorum* (Venice, 1758); *Opera Dogmatica* (Venice, 1770); *Istoria di tutte l'eretiche con loro confutazione* (3 vols. 8vo., Venice, 1773); *Istruzione pratica per i confessori* (3 vols. 12mo., Bassano, 1780); *Homo Apostolicus Instructus in sua Vocatione* (3 vols. 4to., Venice, 1782); *Le glorie di Maria* (2 vols. 8vo., Venice, 1784). His complete works, translated into French, were published in Paris in 80 vols.

8vo. (1834 *et seq.*). Many of his devotional works have been translated into English, and are frequently republished.

LIGURIA, in ancient geography, a district of northern Italy, which according to the divisions of Augustus was bounded N. by the Padus (Po), E. by the Macra (Magra), separating it from Etruria, S. by the Ligurian sea (gulf of Genoa), and W. by the Varus (Var) and the Maritime Alps, separating it from Transalpine Gaul. It thus embraced the whole Sardinian province of Genoa, the territory of Nice, and some adjoining parts, a mountainous country traversed by the Alps and Apennines, whose most important products were cattle and timber. The inhabitants, called Ligyes by the Greeks and Liguores by the Romans, were a strong, active, and warlike people of uncertain origin, some identifying them with the Celts, others with the Iberians, and still others with the Siculi. In early times they were wide-spread, occupying among others the southern coasts of Gaul, and are even mentioned by Hesiod as one of the 3 principal nations of the earth. Eratosthenes calls the whole west of the European continent Ligystice (Liguria). The Romans divided them into Transalpine and Cisalpine Ligurians, calling the inhabitants of the maritime range *Alpini* and those of the Apennines *Montani*. Their tribes on both sides of the Alps were numerous. Their country was first invaded by the Romans during the period which elapsed between the 1st and 2d Punic wars, but it was not till some years after the termination of the latter that the final and fierce struggle was commenced which terminated with their subjugation and the transplantation of some of their tribes to Samnium. Among the principal towns of Liguria under the Romans were: Genua (Genoa), Nicæa (Nice), Polentia (Pollenza), Asta (Asti), and Dertona (Tortona). (For the Ligurian Republic, see GENOA.)

LILAC (Persian, a flower), a flowering shrub of the genus *syringa*. Its generic name suggests the idea of a pipe; and from its wood the tubes of the finest Turkish pipes are said to be made. It was called the pipe tree by the old herbalists in 1597, although this name belonged to the *philadelphus coronarius*, a native of the south of Europe, and known in our gardens as the mock orange or common syringa bush. There are several species of lilac, of which the common lilac (*S. vulgaris*, Linn.) and the white-flowered variety (*S. v. alba*), with the Persian lilac (*S. Persica*), are best known. Several seedling sorts have been produced by the gardeners, mostly inferior to the older kinds, of which Loudon gives a list of the blue, the purple, the white, the larger white, the double white, the red, and the large red-flowered. The Persian lilac is more of a shrub-like character, with small, bending, flexile branches, and narrow, lanceolate, entire leaves; and varieties of it with white flowers or else with cut leaves, some of which are almost pinnatifid, and others with hoary sage-like leaves, are spoken of by Loudon.

The beauty of the common lilac is best seen when the plant is cultivated as a tree by removing from its base the numerous suckers as they appear, and preserving a clear, straight trunk. When so treated it will grow 20 feet high or more, and in a good soil may be trained into a handsome tree of fine foliage, particularly when in full blossom. The duration of the lilac is greatest when it grows in a poor soil; its exact period of life cannot be accurately determined, but it may be considered as short-lived. An abundance of seed vessels may be seen on our garden specimens, but they are uniformly deficient in seeds. To procure seeds that will vegetate, it is recommended to destroy every sucker which springs from the roots, and to thin out the bunches of flowers. To secure decidedly new varieties from seed sowing, previous hybridization must be resorted to. The lilac, though originally supposed to have been derived from Persia, has been found indigenous to parts of Austria. It was first introduced into the European gardens from Constantinople toward the end of the 16th century. It has been used for garden hedges. Though perfectly hardy, it has also been treated as a greenhouse plant, retarding its usual period of development, and causing it to produce flowers at Christmas or on New Year's day.

LILBURNE, JOHN, an English republican agitator, born in Thickney Puncharden, Durham, in 1618, died in 1657. He was apprenticed at 12 years of age to a clothier in London, from whom as well as from his father he imbibed opinions in opposition to the existing hierarchy, which as he advanced in years he announced with singular intrepidity. So thoroughly was he imbued with the revolutionary spirit of the time, that in 1636 he went to Holland for the purpose of getting Dr. Bastwick's pamphlet against the bishops printed; and he subsequently privately circulated this publication, with others of a similar character, in England. Having been betrayed by an associate, he was arraigned before the court of the star chamber, and upon refusing to take the oath *ex officio*, or to answer interrogatories, was condemned, in Feb. 1637, to receive 500 lashes, to be pilloried and confined in the Fleet prison till he conformed to the rules of the court, and to pay a fine of £500 and give security for his good behavior. His fearless bravery on this occasion when confronted with his judges gained him the name of "Free-born John." Four years later the house of commons declared the punishment illegal, barbarous, and tyrannical; and as a reparation for his sufferings and losses during his imprisonment, he subsequently received from parliament £3,000 out of certain sequestered estates. Upon the establishment of a parliamentary army he enrolled himself as a volunteer, and fought at Edgehill and Brentford. At the latter place he was taken prisoner, and would have been executed as a rebel had not Essex, the parliamentary general, threatened the severest retaliation on royalist

prisoners. Disliking the Presbyterian tendencies of Essex, he obtained a commission as major of foot under the earl of Manchester, and subsequently, as lieutenant-colonel of dragoons in Manchester's own regiment, fought with great gallantry at Marston Moor. His sympathy for the Independents caused him to assume a hostile attitude toward the Presbyterian leaders; and for his intemperate language and not less intemperate publications against Prynne, Lenthall, and others, he was committed to Newgate on a charge of seditious practices. On this occasion Marten interfered in his behalf, observing, in defence of the factious course in which Lilburne persisted, "that if none were living but himself, John would be against Lilburne and Lilburne against John." He took an active part in organizing the "Levellers," and his pamphlets, produced in abundance, and appealing to the fanaticism of the soldiery, were a leading cause of the disaffection which prevailed in the army in 1648-'9. He did not scruple to accuse Cromwell and Ireton of a design to usurp the sovereignty; and for reading to a numerous assemblage at Winchester house a pamphlet entitled "England's New Chains," he was in March, 1649, committed by order of parliament to close custody in the tower, whence his political pamphlets issued without cessation. Various attempts were made to conciliate him; but with a man like Lilburne, "who possessed none of the qualifications for a popular leader but those of reckless vanity and indomitable courage," they proved futile. He was tried in October by a common jury, a special commission of members of parliament being appointed to determine his sentence, and was acquitted, to the almost frantic delight of the populace, who celebrated the event by bonfires all over London. A medal commemorating the trial was subsequently struck, having the following inscription: "John Lilburne saved by the power of the Lord, and the integrity of the jury, who are judges of law as well as of fact." He soon after retired to Holland, but returned to England in 1653, and was again arrested, tried, and acquitted. Finally this turbulent agitator, reduced to quiescence by the power of Cromwell, settled in Eltham, Kent, and joining the Quakers preached the doctrines of that faith until his death. An account of his trial, entitled "Truth's Victory over Tyrants," was published in 1649 (4to., London).

LILLE, or LISLE, a fortified city of France, capital of the department of Nord, formerly of French Flanders, 15 m. from the Belgian frontier, traversed by the river Deule and connected by a canal with the sea, and communicating by railway with Dunkirk, Calais, Paris, Brussels, and the principal cities of Europe; distance S. E. from Calais 65 m., N. N. E. from Paris 171 m., and W. by S. from Brussels 83 m.; pop. of the arrondissement of Lille in 1856, 404,279, and of the city, 71,286. The fortifications of Lille are considered to be Vauban's master work, and the city is one of the

most important of France, both in a military and industrial point of view. It is entered by 7 gates (one of which has a triumphal arch in honor of Louis XIV.), and contains over 80 public squares and as many bridges. The town hall dates from the time of John the Fearless, and was inhabited by Charles V. One division of this building is devoted to a school of art, containing in its collection of drawings by old masters 86 by Raphael and nearly 200 by Michel Angelo. Lille rivals English manufacturing towns in the spinning of cotton; there are over 80 establishments for the purpose in active operation. The chief manufacture is that of flax, which is cultivated extensively in the vicinity. The manufacture of Lille thread employs 2,000 persons, and the value of its annual produce is estimated at nearly \$3,000,000. Much linen is also woven here, but the manufacture of tulles and cotton lace has fallen off. Beet root sugar is manufactured to the annual extent of \$1,500,000, and the produce of brandy is about \$1,000,000. There are about 100 windmills in the city and 800 in the arrondissement (one of the communes being consequently called *Moulines*), used for grinding rape seed and other oleaginous grains for oil; the annual value of their products averages \$3,000,000. There are also extensive manufactories of smalt and salt at Lille, beside tanneries, dyeing establishments, and tulip gardens almost as renowned as those of Haarlem. The total value of articles manufactured in the arrondissement is annually about \$40,000,000, and the number of persons employed between 60,000 and 70,000. Fairs are held annually in February and December.—Part of the site on which the city now stands is said to have been anciently occupied by a castle built by Julius Cæsar. The first foundation of the city was laid in the 7th century, and it was enlarged and fortified in the course of the 11th. Henry III. of Germany seized it in 1053, and Philip Augustus of France in 1213. Destroyed by the latter on account of the revolt of the citizens, Lille was rebuilt by the countess Jeanne. In 1296 it was conquered by King Philip the Fair. Afterward it alternately gave its allegiance to France and the counts of Flanders until the end of the 14th century, when it passed into the possession of the house of Burgundy. About the close of the 15th century it passed into that of Austria, and in the next century of Spain, but Louis XIV. reconquered it in 1667, and made it the capital of French Flanders. In 1708 Lille was taken by Prince Eugene and the duke of Marlborough, notwithstanding the heroic defence of Marshal Boufflers. It was restored to France by the peace of Utrecht in 1713. Another memorable siege took place in 1792, when the Austrians, after a heavy bombardment, which destroyed many houses, were repulsed with great loss by the citizens.

LILLO, GEORGE, an English dramatist, born in London in 1693, died there in 1739. He had been brought up a jeweller, and even after

attaining literary celebrity still pursued his business. His first play, "Silvia," appeared in 1731, and met with little success; but his tragedy of "George Barnwell," which he produced in the same year, was acted at Drury Lane for 20 consecutive nights, and so fascinated Queen Caroline that she requested to be permitted to peruse the manuscript of it. In 1736 "Fatal Curiosity," generally considered his best tragedy, was introduced at the Haymarket theatre, and was at first coldly received; but owing to the exertions of Henry Fielding it subsequently became more popular. Harris, in his "Philological Inquiries," compares this play, for skilful construction and development of plot, to the "Edipus Tyrannus" of Sophocles. The dramatic works of Lillo, with a memoir of his life, were published in London in 1755, in 2 vols. 8vo.

LILLY, JOHN, the Euphuist, an English dramatic and miscellaneous author, born in Kent about 1553, died about 1600. He became a student in Magdalen college, Oxford, in 1569, neglected the study of logic and philosophy for poetry, received the degree of master in 1575, and was at that time a noted university wit. He soon after went to London, was reputed a rare wit and poet at the court of Elizabeth, and published his "Euphuæ, the Anatomy of Wit" (1580), followed by "Euphuæ and his England" (1581), the elaborate, fanciful, and dainty style of which became the model of court conversation. (See EUPHUIST.) He enjoyed success also as a dramatic poet, producing 8 plays, most of which were acted before the queen. He was engaged in the Marprelate controversy, and wrote "Pap with a Hatchet" (1589), a once famous pamphlet against the Martinists. A few modern critics, as Malone, Hazlitt, and Charles Lamb, have been enthusiastic admirers of his best pieces, as "Endymion" and the song on Cupid and Campaspe. His dramatic works, with a life and notes by F. W. Fairholt, were published in 1858 (2 vols., London).

LILLY, WILLIAM, an English astrologer, born in Diseworth, near Derby, May 1, 1602, died June 9, 1681. The son of a yeoman, he attended school from his 11th to his 18th year, and made considerable progress in the classics. In 1620 he went to London, his father being then in Leicester gaol for debt, and accepted a situation as footboy. In 1626 his master settled on him £20 a year, and employed him to keep his accounts as head of the salters' company. In the following year, on the death of his master, he married the widow, with whom he received £1,000, and lived happily till her death in 1638. By a second marriage in 1634 he augmented his fortune by £500. "She was of the nature of Mars," and he lived unhappily with her. He began the study of astrology in 1632 under a Welsh clergyman named Evans. He soon practised horary astrology with eminent success, instructed many persons in the art, and gave much attention to mundane astrology. In 1642 and 1643 he carefully noticed all the prin-

cipal actions between the king and parliament, trying to discover their relation to the configurations of the heavenly bodies. In 1644 he produced the first number of his almanac, *Merlinus Anglicus Junior*, which contained remarkable prognostications, was purchased with avidity, and was continued for many years. He was consulted both by the royalists and parliamentarians in the civil war. In 1647 he indicated a safe place for the concealment of the royal person, but complained that the king neglected his advice and was accordingly ruined. In 1651 he published "Monarchy or no Monarchy," containing several hieroglyphical figures, two of which were subsequently declared to have had reference to the plague and the great fire in London, which occurred respectively in 1665 and 1666. He was consequently summoned in 1666 before a committee of the house of commons. He afterward practised medicine in connection with his astrological science, till he was enfeebled by age. He published an autobiography (London, 1715), an "Introduction to Astrology" (new edition, with emendations and additions by Zadkiel, London, 1852), and other works.

LILY, a common name applied to many sorts of plants. The word probably has some oriental origin, though some trace it to the Celtic *li*, which signifies whiteness or shining, both which qualities may be attributed to species of the lily family. The lily belongs to the natural order of the *liliaceae* or lilyworts, which comprises herbaceous plants, shrubs, and even trees, with bulbs, tubers, or rootstocks, and fibrous roots. They are endogenous, with a naked perianth and fleshy albuminous seeds. Their leaves are almost always narrow, with parallel veins; the flowers are of all grades from small and green-colored to those which are large and showy; they are succeeded by succulent, or else dry and capsular, three-celled seed vessels. The lily is best known among us, however, by those garden and field flowers to which the trivial name is applied, some of which are plants belonging to other natural orders. The tulip with its associates, of which the dog's-tooth violet (*erythronium*) and the fritillary (*fritillaria*) may be mentioned, are lilies, and belong to a section in which the true lily of the genus *lilium* is included. The day lilies (*hemerocallis*) and blue African lily (*agapanthus*) represent another section of liliaceous plants; the like may be said of the aloe, the garlic, onion, asphodel, asparagus, and many arborescent forms of tropical vegetation.—The lilies of the genus *lilium* are all superb garden plants. Of these, the white lily (*L. candidum*, Linn.) is a native of the Levant, but has been cultivated for centuries. From this long cultivation three varieties have sprung, viz., the purple blotched, the striped or yellow-edged-leaved, and the double. The long-flowered lily (*L. longiflorum*, Thunberg) comes from China, and is distinguished by its dwarf stature, and larger, pure white, long-tubed blossoms, which expand later in the season.

The beauty of the Japan lily (*L. Japonicum*) is fully equal to that of the white lily; although the flowers have not the same fragrance, yet they fully make up for its absence in their purer white and large trumpet-shaped blossoms, elevated upon a taller stem, and standing out from a slightly curved and delicate footstalk. In pot culture it makes a much more imposing appearance than does the white lily. Its culture is easy, and it is a hardy desirable kind for the flower border. The martagon lilies are sometimes called the Turks' cap, from the circumstance of their petals being reflexed or turned backward so as to resemble a turban; they are generally smaller flowered sorts, and each flower spreads outward from the main stem so as to form a sort of umbel. The scarlet martagon (*L. Chalcedonicum*) covers the plains of Syria with its rich glowing flowers. A small, beautiful, delicate-leaved, and vermilion-colored species is the *L. tenuifolium* (Fischer) from Siberia. The tiger lily (*L. tigrinum*, B. M.) is a well known, showy, red and coarse flowered garden kind. The orange lily (*L. bulbiferum*, Linn.) is seen in our gardens in a dwarf earlier variety, succeeded by a taller and more slender variety, with coarse but pleasing orange-colored blossoms. There are also some other striking varieties of this species, one having party-colored foliage, another with double flowers, another with smaller flowers; the bulbs on the stalks are not constant, but their presence seems to depend on peculiarities of treatment; the variety known as the *umbellatum* of the "Botanical Magazine" (plate 1018) is very superb, and has been known to produce more than 60 flowers from a single root. Some exceedingly beautiful lilies have been raised by impregnating the flowers of *L. lancifolium* (Siebold) and its varieties with other and distinct species. These likewise are hardy, and make admirable plants for the border, blooming as late as September. By cultivating the roots in large pots the plants will grow larger with proportionally larger blossoms, and are very well adapted for the ornamenting of the greenhouse in summer. The giant lily (*L. giganteum*, Hooker) was discovered in the Himalaya at an elevation of 10,000 feet. It is a very singular plant, so stout and vigorous as to seemingly deny any alliance with its dwarfer co-species. Its bulb is large and green; its foliage consists of a cluster of large heart-shaped leaves, each leaf almost a foot broad and two feet long, looking like those of the *Funkia*; its flower stem is from 10 to 12 feet long, bearing 15 or 20 pure white blossoms of great fragrance. Its cultivation is easy, the main bulb, after flowering, making an abundance of offsets. Should it prove hardy, it would soon become a universal favorite in gardens, and a conspicuous associate with the Adam's needle (*yuca filamentosa*).—The North American lilies are very showy plants. In the Carolinas we have Catesby's lily (*L. Catesbii*, Walter), a conspicuous red flower, whose petals taper into a claw at their base, where the color is

yellow variegated with dark spots. Its natural habit of growth is around ponds in the flat pine barrens. The red orange lily (*L. Philadelphicum*, Linn.) is one of the most charming of our midsummer blossoms, found rather plentifully in open copses and among bushes in the pasture lands of New England. The wild yellow lily (*L. Canadense*, Linn.) is a conspicuous plant, growing with a slender stem from 2 to 5 feet high, and bearing numerous, rather small, bright yellow flowers, whose petals are spreading-recurved; it occurs in moist lands. The superb lily, or American Turks' cap (*L. superbum*, Linn.), is similar to it in many respects, and by some considered identical with it, but it is clearly distinct. The leaves of the superb lily are coarser, stronger, and more numerous; the flowers are conspicuously large, of a fine orange red and pale yellow at their base, with distinct spots of black; these spots, when occurring on the orange red, are surrounded by an areola; each petal is very much recurved and involute on its edges, while the contour of the entire plant marks it at once, when seen side by side, as the more beautiful and deservedly the favorite. There seems however to be a variety seen at the South by Michaux to which he gave the name of *L. Carolinianum*; but Elliott considers that there is some obscurity in it as a species, though its blossoming is later than that of the superb lily there by at least two months.—The true lilies are all easy of propagation from their seeds or from the division of their roots. They love a rich, moist soil, and are ornamental in the garden at very different periods of the season, some blossoming very early and others more tardily. They are of little practical utility to man, although we are informed that some are used as articles of food. The Siberians eat the bulbs of the *L. bulbiferum*; the Japanese, according to Kämpfer, eat those of the *L. tigrinum*; and the bulbs of the *L. pomponium* are eaten by the inhabitants of Kamtschatka, where they are even cultivated as potatoes are elsewhere. In trade, among florists and amateur gardeners, the bulbs of rare species and varieties realize large sums, until their rapid multiplication creates a greater supply than demand under such prices. Many years ago the American superb lily was extensively cultivated at Ghent for the trade; and in this country attention is directed to the finer sorts of Japan lilies for the same purpose.—Of other genera, which bear the name of lily, may be mentioned the water lily (*Nymphaea odorata*, Aiton). (See WATER LILY.) The lily of the valley (*Convallaria majalis*, Linn.) has been considered of European origin; but according to Prof. Gray it occurs on the high Alleghanies of Virginia and southward. The lilies of Scripture are conjectured to be the *amaryllis lutea*, or golden lily, and the *lilium Chalcedonicum*, with scarlet blossoms, both natives of Syria. Many other species of *amaryllis* bear the name of lilies, and resemble them in general character.—The day lilies (*hemerocallis*, Lindley) are ornamental

herbaceous plants, of which the golden lily (*hemerocallis flava*) is the best for the garden on account of its graceful foliage and elegant blossoms. The orange or tawny lily was once esteemed, but is now quite discarded, and to be seen only in the rudest attempts at floriculture. In some parts of Essex co., Mass., it is becoming naturalized on the borders of fields and by the sides of the roads, insinuating its coarse fibrous roots between the loose stones of walls and rubbish. There is a form of it with more regularly equitant leaves and larger semi-double flowers, more showy and conspicuous (*H. disticha*), occasionally seen in collections of rare hardy plants. The liability of their roots to run under ground and to throw up numerous suckers renders them of too easy propagation, and without extra care they are apt to prove weedy and troublesome. The white Japan and the blue day lilies, though at one time considered as belonging to the same genus, have been separated from it, and are now known as *Funkia Japonica* and *F. carulea* (Willd.). The former of these possesses a delightful fragrance, and is a universal favorite, though much inclined to spread unduly in the flower border. A variety of equal beauty and fragrance, but of a better habit, more compact and less straggling, has been raised from seed, near Boston. The white Japan day lily grows remarkably well in pots, and is valuable on this account. The blue or *H. carulea* has leaves of a coarser texture, of a darker green hue and less elliptical in their outline, a longer and more slender and elastic peduncle, and smaller, campanulate flowers, which hang suspended one above the other. Abundant supply of water at the period of blossoming greatly promotes the size and beauty of the flowers. From characters thus marked and distinct Mr. Salisbury has erected it into a new genus, which he calls *Saussurea*. Other species, *F. Sieboldii*, *alata*, and *variegata*, the latter with leaves edged with white, are said to be very showy. These day lilies are easily propagated by division of the roots. The well known blue African day lily (*agapanthus umbellatus*, Willd.) is an admirable plant for vases, such as are used to decorate gardens and balconies; its tall straight peduncle is crowned with conspicuous, delicate, and faintly striped blue and light blue blossoms, while its long and large deep green leaves hang elegantly on each side at its base. Several hardy bulbous flowers from the Cape of Good Hope belong to the same group of day lilies, and are to be found in ordinary greenhouse collections, such as *tritoma*, *Tulbaghia*, *Blandfordia*, and *Veltheimia*. According to Lindley, the day lilies differ from the type of true lilies in nothing except their calyx and corolla being so joined to each other as to form a tube of conspicuous length, and in their want of bulbs in many instances.

LILY, WILLIAM, an English grammarian, born at Odiham, Hampshire, about 1466, died in London in Feb. 1523. He was educated at Oxford, spent 5 years at Rhodes studying Greek,

in 1509 established a classical school in London, and is said to have been the first Englishman that ever taught Greek in that country. When Dr. Colet founded St. Paul's school in 1510, he appointed Lily its first master, and he held this office for 12 years. He died of the plague. The most important of his works is *Brevissima Institutio, seu Ratio Grammatices Cognoscenda* (4to., London, 1518), a book which, under the title of "Lily's Grammar," has probably passed through more editions than any other similar work. Dean Colet was the author of the English rudiments, Erasmus of the greater part of the Latin syntax, and Lily of the rest; and Cardinal Wolsey wrote the preface to the second edition. Erasmus styles Lily "no ordinary scholar in classical literature, and a master in the art of tuition."

LILYBÆUM. See MARSALA.

LIMA, a township of Livingston co., N. Y., on Honeoye creek; pop. in 1855, 2,670. It contains 6 churches; the Genesee Wesleyan seminary, founded in 1830 by the Genesee conference of the M. E. church, opened for pupils in 1832, and now occupying a brick building erected in 1842 at a cost of \$24,000; and Genesee college, founded in 1849 under the general supervision of the Genesee and E. Genesee conferences of the M. E. church.

LIMA, the capital of Peru, situated on the banks of the Rimac, in lat. 12° 2' S., long. 77° 8' W., distant 6 m. from Callao, its seaport on the Pacific; pop. about 100,000, of whom $\frac{1}{2}$ are whites, $\frac{1}{4}$ negroes, and the rest Indians and mixed races. The city stands on an extensive plain which rises gradually from the ocean. Viewed from Callao, it makes a splendid appearance, with its many spires and domes glittering in the sun. The Rimac flows through the city, and is crossed by a beautiful stone bridge of 6 arches, 580 feet in length, built in 1618. This bridge connects the city proper with the suburb of San Lazaro, where there are two agreeable *alamedas* or public walks, consisting of avenues formed by double rows of trees. The city is surrounded by brick walls about 9 feet thick at the top and from 18 to 25 feet high. It is two miles in length and nearly as much in breadth, and the circuit of the walls is about 9 miles. The streets are 33 feet wide, and cross each other at right angles, dividing the city into about 200 squares measuring 386 feet each way. The houses are low and irregularly built of adobes, with partition walls of cane covered with plaster, and with roofs of cane covered with mats, which are preferred to more solid materials on account of the frequency of earthquakes and the extreme rarity of rain. The houses for the most part have no windows toward the street, the smaller ones having only a door with a glass lantern hanging over it. Of the larger houses nothing is seen but great folding doors opening into the street, which lead to the *patio* or courtyard, surrounded by walls often painted in fresco; and facing the street door is the principal reception room. Through

the centre of the streets, running parallel with the river, flow small streams used as open drains, and along their margins crowds of turkey buzzards act as scavengers. In the centre of the city is the *plaza mayor* or great square, each side of which measures 510 feet. On the E. side stands the cathedral, a massive stone structure 820 feet long by 180 wide, with a façade painted red and yellow, and with three green doors and lath and plaster towers at each angle. The body of Pizarro lies beneath the grand altar. The palace of the archbishops, on the same side of the square, is now used as a senate house. The palace of the Spanish viceroy, on the N. side, is a mean-looking edifice, with its basement occupied by small shops; it is now appropriated to the courts of justice and other government offices. On the W. side of the square is the city hall, a Chinese-looking building, the gaol, and other offices. The rest of the square is fronted by private houses, with arcades filled with shops beneath, and balconies concealed by old Moorish-looking trellised *jalousies* on the upper stories. In the centre of the square is a handsome stone fountain, constructed in 1658, and surmounted by a bronze statue of Fame; it is supplied with water from the Rimac. Beside the *plaza mayor* there are upward of 80 open squares in the city. There are two foundling asylums and 11 public hospitals, one of which has 600 beds. The city contains 57 churches, 16 nunneries, and 25 chapels, many of which are extremely rich in images of gold decorated with jewels. The church of the Dominican convent is 300 feet long by 80 broad, and has a steeple 180 feet high, the loftiest in Lima. The convent is said to have had under the Spanish rule a revenue of \$80,000 a year. The largest monastic establishment is the convent of St. Francis, founded in 1586; it covers two squares near the banks of the Rimac, and has magnificent cloisters. Lima has a university founded in 1571, once the foremost seat of learning in Spanish America, but now nearly deserted. There are numerous schools for primary instruction, which are said to be well conducted, and two high schools, each of which has about 350 pupils. There are also 8 Latin schools and 4 colleges, one of which is for theology, another for law, and another for medicine. The city contains two theatres, an amphitheatre for cock fighting, and another for bull fights capable of accommodating 12,000 spectators. The manufactures consist principally of gold lace and fringes, glass, cotton cloth, cigars, chocolate, and paper, and are of very limited extent. The climate of Lima is delightfully mild and equable. The temperature ranges only from 60° to 80°, being never under the former and seldom rising above the latter; the ordinary daily range is from 8° to 4°. Rain is extremely rare, and thunder and lightning unknown. The vicinity of the city is exceedingly pleasant, and produces in abundance maize, barley, beans, vegetables, sugar, rice, tobacco, grapes, olives, melons, and other fruits. But all

these advantages are outweighed by the exposure of the city to frequent earthquakes. Slight shocks occur very often, and are little regarded; but since its foundation the city has experienced upward of 12 tremendous earthquakes which were terribly destructive to life and property. The first of these great calamities was in 1586, and its anniversary is still commemorated. The earthquake of 1687 began at 4 o'clock in the morning and destroyed many houses. It recurred again at 6, and destroyed every house the first shock had spared. In 1746 the shocks began at 10½ P. M., Oct. 28, and in 8 minutes the greatest part of the city was in ruins. Callao was overwhelmed by the waves caused by the earthquake at sea, and of 23 ships in the harbor 19 were sunk, and the other 4, one of them a frigate, carried to a considerable distance inland. The last of these great earthquakes was on March 20, 1828, when the most solid buildings were rent from top to bottom, 1,000 persons were killed, and property was destroyed to the amount of \$6,000,000.—Of the inhabitants of Lima, the whites are remarkable for vivacity of manner and quickness of mind. Education has made great progress among them of late years, and the young men, though spending much of their time in indolence and dissipation, and devoted to cock-fighting and gambling, are extremely agreeable in their manners and conversation. The ladies of Lima are frequently very beautiful, with brilliant black eyes, graceful figures, and bright intelligent expressions, accompanied by the most pleasing manners, and frequently great natural talent and wit. Until within a few years they wore when walking abroad the *saya y manto*, a very becoming and elegant dress, now only seen at bull fights, religious processions, and on other great occasions. The *saya* is a petticoat made to fit so tightly that, being at the same time very elastic, the form of the limbs is rendered distinctly visible. The *manto* or mantle is also a petticoat, but, instead of hanging about the heels, it is drawn over the head, breast, and face, and is kept so close by the hands, which it also conceals, that no part of the body, except one eye, and sometimes only a portion of one eye, is perceptible. A rich colored handkerchief, or a silk band and tassel, is frequently tied round the waist and hangs nearly to the ground in front. About 1884 the close fitting skirt was abandoned for the *saya orbegoseña*, or full skirt. But of late years the French fashions have nearly superseded the national costume.—Lima was founded by Francisco Pizarro, the conqueror of Peru, on Jan. 6, 1535, the festival of Epiphany, in honor of which it was called *Ciudad de los Reyes*, or city of the kings, Epiphany being the day appointed to commemorate the worship of Christ by the Magi or kings of the East. This name, however, was soon superseded by that of Lima, a Spanish corruption of the native name Rimac.—See "Cuzco and Lima," by C. R. Markham (London, 1856); Hill's "Travels in Peru" (London, 1860).

LIMBO (Lat. *limbus*, border or edge), according to some of the scholastic theologians, one of the places into which departed spirits are received. St. Thomas Aquinas places hell in the centre of the earth; it is encircled first by purgatory, above which extend successively the *limbus infantum* and the *limbus patrum*. The former includes children dying before baptism, who according to different dogmatists pass thence to heaven or remain for damnation. The latter, which is also called the bosom of Abraham (*sinus Abrahæ*), includes the holy men of the old covenant, the patriarchs and other pious ancients, who died before the birth of Christ. According to the usual account, Christ opened this limbo when he went down into hell, liberated the souls detained there, and admitted them to the privileges of the blessed; and it has remained from that time closed and unoccupied. Dante describes the limbo in which he met with the distinguished spirits of pagan antiquity as the outermost circle of hell. A *limbus fatuorum*, or fools' paradise, is also mentioned.

LIMBURG, or LIMBOURG, a province of Belgium, bounded N. by Holland, E. by the duchy of Limburg, S. by Liège, and W. by S. Brabant and Antwerp; area, 934 sq. m.; pop. in 1858, 193,160. The chief towns are Hasselt, the capital, Tongres, Maaseyck, and St. Trond. The surface is flat and underlaid with strata of fossiliferous limestone. Iron, calamine, and lead are the principal minerals. The most important river is the Meuse or Maas, which skirts the E. frontier. A large part of the surface is occupied by barren heaths, but in some localities, particularly in the S. and centre, there is much arable land. Pasturage is excellent and abundant along the Meuse, and cattle and swine are important items of production. The manufactures include soap, salt, pottery, paper, tobacco, straw hats, beet sugar, &c. The province was formed in 1839 of the greater part of the ancient province of Limburg, which was a part of the kingdom of the Netherlands, and was divided at the separation between Belgium and Holland.—LIMBURG, the former capital of the province, now forms part of the district of Verviers in the Belgian province of Liège; pop. about 2,000. It is picturesquely situated on the summit of a rock on the Vesdre river, and possesses manufactories of cloth. It is chiefly known from the strong-smelling cheese to which it gives its name, and which is largely exported. The greatest portion of this cheese, however, comes from the neighboring village of Harve.

LIMBURG, a duchy and province of Holland, and a member of the Germanic confederation, bounded N. by North Brabant, E. by Rhenish Prussia, S. by Belgium, and W. by Belgian Limburg; area, 852 sq. m.; pop. in 1858, 215,086. Capital, Maastricht; other chief towns, Roermond, Venloo, and Weerdt. The surface is diversified, but in general little elevated. The soil is of poor quality except in the valleys of the Meuse, Roer, Gaule, Itterbeck, &c.; and large tracts of land are occupied by heaths and

marshes. Grain, hemp, flax, oil seeds, garden vegetables, and live stock are the principal products. Gin is made in large quantities, and there are manufactories of tobacco, soap, leather, paper, and glass. This province formerly belonged to Belgium, from which it was taken, and was finally annexed to Holland in 1838.

LIME, or **QUICKLIME** (symbol CaO ; chemical equivalent 28; specific gravity 2.3-3.08), the protoxide of calcium, a white, alkaline, earthy powder, obtained from the native carbonates of lime, such as the different calcareous stones and sea shells, by driving off the carbonic acid in the process of calcination or burning. From time immemorial it has served for the preparation of cements and mortar; and it is supposed, from the mention made of it in Isaiah xxxiii. 12, and in Amos ii. 1, that the modern method of manufacturing it was in use by the Hebrews. Very pure lime may be obtained by subjecting calcareous spar or some of the marbles, either light or dark colored (provided they are not dolomites), to a red heat in an open crucible, and in the free draft of the fire. If the crucible be closed, the stone may be melted and its texture altered without the separation of the carbonic acid. The magnesian carbonates of lime (see **DOLomite**) furnish lime of similar appearance, but combined with magnesia, and possessing somewhat different properties from pure lime, as will be noticed below. To obtain perfectly pure lime, the stone may be dissolved in hydrochloric acid, and the oxide of iron and alumina that may be present precipitated by ammonia and separated by filtering; the addition of carbonate of ammonia will then cause the precipitation of pure carbonate of lime, which, being collected by filtering and dried, is to be decomposed at a red heat. Lime is procured on a large scale by burning the stone in furnaces called kilns, either mixed with the fuel or exposed to the heated air and flames that proceed from side fires, through the central cavity of the furnace, in which the stones are collected. The calcined stones may retain their original form or crumble in part to powder; if protected from air and moisture, they can afterward be preserved without change. The substance possesses a powerful affinity for water, absorbing it from bodies in contact with it, whence its caustic property, and its application as a drying agent for abstracting moisture from gaseous mixtures, from alcohol, &c. Perfectly dry lime appears to have no affinity for carbonic acid; but when it has absorbed moisture it gradually takes up this gas from the air, and externally at least is converted into a combined carbonate and hydrate, of the composition represented by the formula $\text{CaO}, \text{CO}_2 + \text{CaO}, \text{HO}$. When water is poured upon lime, it is taken up with avidity; the lumps of lime open in cracks and swell; great heat is evolved, causing a hissing noise and clouds of steam; and the water, if not in too great quantity, disappears, the lime falling into a dry powder of the definite composition represented by the formula CaO, HO . This is called slaking the lime, and the

product is known as slaked lime. With an excess of water a paste is produced, called milk of lime. The water, if cold, dissolves from $\frac{1}{100}$ to $\frac{1}{70}$ of its weight of lime, and the solution is called lime water. It possesses decidedly alkaline properties and an acrid taste. The introduction of carbonic acid renders it turbid by formation of the insoluble carbonate, whence the use of lime water as a test for determining the presence of this gas. When lime water is boiled, half the lime is precipitated, but redissolves when the water becomes cold again. Lime was regarded as infusible until melted by the compound blowpipe of Dr. Hare. (See **BLOWPIPE**.) But though so difficult to melt alone, it readily fuses when mixed with silicious and ferruginous minerals, the fusion of each being promoted by their mixture. With the silica and alumina it forms a very fusible glass. Thus used in the blast furnace as a flux, it serves to wash out, as it were, the earthy matters combined in the ores with the oxide of iron. Lime when highly heated becomes intensely luminous, and in this state is used for the so called Drummond light. It slowly sublimates at the high temperature.—The chief use of lime is for the mortar or cement of brick and stone work, and for plastering walls. It is also largely consumed in agriculture as a manure. It is produced of different qualities according to the nature of the limestones or other material employed and the method of manufacture. The purer stones and oyster shells make what is called a fat or rich lime, which slakes rapidly on the application of water, doubles or more than doubles in bulk, and falls to a white, soft paste. This, when brought by stirring to uniform consistence, if protected from the action of the air, will undergo no change though kept for many years. Inferior limes are distinguished by slaking slowly with little if any increase of bulk, giving out but little heat in the process, and by leaving an insoluble residuum when dissolved in water frequently renewed in sufficient quantity for the solution of all the lime. Masons also value the limes according to the quantity of sand they find the different sorts will bear to be mixed with in the production of strong mortar. Limestones which contain various mineral ingredients produce lime that is distinguished by the name of hydraulic, the properties of which have been treated in the article **CEMENTS**. It has been customary to rank the lime made from magnesian limestones among those called poor, and it is generally spoken of as slaking slowly, and taking little sand; yet the highest priced lime in the New York and eastern markets is that of Smithfield, R. I., made from a magnesian stone. Excellent lime also has been produced in Westchester co., N. Y., from quarries near the Hudson river of white marble or dolomite, which gave by analysis 45.8 per cent. of carbonate of magnesia, and 52.8 per cent. of carbonate of lime. In slaking it nearly doubles in bulk, and in making mortar it takes 9 barrels of sand to one of lime, or two more than it is

customary to use with Thomaston lime. Burned with anthracite, the stone had always produced lime of very poor quality, slaking imperfectly and leaving lumps in the paste which failed to crumble when made into mortar. When such mortar was used for plastering, unless first ground in a mill, the lumps would at last slake upon the walls, which the masons call "pitting out," and produce unsightly blotches. It was only by the use of wood for fuel, or of bituminous coal producing much flame, that good lime was made. But it is probable that by using high steam of the temperature of 400° or 500° with the air that feeds the anthracite fires, this fuel might be used with equal advantage and greater economy. In the proportion of $\frac{1}{4}$ the weight of the anthracite, it causes with this a strong flame without checking the combustion. In this proportion steam is generated in the consumption of many of the woods and bituminous coals; and even with these fuels it is customary to introduce steam in European kilns, or sometimes to wet the stones instead, which is obviously a more imperfect process. A great part of the lime that supplies the Atlantic coast is brought from Thomaston and neighboring towns in Maine, where quarries of great extent are worked near the coast of Penobscot bay, and the lime is burned with anthracite from Pennsylvania. The excellent quality and cheapness of the lime have long secured markets for it even as far as New Orleans, and into the interior of the country as far as Lynchburg, Va., where, though close to extensive limestone districts, Thomaston lime is regularly quoted in the published prices current. In New York city it is used only for plastering, selling from \$1 to \$1.80 a barrel of $2\frac{1}{2}$ bushels; a strong lime, but darker colored, from Kingston, Ulster co., is afforded at 70 cts. a barrel, answering very well for mortar for stone and brick work. Thomaston lime takes about $\frac{1}{4}$ of a cubic yard of sand, or 7 to 8 barrels, to one of lime.—For making mortar, a sharp clean sand of coarse grains is to be preferred. It is piled around in basin form, and the lime is thrown into the centre and slaked with water sufficient to make a creamy paste. This, being thoroughly worked with hoes, is then mixed with sand, which is well stirred into it. When laid with a trowel to hold stones or brick together, the water evaporates or is absorbed by the stones, which should be wetted to prevent this process taking place too rapidly, and the excess of mortar should be pressed out so as to leave the layer as thin as possible. Each grain of the sand is enveloped in a pellicle of lime, which adheres closely to it, and attaches it also to adjoining surfaces. A chemical change takes place in the lime in contact with the air by its absorbing carbonic acid and forming a stony carbonate, and according to some authorities the lime also partially unites in time with the silica of the sand, forming a superficial layer of still harder and stronger silicate of lime. This change is indicated by the property of old mortar when treated with acids to form a portion of gelatinous

silica, which some authorities state it always does. This is certainly the case with the hydraulic limes. But if common mortar be protected from the air, it may remain without hardening many years. It is stated that lime still in the condition of a hydrate has been taken from one of the pyramids of Egypt; and in one of the bastions of the citadel of Strasbourg, which was built in 1666, Gen. Treussart in 1823 found that the mortar used for its construction was still soft. The creamy paste or hydrate is often kept by builders in pits in the ground, and it improves by the thorough slaking which it undergoes. The excess of water is removed from the surface, and the lime is protected by a few inches of sand being thrown upon it. It is stated by Jahn that when the ruins of the old castle of Landsberg were removed, a lime pit that must have been in existence 800 years was found in one of the vaults. The surface of the mass was carbonated to the depth of a few inches, but below this the lime appeared as if freshly slaked, only rather more dry. It served for use in laying the walls of the new building. If common mortar be laid in water, it not only refuses to harden, but the lime is after a time dissolved out, and washed away.—Lime is burned in kilns of various forms; sometimes indeed, where wood is to be cleared off, in open log heaps, the stones interstratified with the wood. Pure limestone is thus easily converted into good lime, but much of it must be imperfectly burned; and silicious limestones should by such a process be partially melted and glazed upon the surface of the lumps, which is called "dead burnt," and the inner portions of these would escape calcination. Kilns used to be roughly built up of stones without mortar, in pyramidal or cylindrical structures, containing a cavity of corresponding form to the outside extending from top to bottom, about 15 feet in height. A favorite shape for this is still that of an egg set on end. The kilns are improved by a lining of clay, or of hard-burned brick, or still better of fire brick. Arched openings extend horizontally into the base of the kiln, sometimes 8 on a front of 15 feet, as was formerly the case with the oblong kilns at Thomaston, when lime was burned with wood; and in charging the kilns with stone, the larger lumps are built up in arch form, so as to extend these openings through to the back wall, leaving the space below for the fuel. The limestone being thrown in upon the temporary arches, the fires are kept up beneath these for 2 or 3 days and nights until the stone at the top is calcined. After cooling, the lime is drawn out and the operation is renewed. For this, called the intermittent kiln, have been substituted the perpetual or draw kilns, which are far more economical for large operations. These are of various shapes, some of them even having the common principle of charging the fuel and stone in alternate layers, and renewing these layers at the top as the charges settle down and the lime is drawn out at the bottom. A perpetual kiln of another

form was long since in use at Rüdersdorf near Berlin, and with very trifling modifications is employed in the United States under American patents. The fireplaces are in the side of the structure, usually about $\frac{1}{4}$ of the way up from the base, with flues discharging into the central cavity. They may number from 8 to 6 or more, distributed around the stack on one level; and at the base are the arched openings, one in each space, if convenient to have so many, between the fireplaces and alternating with them. The openings of the fireplaces and arches for discharging can all be closed by iron doors. The stone is charged at the bottom of the kiln, the wood or bituminous coal in the fireplaces, and the lime is drawn out below; and the operation may thus be continuously kept up. These kilns are usually constructed with great care; they are from 25 to 30 feet high, with a capacity of about 50 barrels of stone, and cost not less than \$1,000 each. They are of circular or rectangular area within. One in use at Berkshire, Mass., is described as a shaft 8 feet square without and 25 feet high, with a cavity 4 feet square, the walls thus being 2 feet thick. To the height of 7 feet from the base it is built 12 feet wide to afford room for a fireplace on each side; these are 2 feet high and 20 inches wide. With a consumption of 2 to 2 $\frac{1}{2}$ cords of wood a product of 75 bushels is obtained from 8 times drawing the lime in 24 hours; this is about equivalent to 1 part by measure of lime to 8 parts of wood. At Hastings on the Hudson a kiln of circular form with 6 fireplaces, and of the capacity of 50 barrels, produced in 1856 about 88 barrels of lime daily with the consumption of $\frac{3}{4}$ of a ton of the best cannel coal. The product of lime to the fuel consumed is very variable, the difference being chiefly due to the different kilns and methods of burning. Hassenfratz in his elaborate treatise on the production and use of lime gives the plans of many kilns, with descriptions of their workings; among which are noted the following: The intermittent kilns of the Pyrénées, in the form of a truncated cone, produce by measure 1 of lime to 2 $\frac{1}{2}$ of wood; those of Nemours, 1 of lime to 2 $\frac{1}{2}$ of soft wood; of Mezières, one of lime to 1.44 of wood; of Montreuil-sur-Mer, charging 150 barrels at once, 1 of lime to 1 of wood. The perpetual kilns of Littry produce 1 of lime with 0.86 to 0.37 of bituminous coal; of Grenoble, with 0.28 to 0.33 of coal; of Brioude, with 0.16 to 0.20 of good coal; and of Namur, with 0.18 of poor coal. The product of the Hastings perpetual kiln was about 1 of lime to 0.30 of best coal. If the full benefit of the fuel were obtained, the consumption should be $\frac{1}{15}$ the weight of dry wood, or of coal $\frac{1}{15}$ of the weight of the lime; but the proportionate measures above given of $\frac{1}{4}$ to $\frac{1}{8}$ are equivalent to $\frac{3}{10}$ to $\frac{1}{10}$ of the weight of the lime. There is still therefore great waste of fuel over the quantity theoretically required. The specific gravity of limestone is reduced by burning from $\frac{1}{4}$ to $\frac{1}{5}$, and the volume by 10 to 20 per cent. A cubic foot of Rüdersdorf lime-

stone, weighing 93 lbs., was reduced by burning to 48 lbs.; and stones weighing 100 lbs. and occupying a space represented by 209, were found after burning to be reduced to 188 in bulk.—Lime for agricultural purposes is produced at a very cheap rate on the west bank of the Hudson, just at the entrance of the highland narrows in Haverstraw. The ledges of limestone form the river cliffs, and against these are built 89 kilns of a capacity to produce daily 250 bushels each of slaked lime, or 125 bushels of quicklime. About 25 are kept in operation, making from 6,000 to 7,000 bushels, which is shipped in bulk on board vessels to be carried along the coast of Long Island sound and to the south as far as southern Virginia. The kilns are built in pairs, each pair discharging into one arch. The fuel is mixed dust and pea coal, costing about \$2 per ton delivered. A ton burns 200 bushels of slaked lime, thus making the cost of fuel 1 cent a bushel. The quarrying and burning, done by contract, cost as much more, beside the charge for steel used in blasting; but the whole expense for the slaked lime delivered on board the vessels lying opposite the mouth of the kilns does not exceed \$2.35 per 100 bushels. It sells readily at \$3.50, which is equivalent to 7 cts. a bushel for the quicklime. It is but little used however in this condition, probably because it is not of uniform quality. Much of the stone yields 92 per cent. carbonate of lime, and makes a hot and strong lime; in burning it crumbles to powder.—The principles of the application of lime to agricultural purposes may be found in Liebig's "Agricultural Chemistry;" and in London's "Encyclopædia of Cottage, Farm, and Villa Architecture" is a description of a kiln of cheap construction which he regards as the best he had ever seen or heard of.—Lime is applied to various other uses beside those named; as in the preparation of chloride of lime (see BLEACHING POWDERS); in the clarification of sugar; the purification of coal gas; removing hair from hides preparatory to tanning; and for numerous other purposes in the arts and manufactures. Reference may be made to the following works respecting its use, beside those named: Hassenfratz, *Traité théorique et pratique de l'art de calciner la pierre calcaire, et de fabriquer toutes sortes de matières, ciments, betons, &c.* (Paris, 1825); *Manuel du chauxfournier* (16mo., Paris, 1836); Vicat, "Treatise on Calcareous Mortars and Cements," translated from the French by J. T. Smith (London, 1837); Dumas, *Chimie appliquée aux arts*, liv. v. chap. viii.; Regnault, *Cours de chimie*, vol. ii. (1849); Burnell, "Treatise on Limes, Cements, Mortars, Concretes," &c. (in Weale's "Rudimentary Series," 1850); Payen, *Chimie industrielle* (1851).

LIME, an exogenous fruit tree of the genus *citrus* (which includes also the citron, lemon, orange, and shaddock), in the natural order *aurantiacea*, with a spherical, succulent, indehiscent, many-partitioned berry (*bacca*), imbricated petals, nearly free stamens, and dotted leaves. It

is the *C. limetta* of Risso. Some botanists have regarded it as only a variety of the citron (*C. medica*, Willd.). The lime grows to the height of about 8 feet, with a crooked trunk having many diffused, prickly branches; its leaves are ovate-lanceolate, almost quite entire, with wingless, simple petioles. The common character of the family to which it belongs is that of low evergreen trees, whose fruits are large berries, round or oblong, and generally of a yellow color. The entire genus has been so long under cultivation, that varieties are better known than the original species. The juice of the fruit of the lime is not so sharp and acid as that of the lemon, but rather inclined to be bitter; it is employed for flavoring punch, sherbet, and other drinks, and it is extensively used on ships as an anti-scorbutic; it contains a large quantity of citric acid. From a variety of the lime called *cedrati* is extracted a much esteemed perfume.

LIME TREE. See BASS OR BARK WOOD.

LIMERICK, an inland county of Ireland, province of Munster, bounded N. by the Shannon, E. by Tipperary, S. by Cork, and W. by Kerry; area, 1,064 sq. m.; pop. in 1851, 262,136. The surface is mountainous in the N. E., S., and S. W., and elsewhere level or undulating. The most important rivers are the Shannon, Maig, Deel, and Mulkern. The prevailing geological formations are limestone, trap, and sandstone; and iron, copper, and lead ores are found. The soil is very fertile, especially along the banks of the Shannon and in the "Golden Vale," a tract which extends from Tipperary W. through the centre of the county. An excellent breed of long-horned cattle is reared here, and cattle raising and dairy farming are the principal branches of industry. Wheat, oats, rye, potatoes, and turnips are extensively grown. The manufactures consist of coarse woollens, lace, paper, flour, and meal; and large quantities of the products of the country are exported. The chief towns are Limerick, Rathkeale, and Newcastle. The county sends two members to the imperial parliament. This county is the most interesting in Ireland to the archæologist, on account of its numerous Cyclopean remains, military earthworks, ancient castles, and ruins of religious houses. (See IRELAND.)—**LIMERICK**, the capital of the preceding county, a city, and a county in itself, is situated on the estuary of the Shannon, in lat. 52° 39' N., long. 8° 39' W., 106 m. S. S. W. from Dublin, with which and with Cork and Waterford it is connected by railway; pop. in 1851, 58,448. It consists of the "English town," built on an island in the Shannon, and the "Irish town" and "Newtown-Perry," on the left bank of the river. These 3 portions are connected by 5 bridges, one of which cost £85,000. Newtown-Perry is filled with handsome modern houses, and is much the most attractive part of the city. The houses on the island are principally in the Flemish style. The chief public edifices of Limerick are the law courts, prisons, custom house, chamber of commerce, exchange, linen

hall, corn and butter markets, assembly rooms, barracks, and hospitals. There are 18 places of worship, of which 6, including a cathedral with remarkably fine bells, belong to the established church, and 7 to the Roman Catholics. The castle of Limerick is even in its ruins a noble structure. The streets, except in the old quarters, are spacious and regular, and the appearance of the town is very bustling and animated. The staple manufactures are now fish hooks, lace, flour, malt liquors, spirits, leather, and iron; linen and gloves were formerly made very extensively, and there are still some establishments for the production of the latter articles, Limerick gloves being renowned for their excellence. Ship building is also a prominent branch of industry. Limerick has an active foreign trade, being next to Cork the chief seaport of Munster. By the grand canal and by railway it has ready communication with the most important towns of Ireland, while its harbor is sufficiently capacious to receive a large amount of shipping, extending nearly a mile along the river, and has a breadth of 150 yards, with from 2 to 9 feet of water at low tide and 19 feet at spring tide. The line of quays extends about 1,600 yards, and there are also floating docks. During the year ending Dec. 31, 1856, the commerce of the port was as follows:

Character.	Entered.		Cleared.	
	Vessels.	Tonnage.	Vessels.	Tonnage.
Foreign	72	21,181	36	9,523
Coasting	874	58,579	308	53,997
Total	446	75,060	424	63,519

The registered shipping of the port comprised 78 vessels with an aggregate burden of 10,836 tons. The city sends two members to the house of commons. Limerick surrendered to the parliamentarians under Ireton in 1651, after a gallant defence, and was the last place in Ireland which submitted to William III. in 1691. A treaty was signed here on the latter occasion guaranteeing to the Irish Roman Catholics certain religious rights, and promising an amnesty to all who took the oath of allegiance. It is the head-quarters of the S. W. military district, and possesses several barracks. Riots among the soldiery took place there in 1857.

LIMESTONE, a generic term for all the carbonates of lime except calcareous spar and chalk. (See LIME.)

LIMESTONE. I. A N. co. of Ala., bordering on Tenn., bounded S. by the Tennessee river, and watered by Elk river and its branches and several creeks; area, 575 sq. m.; pop. in 1850, 16,483, of whom 8,063 were slaves. The surface is hilly, and soil very productive. The rock is limestone, from which the county derives its name. The productions in 1850 were 861,664 bushels of Indian corn, 59,571 of sweet potatoes, 14,809 bales of cotton, and 2,199 lbs. of rice. There were 6 grist mills, 3 saw mills, 1 cotton factory, 27 churches, and 655 pupils attending schools. Capital, Athens. II. A cen-

tral co. of Texas, watered by the Navasoto and several other small streams; area, 850 sq. m.; pop. in 1858, 3,087, of whom 959 were slaves. The surface is undulating; about two thirds of the soil is a fertile sandy loam, the rest being black, sticky prairie. The productions in 1858 were about 4,882,400 lbs. of cotton, 14,700 bushels of wheat, and 303,210 of Indian corn. Capital, Springfield.

LIMITATION, STATUTES OF, laws which provide that certain debts or claims shall not be prosecuted after a certain time. The origin of these statutes, which are now found in every civilized community, was undoubtedly the probability that an old debt had been paid, and the hardship of holding a payer to pay his debt twice over, because, in the lapse of time, he had lost the evidence of his payment. When therefore such a stale debt was brought before a court, the law presumed that it had been paid, without proof. Such a presumption still exists in cases not provided for by the statutes; it being a general rule of the common law of England and America, that there is a presumption of payment of all personal claims, after 20 years have passed without any evidence of acknowledgment by the debtor. But in the year 1624 (21 James I.) it was enacted by the parliament of England, that all actions of account, and all actions upon the case other than such accounts as concern the trade of merchandise between merchant and merchant, all actions of debt on any lending or simple contract, and all actions of debt for rent due, should be commenced and sued within 6 years next after the cause of such actions should accrue. This statute was the foundation of all the statutes of limitation which have been since then enacted in England and in the United States; nor have they varied greatly from it. Divested of technical language, it may be said, that no action can be maintained for any debt more than 6 years old, founded upon a simple contract; by which is meant any contract not created by a sealed instrument or resting on a judgment of court. The exception of actions founded on mutual accounts of trade between merchants is common; and in Massachusetts and Maine there is an exception in favor of a witnessed note of hand, these accounts and notes being barred only by the 20 years' presumption. At the outset, and for some years, or perhaps generations, the courts favored these laws, and construed them liberally against the debt or action. Then, however, the views and practice of courts changed, and they seemed to regard the statutes of limitation as proper objects of dislike, and construed them very liberally in favor of the debt or action. That is, they permitted the defence of the statute to be overthrown by slight and even frivolous evidence of any acknowledgment on the part of the debtor within 6 years; and although they could not say that this made the original debt any younger, and so took it out of the operation of the statute, they did say that the acknowledgment was a new promise, and maintained

the action on this ground. Thus even Lord Mansfield said (Cowper, 548): "The slightest acknowledgment has been held sufficient; as saying, 'Prove your debt and I will pay you;' or 'I am ready to answer, but nothing is due to you;' and much slighter acknowledgments than these will take a case out of the statute." But a few years since wiser views began to prevail. Judge Story said (5 Mason, 523): "I consider the statute of limitation as a highly beneficial statute, and entitled as such to receive, if not a liberal, at least a reasonable construction, in furtherance of its manifest object." These views now decidedly prevail both in England and America. The question, by what rule the statute shall be construed, is in fact the question whether it shall be regarded as a statute of presumption or a statute of repose. If the former, then an action founded upon an old debt is to be barred only because it is probable that an old debt has been paid; and therefore all confessions or acknowledgments, all acts and all words, in any way throwing a doubt on this payment, may be considered as overthrowing the presumption of payment, and maintaining the action. But if it is to be regarded as a statute of repose, then it is founded on the principle that an old debt, whether it have been paid or not, should not now be brought out to disturb relations between the parties which had become settled by time; for a creditor who has been negligent enough to let his debt lie by so long, neither prosecuted nor verified, should lose it, because the peace of society requires that claims which have long slumbered should be considered as dead. Where this view was adopted, it is plain that no mere acknowledgment of an old debt would prevail against the statute; but if the debtor saw fit to make, within the 6 years, a distinct new promise to pay the debt, there was no reason why he might not make it, and none why, if he made it, he should not be held to perform it. So also, if the debtor saw fit to make, within the 6 years, a part payment of the debt, not in full, but as an acknowledgment of the whole debt, it might fairly be regarded as a promise to pay the remainder, and as reviving the balance of the debt. These views at length prevailed so decidedly in England, that in 1828 (9 George IV.), what is there called Lord Tenterden's act was passed; which appeared to be so reasonable, and was found in its operation so useful, that it has been widely adopted in the United States. This statute provides, in substance, that no debt which is barred by the statute of limitation shall be revived by any new promise or acknowledgment, unless that be in writing; but this statute still permits a part payment to revive the debt.—As the law now stands, it may be said that the new promise which revives a debt must not be in words of doubtful meaning, but an actual promise; some of our courts however, it must be admitted, apply the rule, even now, with much laxity. So if there be an acknowledgment, written where that is required,

or spoken elsewhere, it must be a distinct acknowledgment that the debt now exists and is due. It need not acknowledge or promise any precise amount, for evidence may prove this; but it must be sufficiently precise and definite to show that this very debt was in contemplation when the promise or acknowledgment was made. Hence, it is now clear that an acknowledgment which negatives a promise, as "I owe that debt, but do not choose to pay it," does not revive the debt; and it is but an extension of this rule, to say that an acknowledgment so guarded and defined or limited that it cannot be fairly regarded as intended to be a new promise, will not revive the debt. So if the promise or acknowledgment be conditional, as, "when I am able," or "if I recover such a debt," it revives the debt only if the condition be performed. And however full an acknowledgment may be, the debtor may show by the accompanying words or acts (the *res gestæ*, in law phrase) that it was not understood nor intended by the parties as an acknowledgment. So too the acknowledgment or promise must be voluntary.—If part payment is relied upon as reviving the debt, it must be shown, by direct or circumstantial evidence, that the payment was made as a part of a larger debt, and of the debt in controversy; for in the absence of all such evidence it will be presumed that the payment was made as of the whole that was due. A payment, if made in part, revives the debt although it be made by a promissory note or bill of exchange, or by bank bills or coin which turn out to be counterfeit. So, if a debtor owes his creditor several debts, some of which are outlawed (which is a common phrase for barred by time) and some are not, and pays him a sum of money without indicating what debt it shall be applied to, the creditor may apply the payment to the outlawed debts, but cannot, by such part payment, revive the remainder. But if a debt consist of principal and interest, a payment on account of either will take the whole debt from the statute. Tenderden's act, which requires the new promise to be in writing, is now held, in England and in the United States, not to require the evidence of a part payment to be in writing. As a part payment operates as a new promise, it is clear that no part payment can revive a debt, unless it be made not only on account of the debt, but by some one who had authority from the debtor to make it as a part payment, or to bind him by his promise. If the original promise were made by two jointly, it cannot be revived by either so as to bind the other, unless he has (as a partner has if the firm be in existence when the promise is made) a right to promise for himself and the other also. Formerly, the acknowledgment by one revived it as to all, because it removed the presumption of payment. But now that the statute is regarded as one of repose, the rule is as above stated.—It is important to determine when the 6 years begin to run. The general answer is, from the day when the creditor

could have commenced an action for the debt. Thus, if the original promise be on time, or a sale be on credit, or any debt contracted on definite credit, the 6 years do not begin when the debt begins, but when it is payable; that is, when the time or the credit expires. So if a surety pays for his principal, he may make his principal repay him; and his action is not barred when 6 years elapse from the maturity of the debt which the surety paid, but from the time of his payment. If an action cannot be brought until after a demand, it is not barred (or outlawed) until 6 years after the demand is made. But a note on demand may be sued at once, and is always payable; and the 6 years begin to run against it from its date. The 6 years begin to run as soon as the action accrues, although the damage or injurious consequences occur later; as if one is injured by the fault of another, a railroad company for example, the action must be brought within 6 years from the time when the injury occurs, although its consequences, for which the action is in fact brought, were developed at a much later period. If money be payable by instalments, the statute begins to run as to each instalment from the day on which it becomes due; but if there be an agreement that when one is unpaid all shall become due, the statute begins at once to run as to all.—As the statute does not begin to run until an action could be brought, so it does not apply at all against those who could not bring an action, or could not bring it without especial difficulty. The statutes of limitation always contain exceptions to meet these cases. In general, they are substantially the same as the exceptions in the original statute of James, which provides that if the plaintiff, when the cause of action accrues, be within the age of 21 years, a married woman, of unsound mind, in prison, or beyond the seas, he may bring his action at any time within 6 years after the disability is removed; or, as it is commonly expressed, the statute does not begin to run until the disability is removed. In applying this rule, it is held, that if the disability does not exist when the cause of action accrues, or if it exist then and is afterward removed, although but for a short time, so that the statute once begins to run, the statute is not suspended or arrested by a subsequent disability. If several disabilities exist when the cause of action accrues, the statute does not begin to run until all are removed; but if there be one at that time, and afterward but before that one be removed there be other disabilities, the statute begins to run as soon as the first is removed, and is not affected by the subsequent ones. Thus, if one was 20 years old when a debt to him accrued, and before he was 21 went abroad and remained 10 years, he could not bring his action on his return, because the statutory 6 years began as soon as his minority expired. So too, by a later English statute (4 Anne, ch. 16, s. 19), generally enacted here, it is provided that if the defendant be out of reach, as beyond

the seas, when the action accrues, the 6 years do not begin against the plaintiff until the defendant returns. In the application of this rule, the courts of this country remember its reason, and do not permit the 6 years to commence until the defendant returns in such a way as to be accessible. But in England, if he comes back and hides himself for a few days, and then goes abroad again, the 5 years begin from the moment of his return, although he had taken adequate precaution to prevent the plaintiff from knowing it, or finding him. In the United States, instead of the English phrase "beyond the seas," other phrases are used, the most common of which is, "out of the state," and all are held to mean that.—It is sometimes provided that if, after the action accrues, the defendant shall be absent from and reside out of the state, the time of his absence shall not be taken as any part of the time limited for the commencement of the action. Where there is this provision, it has been questioned whether the aggregate of successive and distinct absences can be deducted from the time, or only one single absence. This is determined differently. Thus, in New York, but one single absence is deducted; while in New Hampshire all the absences are.—The statute affects only the remedy for the debt, or the right to recover it by action, but does not affect the validity of the debt. Hence it does not affect any security given for the debt. Thus, if there be a mortgage of land or of goods to secure a note or bond, this mortgage remains in full force, although the 6 years have expired, and no action can be maintained on the note or bond.—Because the law of limitation is a law of remedy and not of right, it affects the method of recovering a debt, but not the debt itself; and therefore, in general, the law of the forum (*lex fori*), or the law of the place where the action is brought, determines the limitation, and not the law of the place where the debt is contracted. Thus if A lives in Massachusetts, and there owes to B a certain debt which will be barred in 6 years, and they both go to Rhode Island, where we will suppose the debt to be barred in 8 years, and after 8 years B sues A in Rhode Island, the law of Rhode Island bars the action, although the law of Massachusetts would not. And we think the converse proposition equally true, although it is not quite so distinctly settled by adjudication. That is, if the limitation be shorter in the state where the debt was contracted, and longer in that to which the parties have come, it is this last law which prevails. In Massachusetts (11 Pickering, 36) it was held that if both parties remain abroad until the debt is wholly barred where it was contracted, and then both come into that state, the creditor may sue the debtor in Massachusetts until 6 years have expired after their coming into that state. The principle seems to be, that 6 years do not bar a debt before any jurisdiction, unless they are 6 years from the time when the creditor might have sued the debtor before that jurisdiction.—These statutes of limitation

apply generally only to simple contracts, and therefore do not affect actions founded on any specialties, as deeds, bonds, or judgments, or any action to recover land. For all of these there is now in this country a very common but not universal limitation of 20 years. Beside these there are, in the several states, and in the United States, various provisions as to other actions, in which there is little uniformity, and of which we could make no useful statement without occupying many pages with the details. Thus, a limited time is given within which actions may be brought against sheriffs, or marshals, or executors or administrators, or for slanderous words, or for personal assaults or trespasses. For some of these actions, and in some of the states, this limitation is very short. Thus in Alabama, an action for words must be brought within one year from their utterance. —One universal exception is made, either by statute or by adjudication, to all limitation; it is by the application of the ancient law maxim: *Nullum tempus occurrit regi*; or in other legal words, no laches (or neglect) is imputable to the king, or in the United States to the state or government. Therefore any rights of action possessed by the state may be enforced by action at any time, so far as the general statutes of limitation might affect them. But in many of the states there are statutes which bar the right of the state after a certain period; as when encroachments on a road have been long permitted. The act of congress of April 30, 1790, limits the prosecution for treason or other capital offence, except murder or forgery, to 3 years next after the commission of the crime, and for offences not capital to 2 years, unless the party accused fled from justice; and there are in many of the states limitations to prosecutions for crime.—The word "limitation" is also used in law in deeds transferring real estate. It means that an estate cannot continue after a certain contingency occurs; the limitation of an estate is therefore the definition or restriction which confines an estate not to a time certain, but to a time which may be rendered certain by the happening of an event; as if an estate be given to hold until from the net proceeds a certain sum shall be made, or until the grantee marries. The distinction between a limitation in a deed and a condition is technical, and sometimes difficult. In general, if an estate is given to be held by the grantee until a specified event shall occur, this is but a limitation; but if it be given only with a proviso, or a condition (that is, with the words, "provided that," or "on condition that"), to the effect that the estate or interest of the grantee shall cease and determine when the event shall occur, this is not a limitation, but a condition.

LIMOGES, a town of France, capital of the department of Haute-Vienne, situated on the right bank of the Vienne, which is here crossed by 8 bridges, 250 m. by the Orleans railway S. by W. from Paris; pop. in 1856, 42,095. It is built on the top and side of a hill, and except in its

older parts has regular streets, with two handsome squares and many fine edifices. The principal public buildings are the cathedral, a Gothic structure of the 13th century, the bishop's palace, the public library, which contains 12,000 volumes, the town hall, the theatre, and the beautiful fountain of Aigoulène. The town also contains a theological seminary, a college, a mint, and several institutions of charity. It has manufactories of woollens, flannel, cotton handkerchiefs, woollen yarn, paper, papier maché, porcelain, and crucibles, and is largely engaged in the book publishing business. The art of enamelling, for which Limoges was distinguished from the 14th to the 18th century, has since declined. A casket of its enamelled work, with singular representations of the culture of the vine, treading the wine press, &c., was presented in 1859 to the archaeological institute of London. The commerce is active in grain, wine, brandy, iron, copper, tin, and kaolin. Fine horses are raised here.—Limoges was the chief town of the Celtic tribe of the Lemovices. It was a place of importance under the Romans, was ceded to the English by the treaty of Breigny, and formed part of the principality of Aquitania under Edward the Black Prince, who in 1370 put 3,000 of its inhabitants to the sword in consequence of a revolt against his authority. Limoges is one of the oldest strongholds of Roman Catholicism in France, having supplied the church with 4 popes and 60 saints, and possessed more than 40 convents before the revolution.

LINAIRE, THOMAS, an English physician and clergyman, born in Canterbury about 1460, died in London, Oct. 20, 1524. He was a fellow of Oxford, studied on the continent, became professor of physic at Oxford, was physician and tutor to the prince of Wales, and physician to Henry VIII. and to the princess Mary. Through his influence the college of physicians in London was founded, and he was its president during life. He also studied divinity, and received various preferments. He was unrivalled as a physician, and as a scholar he ranks with Colet, Lily, Grocyn, and Latimer. His most celebrated works are his Latin translations from Galen, which, in the opinion of Erasmus, "speak better Latin than they ever spoke Greek."

LINCOLN, the name of counties in 6 of the United States. I. A S. co. of Me., bounded S. by the Atlantic and W. in part by the Kennebec river, and drained by Sheepscott, Damariscotta, Musconegus, and St. George's rivers; area in 1850, 950 sq. m.; pop. in 1850, 74,875. A new county, Knox, was formed from parts of Lincoln and Waldo counties in 1860. The soil is productive, but the attention of the inhabitants is principally directed to navigation and the fisheries. It has a sea coast of about 50 m., with many fine harbors. The productions in 1850 were 7,815 bushels of wheat, 154,452 of Indian corn, 84,137 of oats, and 115,410 lbs. of wool. There were 6 grist mills, 84 saw mills, 4 iron foundries, 7 woollen factories, 12 tanneries, 118 churches, 12 academies with 508 pupils,

and 408 schools with 25,757 scholars. Capital, Wiscasset. II. A. S. W. co. of N. C., intersected by the South Catawba, and bounded E. by the Great Catawba; area, 275 sq. m.; pop. in 1850, 7,746, of whom 2,053 were slaves. The surface is undulating and the soil fertile. Gold is found in the E. portion of the county, and iron is abundant. The productions in 1850 were 36,256 bushels of wheat, 274,331 of Indian corn, 506 bales of cotton, and 1,103 lbs. of tobacco. There were 28 grist mills, 17 saw mills, 4 iron foundries, 1 woollen factory, 25 churches, and 68 pupils attending schools. Capital, Lincolnton. III. A. N. E. co. of Ga., bounded N. E. by the Savannah river, which separates it from S. C.; area, 220 sq. m.; pop. in 1850, 5,810, of whom 3,723 were slaves. The surface is hilly and the soil moderately fertile. The productions in 1850 were 204,594 bushels of Indian corn, 32,123 of sweet potatoes, and 5,447 bales of cotton. There were 6 saw mills, 8 tanneries, 14 churches, and 153 pupils attending schools. Capital, Lincolnton. IV. A. S. co. of Tenn., bordering on Ala.; area, 650 sq. m.; pop. in 1850, 23,492, of whom 5,621 were slaves. The Elk river intersects it from E. to W. The surface is undulating, and the soil fertile. It is well watered, the streams affording valuable water power. The productions in 1850 were 1,873,321 bushels of Indian corn, 239,707 of oats, 33,086 of sweet potatoes, and 13,285 lbs. of tobacco. There were 40 grist mills, 11 saw mills, 18 tanneries, 34 churches, and 2,039 pupils attending schools. Capital, Fayetteville. V. A central co. of Ky., drained by Dick's river and its branches, and by the sources of Green river; area, 280 sq. m.; pop. in 1850, 10,093, of whom 3,855 were slaves. The surface is undulating, and the soil fertile. The productions in 1850 were 740,499 bushels of Indian corn, 87,485 of oats, 40,655 lbs. of wool, and 2,000 of tobacco. There were 10 grist mills, 4 saw mills, 6 tanneries, 12 churches, and 775 pupils attending schools. Capital, Stanford. VI. An E. co. of Mo., separated from Ill. by the Mississippi river; area, 576 sq. m.; pop. in 1856, 11,630, of whom 2,609 were slaves. It is drained by the Cuivre or Copper river and its branches, and by the Eagle fork and Big creek. The surface is undulating and the soil fertile. The productions in 1850 were 64,552 bushels of wheat, 567,472 of Indian corn, 70,494 of oats, and 29,434 lbs. of wool. There were 10 grist mills, 2 saw mills, 8 churches, and 1,564 pupils attending schools. Capital, Troy.

LINCOLN, a city and parliamentary and municipal borough of England, capital of Lincolnshire, and a county in itself, situated on the Witham, 120 m. N. from London; pop. in 1851, 17,536. It is irregularly built, is paved, lighted with gas, and well supplied with water. The principal edifice is the cathedral, conspicuously situated on an eminence, and regarded as one of the finest in the kingdom. Its length including buttresses is 516 feet, width 174 feet. There are 3 towers, the central being 270 feet high,

the others 180 feet each. In the principal tower is hung the bell called Great Tom of Lincoln. Among its educational institutions is Christ's hospital, or the blue-coat school, which has an annual revenue of £2,000. Lincoln returns two members to parliament.

LINCOLN, ABRAHAM, an American lawyer and statesman, born in a part of Hardin co., Ky., which is now included in Larnie co., Feb. 12, 1809. His ancestors, who were Quakers, went from Berks co., Penn., to Rockingham co., Va., and from there his grandfather Abraham removed with his family to Kentucky about 1782, and was killed by Indians in 1784. Thomas Lincoln, the father of Abraham, was born in Virginia, and in 1806 married Nancy Hanks, also a Virginian. In 1816 he removed with his family to what is now Spencer co., Ind., where Abraham, being large for his age, was put to work with an axe to assist in clearing away the forest, and for the next 10 years was mostly occupied in hard labor on his father's farm. He went to school at intervals, amounting in the aggregate to about a year, which was all the school education he ever received. At the age of 19 he made a trip to New Orleans as a hired hand upon a flat boat. In March, 1830, he removed with his father from Indiana, and settled in Macon co., Ill., where he helped to build a log cabin for the family home, and to make enough rails to fence 10 acres of land. In the following year he hired himself at \$12 a month to assist in building a flat boat, and afterward in taking the boat to New Orleans. On his return from this voyage his employer put him in charge as clerk of a store and mill at New Salem, then in Sangamon, now in Menard co., Ill. On the breaking out of the Black Hawk war in 1832 he joined a volunteer company, and to his surprise was elected captain of it, a promotion which, he says, gave him more pleasure than any subsequent success in life. He served for 8 months in the campaign, and on his return was in the same year nominated a whig candidate for the legislature; but the county being democratic, he was beaten, though his own election precinct gave him 277 votes and only 7 against him. He next opened a country store, which was not prosperous, was appointed postmaster of New Salem, and now began to study law by borrowing from a neighboring lawyer books which he took in the evening and returned in the morning. The surveyor of Sangamon co. offering to depute to him that portion of his work which was in his part of the county, Mr. Lincoln procured a compass and chain and a treatise on surveying, and did the work. In 1834 he was elected to the legislature by the highest vote cast for any candidate, and was reelected in 1836, 1838, and 1840. In 1836 he obtained a license to practise law, and in April, 1837, removed to Springfield, and opened an office in partnership with Major John F. Stuart. He rose rapidly to distinction in his profession, and was especially eminent as an advocate in jury trials. He did not, however,

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withdraw from politics, but continued for many years a prominent leader of the whig party in Illinois. He was several times a candidate for presidential elector, and as such in 1844 he canvassed the entire state, together with part of Indiana, in behalf of Henry Clay, making almost daily speeches to large audiences. In 1846 he was elected a representative in congress from the central district of Illinois, and took his seat on the first Monday of Dec. 1847. In congress he voted for the reception of anti-slavery memorials and petitions; for motions by Mr. Giddings for committees to inquire into the constitutionality of slavery in the district of Columbia, and the expediency of abolishing the slave trade in the district; for various resolutions prohibiting slavery in the territory to be acquired from Mexico. He voted 42 times in favor of the Wilmot proviso. On Jan. 16, 1848, he offered to the house a scheme for abolishing slavery in the district by compensating the slave-owners from the treasury of the United States, provided a majority of citizens of the district should vote for the acceptance of the proposed act. He opposed the annexation of Texas, but voted for the loan bill to enable the government to defray the expenses of the Mexican war. He voted also in favor of river and harbor improvements, in favor of a protective tariff, and of selling the public lands at the lowest cost price. He was a member of the whig national convention of 1848, and advocated the nomination of Gen. Taylor. In 1849 he was a candidate for the U. S. senate, but the legislature was democratic, and elected Gen. Shields. After the expiration of his congressional term Mr. Lincoln applied himself to his profession till the repeal of the Missouri compromise called him again into the political arena. He entered with energy into the canvass which was to decide the choice of a U. S. senator in place of Gen. Shields, and it was mainly to his exertions that the triumph of the republicans and the election of Judge Trumbull to the senate was attributed. At the republican national convention in 1856, by which Col. Fremont was nominated for president, the Illinois delegation ineffectually urged Mr. Lincoln's nomination for the vice-presidency.—On June 2, 1858, the republican state convention met at Springfield, and unanimously nominated him as candidate for U. S. senator in opposition to Mr. Douglas. The two candidates canvassed the state together, speaking on the same day at the same place. The debate was conducted with eminent ability on both sides, and excited universal interest. In the course of this debate Mr. Lincoln said, in reply to questions from his antagonist: "I do not now, nor ever did, stand in favor of the unconditional repeal of the fugitive slave law. I do not now, nor ever did, stand pledged against the admission of any more slave states into the Union. I do not stand pledged against the admission of a new state into the Union with such a constitution as the people of that state may see fit to make. I do not stand to-day pledged to the

abolition of slavery in the district of Columbia. I do not stand pledged to the prohibition of the slave trade between the different states. I am impliedly, if not expressly, pledged to a belief in the right and duty of congress to prohibit slavery in all the United States territories." He said further in explanation of these answers: "In regard to the fugitive slave law, I have never hesitated to say, and I do not now hesitate to say, that I think, under the constitution of the United States, the people of the southern states are entitled to a congressional fugitive slave law. Having said that, I have had nothing to say in regard to the existing fugitive slave law, further than that I think it should have been framed so as to be free from some of the objections that pertain to it, without lessening its efficiency. And, inasmuch as we are not now in an agitation in regard to an alteration or modification of that law, I would not be the man to introduce it as a new subject of agitation upon the general question of slavery. In regard to the other question, of whether I am pledged to the admission of any more slave states into the Union, I state to you very frankly that I would be exceedingly sorry ever to be put in a position of having to pass upon that question. I should be exceedingly glad to know that there would never be another slave state admitted into the Union; but I must add that, if slavery shall be kept out of the territories during the territorial existence of any one given territory, and then the people shall, having a fair chance and a clear field, when they come to adopt their constitution, do such an extraordinary thing as to adopt a slave constitution, uninfluenced by the actual presence of the institution among them, I see no alternative, if we own the country, but to admit them into the Union. In regard to the abolition of slavery in the district of Columbia, I have my mind very distinctly made up. I should be exceedingly glad to see slavery abolished in the district of Columbia. I believe that congress possesses the constitutional power to abolish it. Yet as a member of congress I should not with my present views be in favor of endeavoring to abolish slavery in the district of Columbia unless it would be upon these conditions: 1, that the abolition should be gradual; 2, that it should be on a vote of the majority of qualified voters in the district; and 3, that compensation should be made to unwilling owners. With these three conditions, I confess I would be exceedingly glad to see congress abolish slavery in the district of Columbia, and, in the language of Henry Clay, 'sweep from our capital that foul blot upon our nation.'" The result of the election was a vote of 125,275 for the republican candidates, who were pledged to the election of Mr. Lincoln, 121,190 for the Douglas candidates, and 5,071 for the Lecompton candidates. Mr. Lincoln had thus a majority of more than 4,000 on the popular vote over Mr. Douglas; but the latter was elected senator by the legislature, in which his supporters had a majority of 8 on joint ballot.—On May

16, 1860, the republican national convention met at Chicago, and on May 18 began to ballot for a candidate for president. The whole number of votes was 465—necessary to a choice, 238. On the first ballot Mr. Seward received 178½, Mr. Lincoln 102, Mr. Cameron 50½, and Mr. Bates 48, while the rest were scattered among several candidates. On the second ballot Mr. Seward had 184½, and Mr. Lincoln 181. On the third ballot Mr. Lincoln had 354, Mr. Seward 110½, Mr. Dayton 1, and Judge McLean ½ a vote. The nomination of Mr. Lincoln was subsequently made unanimous on motion of the chairman of the New York delegation.

LINCOLN, BENJAMIN, an American general, born in Hingham, Mass., Jan. 24, 1783, died there, May 9, 1810. Until the age of 40 he followed the calling of a farmer, holding also at different times the offices of magistrate, representative in the provincial legislature, and colonel of militia. He was also an active member of the 8 provincial congresses of Massachusetts, and as a militia officer displayed an efficiency which procured his promotion in 1776 to the rank of major-general. In this capacity he became favorably known to Washington during the siege of Boston. After the American defeat on Long island he was despatched by the council of Massachusetts to join Washington with a body of militia, and he subsequently participated in the battle of White Plains and other engagements. In the beginning of 1777 he joined Washington at Morristown with a new levy of militia, and soon after, at the suggestion of the commander-in-chief, was transferred to the continental service with the rank of major-general. After serving for several months in New Jersey, he was sent to join the forces assembled to oppose the progress of Burgoyne, and during the battle of Bemus's heights commanded inside the American works. On the succeeding day, while reconnoitring in the vicinity of the enemy's position, he was severely wounded in the leg, and compelled for nearly a year to retire from service. In Sept. 1778, he was appointed to the command of the southern army, and for several months was engaged in protecting Charleston against the demonstrations of Gen. Prevost. Upon the arrival of Count d'Estaing he cooperated with the French troops and fleet in the unsuccessful assault on Savannah; and from the unwillingness of his allies to continue the siege he was obliged to return to Charleston, where in the spring of 1780 he was besieged by a superior British force under Sir Henry Clinton. After an obstinate defence he was forced in May to capitulate, and in November retired to Massachusetts on parole. In the spring of the succeeding year he was exchanged, and immediately joined Washington on the Hudson, and subsequently participated with credit in the siege of Yorktown. In consideration of his merits and misfortunes Washington appointed him to receive the sword of Cornwallis upon the surrender of the British forces. He held the office of secretary of war for two years from

Oct. 1781, and then returned to his farm. In 1787 he commanded the forces which quelled the Shays rebellion in western Massachusetts, and in the same year he was elected lieutenant-governor of the state, which office he held one year. Upon the establishment of the federal government, being in somewhat straitened circumstances, he received from Washington the appointment of collector of Boston, from which office he retired about two years before his death. He was a member of the commission which in 1789 formed a treaty with the Creek Indians, and of that which in 1798 unsuccessfully attempted to enter into negotiations with the Indians north of the Ohio. He was one of the noblest characters of the revolutionary period, and possessed the regard of Gen. Washington and of many other eminent men.—See life by Francis Bowen in Sparks's "American Biography" (3d series, vol. xiii.).

LINCOLN, JOHN LARKIN, LL.D., an American scholar and author, born in Boston, Feb. 23, 1817. He was graduated in 1836 at Brown university, where, after two years' residence at the Newton theological institution, he held the office of tutor in Latin for two years, and then passed several years in Europe in travel and literary studies. In 1844 he returned to the United States, and in the autumn of that year was appointed to the professorship of the Latin language and literature in Brown university, which he still retains. He is well known as a writer on classical and literary subjects in reviews and periodicals, and has published "Selections from Livy" (1847) and the "Works of Horace" (1851) for schools and colleges.

LINCOLN, I. LEVI, an American lawyer and statesman, born in Hingham, Mass., May 5, 1749, died April 14, 1820. His father, a farmer of Hingham, was prominent in local politics, but was unable to bestow any special advantages of education on his son, who was early intended for a mechanical employment. During his apprenticeship, his tastes led him to seek literary instruction, and to devote his leisure to the study of the Latin and Greek languages, and soon gained for him the encouragement of competent friends. He entered Harvard college in 1768, where he was graduated in 1772 with reputation for scholarship. He was a student at law under Joseph Hawley of Northampton when the battle of Lexington occurred, and immediately marched as a volunteer with the minute men to Cambridge. Admitted to the bar in the same year (1775), he commenced practice in Worcester, and his decision of character, energy, probity, and popular address soon gave him eminence. He had an extensive business, was zealous in the cause of independence, and was the author of numerous patriotic appeals, and between 1775 and 1781 was successively clerk of the court and judge of probate of Worcester county. In 1779 he was specially commissioned to prosecute the claims of government to the large estates of the refugees confiscated under the absentee acts, and was commissioned

to expedite the payment of the continental tax. He was a delegate to the convention in Cambridge for framing a state constitution, and in 1781 was elected by the legislature, under the confederation, representative to the continental congress, an honor which his professional engagements compelled him to decline. In 1796 he was a member of the house of representatives, and in 1797 of the senate of Massachusetts. In 1800 he was elected a representative to the national congress, and soon after taking his seat was invited by President Jefferson to become a member of his cabinet as attorney-general of the United States; and he was provisional secretary of state during the few months preceding the arrival of Mr. Madison. Upon the reelection of Jefferson, his private interests constrained him to retire from office, and his letter of resignation was received with reluctance. "You carry with you," wrote Jefferson, "my entire approbation of your official conduct, my thanks for your services, my regret on losing them, and my affectionate friendship." In 1806 he was elected a member of the council of Massachusetts; in 1807 and 1808 he was lieutenant-governor of the commonwealth; and on the decease of Gov. Sullivan in Dec. 1808, he discharged the duties of chief magistrate from that time till the following May. In 1811 he was appointed by President Madison, without previous suggestion, an associate justice of the supreme court of the United States. Weakness of sight, which terminated in almost total blindness, rendered it necessary to decline this station, though the president pressingly urged his acceptance, and to retire from public life. A partial restoration of vision afterward enabled him to resume the cultivation of his farm and his classical studies, both of which were to him objects of passionate attachment; and with them he alleviated the infirmities of advancing years. He was one of the original members of the American academy of arts and sciences, sustained distinguished relations to other literary institutions, and from the close of the revolution to the commencement of the present century was reputed to be the head of the Massachusetts bar. In 1781 he married a daughter of Daniel Waldo, an eminent merchant of Boston, by whom he had 7 children, several of whom rose to distinguished stations. II. LEVI, LL.D., eldest son of the preceding, an American lawyer and statesman, and governor of Massachusetts, born in Worcester, Mass., Oct. 25, 1782. He was graduated in Harvard college in 1803, began immediately to study law in the office of his father, then attorney-general of the United States, and was admitted to the bar in 1805. He began to practise in Worcester, where he has since resided, and entered at once upon a highly successful professional career, being at the same time connected with the military of the commonwealth and with the political agitations of the time. Between 1812 and 1822 he was elected several times to both branches of the state legislature, was speaker of the house in

1822, and was a prominent member of the party which sustained Mr. Jefferson. In 1814 he entered warmly into the debate in opposition to the Hartford convention, and drew up the protest against that body, which was signed by 75 other members of the legislature and was widely circulated. In 1820 he was a member of the convention called to revise the constitution of Massachusetts. In 1824 he was appointed to the bench of the supreme court by Gov. Eustis. In 1825 he was selected by both the political parties as their candidate for governor of the state, and was elected with great unanimity by the people. He is believed to have been the first governor, under the constitution, who exercised the veto power. The measure which he vetoed was an act for building a new bridge between Boston and Charleston, thereby destroying the value of the existing franchise of the Charles river bridge, and a violation, as Gov. Lincoln believed, of the plighted faith of the commonwealth. In 1834 he was elected to succeed John Davis as representative in congress, and was again chosen to the 25th and 26th congresses. On the accession of Gen. Harrison to the presidency (1841), he was appointed to the office of collector of Boston, which he held till Sept. 1843. In 1844 and '45 he was again a member of the state senate, of which body he was president in the latter year. His last public office was as presidential elector in 1848, when he presided over the electoral college, excepting that upon the organization of his native town as a city he became its first mayor. He has long been an active member of the American antiquarian society, of the American academy of arts and sciences, and of the Massachusetts historical society. III. ENOCH, brother of the preceding, an American lawyer and statesman, governor of the state of Maine, born in Worcester, Mass., Dec. 28, 1788, died in Augusta, Me., Oct. 11, 1829. He entered the sophomore class of Harvard college in 1806, subsequently received the degree of master of arts from Bowdoin college, studied law with his brother Levi at Worcester, and was there admitted to the bar in 1811. He began practice in Salem, but removed in 1812 to Fryeburg in Maine, a beautiful region, high up on the bend of the Saco, within view of the White mountains. In 1816 he published "The Village," a poem descriptive of the scenery and romance of this forest town, and of the social condition of the population of the territory. The aboriginal inhabitants and their ancient haunts yet remaining in the neighborhood had special attractions for him, and long continued to be visited by him and to be the subject of his researches. He delivered a poem at the centennial celebration of the fight of Lovewell's pond; and he also made an imitation of a Penobscot song in welcome of the French, whom he always considered to have been the truest friends of the Indians. The first volume of the Maine historical collections contains valuable papers left by him on the Indian languages and the French missions in

Maine. In 1819 he removed from Fryeburg to the neighboring shire town of Paris, where he extended his professional practice and reputation, and he represented the district of Oxford in the national congress from 1819 till 1826. In the following year he was elected governor of Maine, to which office he was 3 times reelected with hardly any opposition. His proclamations were marked by a peculiar felicity and terseness of expression, and his official correspondence embraced an energetic vindication of the rights of the state in the question of the north-eastern boundary. Before completing his last gubernatorial term he declined being again a candidate, intending to live in retirement, devoted to agriculture, to the study of the classics and the natural sciences, and to literary avocations, especially to the completion of a work on the history, resources, and policy of Maine, for which he had collected many materials, and which was left unfinished in manuscript. He was through life an enthusiastic lover of rural nature. His last public performances were an oration at the ceremony of laying the corner stone of the capitol at Augusta (July, 1829), and an address at the establishment of the female seminary in that city. Suffering from illness, the performance of the latter task exhausted his strength, and he died within a few days, and was buried in front of the capitol with civil and military honors.

LINCOLNSHIRE, an E. co. of England, bounded N. by the Humber and its estuary, E. by the German ocean, S. by the counties of Cambridge, Northampton, and Rutland, and W. by those of Leicester, Nottingham, and York; area, 2,888 sq. m.; pop. in 1851, 407,222. Much of the surface is flat and low, a large portion lying below the level of the sea, from which it is protected by embankments. Since the Roman occupation vast tracts of this fenny district have been from time to time reclaimed from the sea, and constitute some of the most productive land in Great Britain. (See BEDFORD LEVEL.) The principal rivers are the Trent, Witham, Welland, and Ancholme. The soil of the fens consists chiefly of a deep loam, clay, and peat; elsewhere it is generally a rich sandy loam. The county is celebrated for the high condition of its agriculture, and for its fine breeds of cattle, horses, and sheep, as well as for the number and beauty of its ancient parish churches. It returns 4 county members to parliament. Capital, Lincoln.

LIND (GOLDSCHMIDT), JENNY, a Swedish vocalist, born in Stockholm, Oct. 6, 1821. From infancy she manifested a remarkable talent for singing, and her parents, who were in moderate circumstances, and by profession teachers of youth, were urged to allow her to be educated for the stage. At the earnest solicitation of their daughter and of Mme. Lundberg, an actress at the Stockholm theatre, they gave a reluctant assent; and by the influence of Count Pücke, the manager of the court theatre, to whom Croelius, a music teacher of Stockholm, had introduced her, Jenny gained admission

when about 9 years of age to the musical academy. Here she made such progress that at the end of a year she was deemed fitted for the stage, on which she soon made her appearance in juvenile parts, showing dramatic talents not less remarkable than her vocal accomplishments. For two years she performed to the delight of Stockholm audiences, and was giving promise of great lyric triumphs, when the upper notes of her voice became clouded and harsh, and the idea of preparing her for the grand opera was abandoned. For 4 years she remained in obscurity, forbidden to exercise her voice, and finding her chief enjoyment in studying instrumental music. When she was about 16 years of age, accident brought her upon the stage one night temporarily to assume a short and unimportant part in one of Meyerbeer's operas, and to her delight she discovered that her voice had returned to her with more than its former purity and power. The next day she was invited by the manager of the opera to assume the part of Agatha in Weber's *Freischütz*, and for upward of a year and a half she was the reigning prima donna of the Stockholm opera. Feeling, however, that her voice was not under sufficient control to enable her to take her position as a first-rate singer, she went about 1840 to Paris, and put herself under the instruction of Garcia, then the first singing master in Europe. He gave his pupil little encouragement, and although she made astonishing progress under his hands, and manifested an unusually intelligent appreciation of music, he never anticipated the triumphs she subsequently enjoyed. About a year after her arrival in Paris, however, she was introduced to Meyerbeer, in whom she found a cordial and appreciative admirer of her talents, and from whom she subsequently received an invitation to sing in the opera at Berlin. She made her reappearance upon the stage in her native city, and in 1844 first sang before a Berlin audience at the opening of the opera house, as Vielka in Meyerbeer's "Camp of Silesia." Thenceforth her reputation seemed to increase with every performance, and in Vienna and other influential musical cities she was received with great enthusiasm. In May, 1847, she made her début before a London audience as Alice in the opera of *Robert le diable*, and excited a sensation almost without a parallel in the history of the opera in England. During this season she also appeared as Marie in *La fille du régiment*, Amina in *La sonnambula*, Norma in the opera of that name, and Agatha in *Der Freischütz*. For the next 3 years she appeared repeatedly in England, Germany, and Sweden, adding meanwhile to her parts those of Lucia di Lammermoor, Adina in *L'elisir d'amore*, Susanna in the *Nozze di Figaro*, and Elvira in *I Puritani*, and showing her versatile powers in oratorios and miscellaneous concert music. In Sept. 1850, being then in the zenith of her fame, she arrived in the United States, in which she had been engaged by Mr. P. T. Barnum to make an extended professional tour, to

embrace 150 concerts. Her first concert in New York, given shortly afterward, excited an enthusiasm bordering on the wildest extravagance. The first ticket sold brought several hundred dollars, and the remaining ones commanded prices unprecedented in America. Her share of the receipts, amounting to \$10,000, was bestowed in local charities. A similar excitement attended her appearance in other cities, until, wearied by ceaseless demands upon her time, patience, and voice, she availed herself in June, 1851, of an article in her agreement with Mr. Barnum, and terminated her engagement after the 95th performance. She subsequently gave a series of concerts on her own account, and in Feb. 1852, was married in Boston to Mr. Otto Goldschmidt, a young pianist who had accompanied her during a part of her tour, and with whom she soon after returned to Europe. For several years she resided with her husband in Germany, rejecting all proposals for her reappearance upon the stage, but singing occasionally in concerts. In 1858 she removed to England, where she is now living. Her voice, a soprano, embracing a register of 2½ octaves, is not less remarkable for sweetness and purity of tone than for its sympathetic power. Her execution is equally remarkable, and in the interpretation of many varieties of music, from the oratorios of Handel to the rondos of Rossini or Donizetti, or simple national ballads, she is probably without a rival among living singers, her success being due, according to the composer Benedict, to the fact "that she makes a conscience of her art." Her private character is spotless, and her benefactions are on a princely scale. She is known to have bestowed \$50,000 in charities during her visit to the United States, and like sums in England and Sweden, beside large amounts for various private objects.

LINDE, SAMUEL GOTTLIEB, a Polish philologist, born in Thorn in 1771, died in Warsaw, Aug. 8, 1847. He was of Swedish extraction, studied at Leipsic, took part in the revolutionary war under Kosciuszko, lived subsequently for some time in Vienna, and in 1808 established himself in Warsaw. He held various literary offices under the numerous governments to which that part of Poland was successively subjected, and retired into private life in 1838. His fame rests on his "Dictionary of the Polish Language" (6 vols., Warsaw, 1807-'14), one of the greatest works of its kind, though his exclusive right to its authorship is with some a matter of doubt.

LINDEN. See BASS OR BARK WOOD.

LINDENAU, BERNHARD AUGUST VON, a German astronomer, born in Altenburg, June 11, 1780, died May 21, 1854. In 1808 he was appointed director of the observatory at Seeberg, near Gotha. Subsequently he was for many years in the civil service of the duke of Saxe-Gotha; and in 1843 he retired from public life, and devoted himself to his favorite studies. He published "Barometrical Tables for facilitating the Calculation of Levellings and of

Measures of Height by the Barometer" (1809); *Tabula Veneris* (1810); *Tabula Martis* (1811); "History of Astronomy during the first Ten Years of the Nineteenth Century" (1811), &c. He also edited or contributed to the *Zeitschrift für Astronomie* and other scientific periodicals.

LINDLEY, JOHN, an English botanist, born at Catton, near Norwich, Feb. 5, 1799. His father cultivated a large nursery garden in Catton. At an early age the son published a variety of papers and monographs on botanical subjects, some of which appeared in the "Transactions" of the Linnæan society and in Hooker's *Flora Scotica*. About 1821 he settled in London, where for many years he was employed in writing the descriptive portion of Loudon's "Encyclopædia of Plants," published in 1829. According to the testimony of the editor, the botanical merits of the work belong principally to Lindley, who "determined the genera and the number of species to be arranged under them; prepared the specific characters, derivations, and accentuations; either wrote or examined the notes; and corrected the whole while passing through the press." While engaged upon this work, the arrangement of which was according to the artificial system of Linnæus, he became a decided convert to the natural arrangement, and in 1830 published his "Introduction to the Natural System of Botany," in which its uses and advantages are presented at length. This was followed in 1832 by his "Introduction to Systematic and Physiological Botany," and "Synopsis of the British Flora," and in 1833 by his *Nexus Plantarum*, in which the author undertook to reduce the natural orders into groups subordinate to the higher divisions. In 1846 appeared his "Vegetable Kingdom," an expansion of a work previously published under the title of "A Natural System of Botany," which in its turn was remodelled from the "Introduction to the Natural System of Botany." The "Vegetable Kingdom" is considered the most comprehensive work on the structure and uses of known plants yet published, and it has passed through several editions. Previous to the appearance of this work he published *Flora Medica* (8vo., 1838), in which full descriptions of the plants used in medical practice are given; and in conjunction with Mr. Hutton the "Fossil Flora of Great Britain," which was commenced in 1833, and published in parts. He is also the author of a number of popular treatises on botany, including "Ladies' Botany," in a series of letters; "School Botany and Vegetable Physiology," &c. The practical aim of his studies is evinced in his "Theory and Practice of Horticulture," which has passed through several editions and is highly esteemed by horticulturists, in his "Orchard and Kitchen Garden," and in his contributions to the "Gardener's Chronicle," a weekly journal, which he has edited since 1841. In the department of pomology he has published *Pomologia Britannica* (8 vols. royal 8vo., 1841), a work of great value. Since 1829 he has filled the chair of botany in

University college, London, and has lectured on his favorite science at the royal institution, and at the botanic gardens, Chelsea. He is a fellow of the royal society, and a member of the chief botanical societies of Europe and America.

LINDPAINTNER, PETER JOSEPH VON, a German composer, born in Coblenz in 1791, died in 1856. He was for many years leader of the orchestra of Stuttgart, which by his efforts became one of the best of Germany. Among his principal works are the operas of "The Sicilian Vespers" and "The Vampyre."

LINDSAY, ALEXANDER WILLIAM CRAWFORD, lord, a British author, born Oct. 18, 1812. He is the eldest son of the earl of Crawford and Balcarra, and was educated at Trinity college, Cambridge. Having made an extensive tour in the East, he published in 1838 "Letters from Egypt, Edom, and the Holy Land" (5th edition, with additional notes by the author, 1868, in Bohn's "Illustrated Library"). This was succeeded by a "Letter to a Friend on the Evidence and Theory of Christianity," and "Progression by Antagonism, a Theory involving Considerations touching the Present Position, Duties, and Destiny of Great Britain," the latter an enunciation of the new philosophical views adopted by the author. His most important work, however, is his "Sketches of the History of Christian Art," published in 3 vols. in 1847, in which he takes a survey of the various pagan and Christian schools of art, traces the development of the latter through their successive stages, and defines the distinctive character of the symbolisms of Christian art. The work contains also a full classification of schools and artists. It is written with considerable learning, and in passages rises to a high degree of eloquence. His subsequent works have been "Lives of the Lindsays" (3 vols. 8vo., 1849), a family history, but full of interest, and written with much animation; and a defence of the claim of his branch of the family to the ancient earldom of Crawford. In the latter part of 1858 he published a letter defending the aristocracy from the strictures of Mr. John Bright.

LINDSAY, or LYNDSEY, SIR DAVID, a Scottish poet, born in Garmylton, Haddingtonshire, about 1490, died at some date between 1555 and 1567. He was sent upon various embassies, and in 1548 negotiated free trade in grain with Denmark. He early incurred the hatred of the clergy by his satires, was in 1547 one of those who urged Knox to receive ordination, and his name was long popular as a Protestant champion. His principal poems are the "Dreme," "Testament and Complaynt of our Sovereign Lordes Papingo," "Complaynt of John the Commonweill," "Historie of Squyer Meldrum," the "Monarchie," and "Satyre on the Three Estaitis," a play directly attacking the clergy, constructed on the principle of the mysteries or miracle plays of an earlier age. According to Hallam, he displays accomplishments and scholarship superior to those of Skelton, and a more reflecting and philosophical mind than Dunbar.

Many of his productions are indecent and severely satirical. The latest edition of his works, with a life, introduction, and glossary by George Chalmers, appeared in London in 1806, in 8 vols.

LINDSEY, THEOPHILUS, an English theologian, born in Middlewich, Cheshire, June 20, 1723, died in London, Nov. 3, 1808. He was educated at St. John's college, Cambridge, received orders, and held various preferments. In 1769 he formed an intimacy with Dr. Priestley, then Unitarian minister at Leeds, the result of which, combined with doubts which he had long previously entertained, was that Lindsey surrendered his living in 1773, and made public profession of Unitarianism. He now proceeded to London, and in April, 1774, began to officiate as a Unitarian minister in a room in Essex street. After 4 years his congregation erected a chapel for him, where he continued till age and failing health compelled him to resign in 1793. Among his writings are an apology for his abandonment of Anglicanism, and several controversial and historical writings on Unitarianism. A memoir of his life, by the Rev. Thomas Belsham, was published in London in 1812.

LINDSLEY, PHILIP, D.D., an American clergyman and educator, born in Morristown, N. J., Dec. 21, 1786, died in Nashville, Tenn., May 25, 1855. He was graduated at the college of New Jersey in Princeton in 1804, and about 1807 became a candidate for the ministry in the Presbyterian church, and Latin and Greek tutor in Princeton college. While holding this office he devoted himself to the study of theology, and in April, 1810, was licensed to preach. After preaching in various places for two years, he returned in 1812 to Princeton in the capacity of senior tutor in the college, and in 1813 was appointed professor of languages and secretary of the board of trustees. In 1817 he was twice chosen president of Transylvania university, Ky., but in both instances declined the office, and in the same year he was ordained *sine titulo* by the presbytery of New Brunswick, and was also elected vice-president of Princeton college. After the resignation of Dr. Green in 1822 he was for one year the acting president, and in the succeeding year he was chosen president of Cumberland college, Tenn., now the university of Nashville, and also of Princeton college, both of which appointments he declined. After refusing to entertain overtures concerning the presidency of Ohio university at Athens, he was again offered the presidency of Cumberland college, and was finally induced to make a visit to Nashville, the result of which was his acceptance of the office in 1824. This decision was contrary to his own wishes and to those of his friends in New Jersey; but the representations of the benefit which his efforts would be likely to confer in this new field of labor proved superior to any considerations of personal comfort, and in the latter part of 1824 he removed with his family to Nashville, where for more than a quarter of a century he labored earnestly and

efficiently in the interests of education. Such was the extended reputation he enjoyed throughout the southern and western states as an educator, that during this interval he was offered the presidency of other colleges more frequently perhaps than any other man who has lived in the United States. In addition to the instances mentioned, he declined offers from Dickinson college, Penn., in 1824 and again in 1829; from Washington college, Lexington, Va., in 1829; from the university of Alabama, at Tuscaloosa, in 1830; from the university of Pennsylvania, of which he was chosen provost, in 1834; from the college of Louisiana, at Jackson, in the same year; from South Alabama college, at Marion, in 1837; and from Transylvania university in 1839. In May, 1834, he was also unanimously elected moderator of the general assembly of the Presbyterian church, then holding its sessions at Philadelphia. In Dec. 1850, he became professor of ecclesiastical archaeology in the New Albany theological seminary, which office he held until April, 1853, when he retired. A few weeks before his death he visited Nashville as commissioner of the presbytery to the general assembly, and while there was stricken with paralysis, of which he died two days after the attack. According to the testimony of Dr. Maclean, president of Princeton college, he possessed in a remarkable degree the faculty of imparting to his pupils his own ardor, and taught them to give close attention to grammatical niceties as well as to the style and sentiment of the authors they studied. As a classical scholar he was one of the most accomplished in the country; and to his acquaintance with Homer, Aristotle, and Longinus may be traced some of the characteristics of his own style. A volume of his educational discourses, the first of a series containing his complete works, with a biography, has recently been published (8vo., Philadelphia, 1859).

LINEN (Gr. *λίνον*, Lat. *linum*, flax, linen), a fabric made of flaxen threads. The manufacture is very ancient, and no record is preserved of its early history. It was old in the time of Herodotus; and in his day linen was exported from Egypt to the ports of the Mediterranean. The ancient Egyptians, celebrated for their textile products, not only consumed the fabric largely for their own uses, but supplied it to foreign markets. Its use was particularly connected with their religious and funeral services. The priests were forbidden to enter the temples robed in other than linen garments, and the dead were always shrouded in this material. It has indeed been questioned whether the bandages of the mummies are not of cotton; but from the microscopical examinations of Dr. Ure, Mr. James Thomson, cotton manufacturer, and Mr. Bauer of Kew, England, it appears that the threads have the jointed cylindrical form of the flaxen fibre, and not the flat and spirally twisted shape of the fibre of cotton. The inner wrappings of the mummies are of coarse texture, but the outer are much finer. Some of the

work of the rude looms of the ancient Egyptians was extremely delicate; and it is probable that the "fine linen" mentioned in Scripture would compare favorably with that produced by the most perfect machines of the present time. In the British museum are specimens of mummy cloths thin and transparent like the muslins of India. Some of these even contain 270 threads to an inch in the warp, and 110 in the woof, while the finest work of the Decca looms has only 100 threads to an inch in the warp and 84 in the woof. In all the Egyptian linens the number of threads in the warp is much greater than of those in the woof, owing to the difficulty of working in the latter when the shuttle was thrown by hand. The coarser fibres of the flax appear to have been employed by the Egyptians for nets, ropes, and sail cloth. The Greeks obtained linen from Egypt, and adopted for it the name of *σάβη* applied in that country to fine linen, as also the more general term *σινδών*; but as the cotton of India came to be also introduced into Greece, the names appear to have been applied to this product also; and finally the term *βυσσος*, byssus, supposed to be of similar origin and to designate the plant which produced the linen, came to be used with the same ambiguity. But this last word, of frequent occurrence in the Greek classics, is most commonly applicable, it is supposed, to fabrics of linen rather than to those of cotton. So Josephus used it in speaking of the garments worn by the Jewish priests; and several of the early fathers speak of byssus as an Egyptian plant, while cotton is known to have been chiefly of Indian growth. In both the Old and New Testaments the use of linen garments, by the priests particularly, is often alluded to; and the fibre, we are told, was applied to the manufacture of cords, lamp wicks, and measuring lines. From this last use of the material, *linum*, comes the word *linea*, line, as explained by Isidorus of Seville: *Linea genere suo appellata, quia ex lino fit*. Linen was in high repute among the more wealthy Romans, and it is recorded in the life of Alexander Severus, by *Ælius Lampridius*, that this emperor preferred that which was plain to such as was interwoven with flowers, feathers, and gold; and the emperor Carinus is stated to have extolled in high terms the linen cloths brought from Egypt, and those from Tyre and Sidon, transparent from their thinness, glowing with purple, and most precious for the perfection of their embroidered work. Pliny mentions the cultivation of flax in Elis in Greece, and describes the method of gathering, treating it by drying and steeping, again drying, then beating it, and finally combing it with iron hooks; processes similar to those now in use, and already described under *FLAX*. Pliny also refers to the production of flax in Spain and other parts of Europe, and states that in all parts of Gaul it was woven into sail cloth, and that in some of the countries beyond the Rhine the most beautiful apparel of the women was linen. For the culture of the crop in modern times see

the article *FLAX*, in which is also described the treatment to which the fibre is subjected until it is made into slivers for spinning. It was not until the machine processes of spinning and weaving cotton had been for some time in successful operation, that similar improvements were applied to the manufacture of linen. The spinning wheel and hand loom were universally employed throughout the linen districts of Europe even into the present century, affording to the females of every family the means of a most useful and genial occupation. In the quality of the fabrics the highest excellence was attained by the French and Belgians, and among commercial products the linen of Flanders and the north of Europe long maintained a high rank. Ireland, too, was celebrated for the general diffusion of the manufacture, especially among the families of the province of Ulster, and the heavy linens of that country in the form of table cloths and sheeting have long held an important place in the general trade in this fabric. Near the close of the last century the first mills in England for spinning flax were erected in Darlington, upon plans which the French claim as having devised, though afterward, as they admit, greatly perfected by the English. This enterprise was soon followed by the establishment of other mills, and the British manufacture at last became more extensive than that of other nations. It attained the greatest prosperity in Ireland, where the manufacture is more extensively carried on than in any other country, owing, as it is asserted, to its climate being best adapted for successfully prosecuting the linen bleaching—a process much more difficult and tedious than that of bleaching cotton, conducted very much in the open air, and dependent in great measure upon the condition of the atmosphere. The machine processes of weaving and spinning are not very different from those for cotton already described. To make the slivers into yarn for thread, the tin cans containing them are brought to a drawing or spreading frame, and several slivers are united into one and drawn out, a process which may be several times repeated, as in the preparation of the cotton yarns. The drawings are then slightly twisted upon a roving frame, and wound upon bobbins to be ready for spinning. For the finer fabrics it is found necessary to increase the pliability of the fibres by keeping them moist. This is effected by means of a trough of warm water, which is arranged along the spinning frame, so that the spindle by its rapid motion shall cause a fine spray to be constantly thrown up from the surface of the water. The yarns thus prepared do not equal in fineness some of those made by hand. They are rated at so many "leas" of 300 yards each to the pound; in 1889 a common maximum was 150 to the pound, but recently they are spun of 200 to 240 leas. Such yarn is employed for Irish lawns and coarse cambrics. The finer fabrics of cambric and valenciennes require hand-spun yarns. At the great exhibition of 1851, a

specimen spun by Jane Magill, 84 years of age, was the finest (760 leas); and one by Ann Harvey of 600 leas was the most perfect in quality and spinning. To each of these a premium of £10 was awarded. The yarns are assorted into bundles, which are made up each one of 20 hanks of 10 leas each, and their quality is indicated either by naming the number of leas to the pound, or the direct weight of the bundle itself, an 8 pound bundle being one of 25 leas to the pound, and a 2 pound bundle one of 100 leas to the pound. To make linen thread, the yarns are doubled, and after bleaching the thread is wound into balls or upon spools.—In former times the sale of brown manufactured linens was conducted in the market towns (especially in Ulster) in halls set apart for the purpose; and in Armagh, Ballymena, Coleraine, Ballymony, and Lurgan the practice is still continued. These sales, however, are only of hand loom goods, the power loom productions being sold direct to the merchants. The great business in these is conducted by private contracts, and through the agency of commission houses in Belfast; and to such an extent has it increased, that a single establishment now makes little of furnishing 2,000 or 3,000 pieces of linen a week, when 50 years ago such an amount would have served the largest works for a whole year. The prices are said to be very difficult to quote, owing to the great variety of "sets" representing the fineness and the variety in the yarns used for the "set." Each large firm has its own standard of rates. The brown linens when purchased are chiefly sent to the bleach greens, where they are boiled in a lye of soda ash, and then spread to dry for 2 or 3 days upon the grass. These processes may be repeated several times until the goods are half white. (See BLEACHING.) The straw of the flax, which cannot be perfectly extracted in the scutching and cleaning, now shows itself more plainly. To remove this the goods are soaked in a bath of water containing an alkaline chloride, as of soda, and are treated, either after or before this, with dilute sulphuric acid of 2° or 3° Twaddell. The "rubbing" succeeds, which is a thorough washing by machinery, with the use of plenty of soap. When the linen is quite white it is starched, and afterward dried on steam-heated rollers. It is then ready for the "finishing" process, which is effected by machines called "beetles," or by the patent method of spreading the linens on frames in a stove house, and while they are gently stretched and carefully handled upon these exposing them to a current of air which is made to pass continually over them. A finish is thus obtained like that of linen pocket handkerchiefs. The whole time required for bleaching is from 4 to 7 weeks, according to the season and the weight of the fabric. The extreme whiteness given to some linens is often at the expense of their strength, the material being partially worn out in the operation. A fair, even shade, attainable by all intelligent bleachers, ought to suffice if it be de-

sirable to produce the best quality of goods. Linens that are not to be bleached are either finished brown, or are colored before finishing; and some are partly bleached and dyed. Many goods have lately been first bleached and then printed with fancy patterns.—Yarns, thread, and the woven fabric are all largely exported from Great Britain. In 1853 the exports of yarns were 22,893,586 lbs., valued at £1,154,977; in 1854, 17,696,567 lbs., valued at £944,502; and in 1855, 17,872,950 lbs., valued at £916,429. Of thread in the same years the value of the exports was £388,874, £315,685, and £298,819; and of linen, not including thread lace, £4,345,600, £3,769,107, and £3,808,487. Of thread lace in the same years the exports were of the value of £8,267, £7,296, and £4,451. The exports of British and Irish manufactures in the year ending Dec. 31, 1858, comprised 122,561,748 yards of linen cloths of all kinds and cambrics, valued at nearly £4,000,000; linen thread, 8,177,251 lbs., valued at £822,000; and linen yarn, 81,911,793 lbs., valued at £1,700,000. The principal seats of the manufacture in Great Britain are in and near the west riding of Yorkshire, in Lancashire, Dorsetshire, Durham, and Shropshire, in Dundee in Scotland, and Belfast in Ireland. The manufacture of linen was introduced into the United States by the establishment of a large mill in 1834 at Fall River, Mass., which has since continued in operation. The imports of bleached and unbleached linens into the United States in the year ending June 30, 1859, were valued at about \$9,000,000, of which \$6,000,000 worth was from Belgium, about \$2,000,000 from Scotland, \$500,000 from Ireland, and the rest from other countries.

LING, a European fish of the cod family, *Lota lota* (Ouv.). The body is elongated, the head flat, the gape large, the lower jaw the shorter with a single barble at the extremity; teeth in the upper jaw small and very numerous, a single larger and longer row below; scales small and firmly adherent; the dorsal fins of equal height, the first short but not pointed as in the hake, the second long, immediately behind the first, reaching nearly to the caudal, and most elevated posteriorly; anal nearly coextensive with the dorsal, and caudal rounded. The back and sides are gray, inclining to olive; the belly silvery; ventrals white, and dorsal and anal edged with the same; caudal marked near the end with a transverse black bar, and the extreme tip white. This is a very valuable species, and is caught in great numbers on the English and Irish coasts by hand and long lines; it is consumed fresh and salted, and is largely exported to southern Europe, forming an article of commerce almost as valuable as codfish; the sounds, roes, and oil from the livers are valuable, the latter for use in lamps and as an internal medicine in rheumatism. It is very prolific and voracious, feeding on any living thing coming in its way. The best time for the fishery is between January and August, and the favorite resorts are the margins of rocky valleys in the

ocean; it bites eagerly, and is readily caught. The usual length is about 3 or 4 feet.—Another species of *Iota*, inhabiting the lakes and rivers of America from northern New York to the arctic regions, the *L. maculosa* (Lesueur), the codfish of the lakes or eel pout, is sometimes called ling in northern New England. The eel-shaped blenny (*soarces anguillaris*, Peck), of the goby family, is also called ling by the Massachusetts fishermen. Other European gadoids of the genus *motella*, with a slightly elevated and delicate first dorsal, with a barbel on the chin and 2 or 4 on the upper jaw, are called rock ling; they frequent rocky ground well supplied with sea weed; though readily taking the bait, they are not much esteemed as food unless eaten very soon after they are caught; the length varies from 10 to 15 inches; the food consists of small fishes and thin-shelled crustacea.

LING, PETER HENRIK, a Swedish physiologist and poet, born in Ljunga, Smaland, Nov. 15, 1766, died in Stockholm, May 8, 1839. He was the son of a curate, and was left an orphan in his infancy, but his education was provided for at the schools of Wexjö, and in 1797 he passed the examination qualifying him for the theological profession. From this time he travelled over Europe, apparently with no definite object, often reduced to extreme want, yet maintaining a sturdy independence of character. His love of adventure at one time led him to take part in a sea fight against Nelson. He at last returned to Sweden, having acquired several modern languages beside a variety of other knowledge. While at Stockholm suffering from an attack of gout in the elbow, he conceived the idea of curing the complaint by exercise, and with this object learned the art of fencing. His success in this experiment led him to believe that many other diseases might also be relieved or cured by suitable combinations of movements, such as would induce the proper physiological action in the part exercised. Such was the origin of the so called kinesipathy or movement cure, a system of curative gymnastics, on the establishment of which his reputation is chiefly based. This system, now generally recognized by the faculty as a legitimate medical auxiliary, applicable especially to chronic diseases, cases of deformity, &c., is successfully practised in Sweden by Prof. Branting and Dr. Satherberg of Stockholm, Millioher in Vienna, Neumann in Berlin, Daly in Paris, Roth and Prof. Georgii in London, and Charles F. Taylor, M.D., in New York. Its practice consists chiefly in effecting certain movements by the aid of an assistant, the patient at the same time exercising his own will as directed. Thus a healthy action instead of a morbid one is induced in the part affected. Paralyzed limbs are exercised by movements caused from time to time by the assistant, until the muscles recover in part their healthy action, and are brought under the will of the patient. Care is always taken that no fatigue, pain, or over-exertion shall be experienced. Congestion

of the internal organs is treated by exercising the muscles of the extremities, while the rest of the body remains quiet. Ling also perfected several other branches of gymnastics; as the military gymnastics, including the exercises specially adapted for developing the qualities most useful to the soldier in active service. Some of these exercises, as the bayonet practice, are introduced in the regular drills of most civilized countries. Another branch of gymnastics which he systematized may be called the æsthetic, including the art of bodily expression, as practised in oratory, &c.; while another may be styled the pedagogical, the object of which is the practice of the most suitable exercises for young persons. Ling became a proficient in anatomy and physiology, and with scrupulous reference to the structure and functions of the human system he studied to produce in his practice a harmonious development of all the bodily powers. He at first supported himself by teaching the modern languages and fencing; in 1805 he was appointed professor of fencing in the university at Lund. He also lectured on the old Norse poetry, history, and mythology, and wrote dramas and many poetical essays, some of which, as the *Tirfing*, are classed among the most beautiful poetical productions in the language. He still devoted himself assiduously to the study of the curative effects of certain bodily movements; and on being appointed master of fencing at the military academy at Carlberg, he was enabled to put his ideas into practical execution, after having long struggled against the indifference of others and his own poverty. In 1818 the royal central institution was established at Stockholm to be devoted to his special practice, and he was made the director. Commencing upon a small scale, it has been gradually enlarged under his own direction and that of his pupil and successor Prof. Branting, till now it affords the means of treatment for hundreds of invalids who resort to it from all countries, and to the youth of Stockholm gratuitous opportunities for going through complete courses of gymnastics. In the institution are departments devoted to instruction in physiology, anatomy, including dissection, and military training. Ling was elected member of the Swedish academy, a dignity conferred only on the most eminent, and was honored by his sovereign with the special appointment of professor and knight of the order of the north star. His "Elementary Principles of Gymnastics" was published after his death in Swedish (Upsal, 1840). Several writers have since expounded his theories, as Rothstein in his *Gymnastik nach dem System des Schwedischen Gymnasiarchen Ling dargestellt* (Berlin, 1847-'51), and in his *Die gymnastischen Freübungen nach dem Systeme Ling's* (Berlin, 1853); M. Roth, M.D., in a work entitled "Handbook of the Movement Cure" (London, 1856); A. O. Neumann in his *Therapie der chronischen Krankheiten vom heilorganischen Standpunkte*; and Dr. Charles F. Taylor in a series of mono-

graphs published in the medical journals of New York, which are collected in a work entitled "Theory and Practice of the Movement Cure" (New York, 1860).

LINGARD, JOHN, D.D., an English clergyman and historian, born in Winchester, Feb. 5, 1771, died in Hornby, near Lancaster, July 18, 1851. His parents, who came of an old Hampshire family, were Roman Catholics, and in humble circumstances. The friendship of Bishop Talbot enabled him to be sent at the age of 10 to the English college at Douay, where he studied with brilliant success, entering the theological department in 1791. During the disturbances of the French revolution he once narrowly escaped being hanged by a mob, and soon afterward, anticipating the forcible dissolution of the college, which took place a little later, withdrew with some others of the community to England, where they formed a seminary at Crook Hall, near Durham. Mr. Lingard was ordained priest in May, 1795, and was appointed about the same time vice-president of the seminary and professor of natural and moral philosophy. A series of papers read at occasional literary meetings in this institution formed the basis of his "Antiquities of the Anglo-Saxon Church" (2 vols. 8vo., Newcastle, 1806), an enlarged edition of which appeared in 1844. In 1808 the community removed to Ushaw near Durham, where Dr. Lingard remained 8 years, having previously refused the presidency of the college of Maynooth. In 1811 he accepted the charge of a small mission at Hornby for the purpose of pursuing his studies with less interruption, and prosecuting the design which he had already formed of writing a history of England from the time of the Roman invasion. In the preparation of this work he consulted original authorities, and brought to light from regions previously unexplored a wealth of information which at once gave him a place in the foremost rank of English historians. The first part of the work was published in 3 vols. in 1819, and extended to the death of Henry VII. The reigns of Henry VIII. and Edward VI. formed the subject of a 4th volume immediately afterward; and in 1830 the work was completed in 8 vols. 4to., bringing the narrative down to the accession of William and Mary. Five other editions have appeared in England, the last in 10 vols. 8vo. (1854-'5), and 3 in the United States, the last being in 18 vols. 12mo. (Boston, 1853, and New York, 1860). The 5th London edition (1849) was thoroughly revised and corrected by the author. The style of the work is animated and dignified; and although Dr. Lingard made no attempt to conceal his religious preferences, its accuracy and general impartiality are universally admitted. Dr. John Allen attacked it in the "Edinburgh Review," Nos. xlii. and xlii.; but after the temperate "Vindication" published by Lingard in 1826 its merits were more fully recognized, and a juster criticism of it appeared in No. liii. of the same periodical. The work was translated into several foreign lan-

guages, and a special decree of the university of Paris ordered a copy of it to be placed in the library of every college in France. In the mean time Dr. Lingard had occasionally employed himself in other literary labors. In 1805 he published in the Newcastle "Courant" a series of letters on Catholic loyalty, which were subsequently reprinted in a volume, and in 1812 "Documents to ascertain the Sentiments of British Catholics in former Ages in regard to the Power of the Popes." About the same time he was engaged in a controversy growing out of the writings of Bishops Huntingford and Tomline and Lord Kenyon on the Catholic question, and a collection of his pamphlets on the subject was published under the title of "A Review of certain Anti-Catholic Publications" (1818). In 1815 appeared his "Strictures on Dr. Marsh's Comparative View of the Churches of England and Rome." In 1817 he was sent to Rome by Bishop Poynter to negotiate matters of importance. He made a second journey thither in 1825, and was treated with great distinction by Pope Leo XII., who conferred upon him a gold medal, pressed him to remain in Rome, and proposed to make him a cardinal, an honor which Dr. Lingard declined. In 1836 he published at London a "Translation of the Four Gospels," which was followed by an "Account of the Martyrs" (1839) and "Catechetical Instructions on the Doctrines and Worship of the Catholic Church" (1840). The degrees of D.D. and LL.D. were conferred upon him by Pope Pius VII. in 1821, and during the last years of his life he received a pension of £300 from the British government.

LINLEY, THOMAS, an English composer, born at Wells in 1725, died in London in 1795. After completing his musical education he established himself in Bath, where he was very successful in teaching and giving concerts. His two elder daughters, afterward Mrs. Sheridan and Mrs. Tickell, were accomplished singers, and added greatly to the attractions of his concerts. On the retirement of Christopher Smith he removed to London to take the management of the oratorios, first in conjunction with Stanley the blind composer, and afterward with Dr. Arnold. In 1775 he set to music the opera "The Duenna," by his son-in-law Richard Brinsley Sheridan, the unparalleled success of which induced him to join the latter in purchasing an interest in Drury Lane theatre, the musical department of which he conducted for many years. He was the author of 12 ballads which are considered among the finest specimens of this species of composition. His death was hastened by grief at the loss of his eldest son, Thomas, a musician of great promise and an intimate friend of Mozart.—WILLIAM, youngest son of the preceding, also a composer, born about 1767, died in 1835. He was for many years in the East India company's service, and having accumulated a handsome competency, he devoted the remainder of his life to literary pursuits and music, for which he possessed a hereditary tal-

ent. He was the author of numerous glees, canzonets, and miscellaneous pieces, distinguished by grace and feeling, and compiled the "Dramatic Songs of Shakespeare" (2 vols. fol.), in which are several of his own compositions. He also wrote two comic operas and several novels.

LINLITHGOWSHIRE, or **WEST LOTHIAN**, an E. co. of Scotland, bounded N. by the river and frith of Forth; area, 101 sq. m.; pop. in 1851, 80,185. The coast is low and the waters shoal; but there are small harbors at Queensferry, Borrowstounness, Newhalls, and Port Edgar. In the S. are extensive heaths and mosses, and elsewhere the surface is varied with knolls and undulations. The principal rivers are the Almond and Avon. Coal, limestone, freestone, and granite are plentiful, and there are several iron works at Borrowstounness. Agriculture is in an advanced state, but there are few manufactures. The principal towns are Linlithgow, Queensferry, Bathgate, and Borrowstounness. — **LINLITHGOW**, the capital, and a royal and parliamentary burgh, is situated on Linlithgow loch, and on the Union canal and the Edinburgh and Glasgow railway, 17 m. from Edinburgh; pop. in 1851, 4,213. It was a place of much importance as early as the beginning of the 12th century, and contains the ruins of a splendid palace, the nucleus of which was built by Edward I. of England, and in which Mary queen of Scots was born; it was burned by Hawley's dragoons in 1746, but steps have recently been taken to restore some parts of the building and prevent further dilapidation. There is also an ancient church, founded by David I., and now considered one of the most perfect specimens of Gothic architecture in Scotland.

LINN. I. A N. co. of Mo., drained by Locust and Yellow creeks; area, 588 sq. m.; pop. in 1856, 6,567, of whom 495 were slaves. It has a rolling surface with a fertile soil. In 1850 it produced 219,500 bushels of Indian corn, 15,570 of wheat, 24,257 of oats, 844,665 lbs. of tobacco, and 47,179 of butter. There were 5 grist mills, 8 saw mills, and 100 pupils attending public schools. Capital, Linneus. II. An E. co. of Iowa, drained by the Wapsipinicon and Red Cedar rivers and Prairie and Buffalo creeks; area, 720 sq. m.; pop. in 1859, 17,720. It is well timbered, and has a diversified surface and an excellent soil. The productions in 1859 were 854,577 bushels of Indian corn, 122,860 of wheat, 62,438 of oats, 89,460 of potatoes, 806,460 lbs. of butter, 12,470 tons of hay, and 16,920 galls. of molasses from sorghum. Capital, Marion. III. A W. co. of Oregon, bounded W. by Willamette river, and drained by the Santyam, Calapooya, and Mackenzie's fork; area, about 3,000 sq. m.; pop. in 1858, 6,009. The soil along the streams is fertile. The productions in 1850 were 21,893 bushels of wheat, 1,694 of oats, 3,866 of potatoes, 84,910 lbs. of butter, and 5,055 of cheese. Capital, Albany.

LINN, **JOHN BLAIR**, an American clergyman and poet, born in Shippensburg, Penn., March 14, 1777, died in Philadelphia, Aug. 30, 1804. His

father having removed to New York, he pursued his preparatory studies at Flushing, was graduated at Columbia college when 17 years of age, and began to study law in the office of Alexander Hamilton. Within a year his drama of "Bourville Castle, or the Gallic Maidens," was brought out at the John street theatre, but was not successful. He took little interest in his profession, and was led to exchange it for that of the ministry in consequence of deep religious impressions. He was ordained a Presbyterian clergyman in 1798, and became assistant pastor of the first Presbyterian church in Philadelphia, where he resided from that time. His principal poem, entitled "The Powers of Genius," which appeared in 1801, evinced culture and taste, and was favorably received. Immediately after he wrote a pamphlet in answer to the comparison which Dr. Priestley had made between Socrates and Christ. A brief controversy terminating with a second reply from Dr. Priestley was the result. These publications obtained for him the degree of D.D. at an unusually early age. Soon after his death, caused by consumption, his poem of "Valerian" was published, with a memoir by his friend and brother-in-law Charles Brockden Brown. It is in blank verse, a story of religion and love in the fanciful kingdom of Montalvia.

LINN, **LEWIS FIELDS**, an American senator, born near Louisville, Ky., Nov. 5, 1795, died in St. Genevieve, Mo., Oct. 3, 1843. His family emigrated from Pennsylvania to Kentucky with the first settlers of that state, and in the protracted warfare with the Indians both his grandparents with 7 members of their family at different times fell victims to the scalping knife. Having been left an orphan at the age of 12, he commenced a course of self-education, subsequently studied medicine, and about 1816 established himself in St. Genevieve, Mo., as a physician. His practice became in time lucrative, and he took an active part in politics as a member of the democratic party, although he repeatedly declined to enter public life. In 1833, however, he accepted the office of commissioner to settle the old French land claims in Missouri tendered him by Gen. Jackson, and in the same year entered congress as a senator from Missouri, a position which he filled during the remainder of his life. He was a devoted personal friend of Gen. Jackson. Among the measures which he advocated were the settlement and occupation of Oregon, his bill for which, after 5 years' delay, was passed by the senate a few months before his death; and the bill to remit the fine imposed by Judge Hall upon Gen. Jackson, which he supported in an elaborate speech. In 1857 appeared the "Life and Public Services of Dr. Lewis F. Linn," by E. A. Linn and N. Sargent (8vo., New York).

LINNÉ, **CARL VON**, better known by his Latinized name **LINNÆUS**, a Swedish naturalist, born near Stenbrohult, in the province of Småland, May 24, 1707, died in Upsal, Jan. 10, 1778. His father, the Protestant minister of

the parish of Stenbrohult, was a lover of flowers, and in the well stocked garden of the rectory young Linnæus passed his leisure hours, familiarizing himself almost as soon as he could articulate distinctly with the names of the plants to be found there, as well as those indigenous to the neighborhood. Notwithstanding this manifest predilection for botany, his father, whose circumstances were far from easy, designed him for the ministry, and at 10 years of age Carl was sent to the academy at Wexiö. Here he read with eagerness whatever works on physical science, and particularly on natural history, came within his reach, but made such limited progress in the studies applicable to his intended profession, that the teachers, conceiving a contempt for his intellectual abilities, advised his father to make a carpenter or tailor of him. Fortunately for young Linnæus, Dr. Rothmann, a physician of Wexiö, who had noticed his enthusiasm for botany, prevailed on the father to allow him to study medicine and natural history; and to render the scheme practicable, he received the boy into his own house, and instructed him in physiology, and in botany according to the system of Tournefort. In 1727 he repaired to the university of Lund, where for a year he was an inmate of the family of Dr. Stobæus, professor of physic and botany, with whose approbation he finally surrendered his whole time to the study of botany. Following the advice of Rothmann, he went in 1728 to the university of Upsal in the hope of finding some kind of employment there. In this he was disappointed, and he was obliged to return to the study of medicine. His situation now became pitiable in the extreme; for months he was frequently in want of food and clothing, and the lectures of Rudbeck, the professor of botany, tormented him with the desire to resume his favorite study. One day during this season of destitution he was observed by Dr. Olaf Celsius, professor of divinity, intently examining a plant in the university garden, and upon being questioned answered with so much readiness and intelligence that he received a proposal from Celsius to assist him in a work on the plants mentioned in Scripture. At the same time he became an inmate of the professor's house, where a library rich in botanical works was open to him, and was introduced by his protector to Rudbeck. The latter being prevented by the infirmities of age from discharging fully the duties of his office, Linnæus was occasionally deputed to lecture in his place, and acquitted himself with so much credit in this capacity, that in 1731 he was commissioned by the royal academy of sciences in Upsal to make a botanical tour of Lapland. Departing in May, 1732, he performed, mostly on foot, a journey of nearly 4,000 miles within 5 months, in the course of which he thoroughly explored the desolate region assigned to him. The result of this journey was his *Flora Laponica*, published 5 years afterward. He was poorly requited for his labors by admission to the

academy of sciences and a grant of about \$50 in money; and to provide for his necessities he commenced a course of lectures in the university on the assaying of metals. A Dr. Rosen, professor in the university, jealous of the rising fame of Linnæus, successfully interfered to prevent him from lecturing; and the young naturalist, finding all hope of advancement in Upsal cut off, established himself in Dalecarlia, where he instructed the copper miners in the processes incidental to their occupation. At Falun he formed an attachment for a daughter of Dr. Moræus, a physician of the place, aided by whom he repaired in 1735 to Holland and took the degree of M.D. at the university of Harderwyk. In the same year he published the first sketch of his *Systema Naturæ*, in the form of tables, in 14 pages folio. In Holland he was warmly received by the eminent naturalists of that country, and soon numbered among his friends Boerhaave, Burmann, and Gronovius, by whom he was urged to settle there. At Amsterdam he made the acquaintance of a banker of scientific tastes named Cliffort, who possessed a magnificent country seat and a garden stored with rare plants at Hartecamp, near Haarlem. At the invitation of this gentleman Linnæus took up his residence at Hartecamp, and in the course of the next two years devoted much time to the arrangement of its collections of natural history, and of the plants in the gardens and herbarium. In the interval he visited England at the expense of his patron, and was well received by some of the chief naturalists, including Dillenius and Martyn, professors of botany at Oxford and Cambridge. The period of his residence in Holland was one of extraordinary application; and, aided by the extensive library at Hartecamp, he completed several important botanical works, which his previously unsettled life had not permitted him to pursue uninterruptedly. Among these the *Systema Naturæ*, of which 18 editions appeared in the author's lifetime, and the *Genera Plantarum* (8vo., Leyden, 1737), hold the first place, the latter being memorable for unfolding with particularity the celebrated artificial system called after the author, and founded on the sexual parts of plants. The idea of classifying plants after this method had however been broached by him as early as 1731 in his *Hortus Uplandicus*. The *Genera Plantarum* is a monument of industry and application, the author having, in preparing it, examined the characters of 8,000 flowers. Among his other important works of this period were the *Fundamenta Botanica* (Amsterdam, 1736; 8th ed., Paris, 1774); *Bibliotheca Botanica* (Amsterdam, 1736); *Flora Laponica* (Amsterdam, 1737); *Critica Botanica* (Leyden, 1737); *Hortus Cliffortianus* (Amsterdam, 1737), a magnificent work, prepared in honor of his benefactor, whose collections it describes; and the *Classes Plantarum* (Leyden, 1738). Wearying finally of the drudgery of his life at Hartecamp, Linnæus returned in the summer of 1738 to Sweden, having first paid a short visit to

Paris, where he met a cordial reception from the Jussieus, and was elected a member of the academy of sciences. He was soon after married to the lady to whom 5 years previous he had been betrothed, and established himself in Stockholm as a physician. Notwithstanding the fame he had acquired abroad as a naturalist, his countrymen failed at first to recognize his merits, and his early efforts to obtain practice met with so little encouragement that he was at one time on the point of quitting his native country. His energy was equal to any emergency, however, and within a year he was appointed physician to the fleet and president of the newly established royal academy of Stockholm. The botanical chair at Upsal had always been the chief object of his ambition, and in 1741 he was enabled by his appointment as medical professor at the university to perform the functions of the former office, his old opponent, Rosen, who had succeeded Rudbeck, consenting to an exchange of duties with him. Before entering upon his professorship he made a scientific survey of the islands of Oeland and Gottland in the Baltic, the reflections and observations resulting from which were embodied in a Latin oration "On the Necessity of Travelling in one's own Country," which he pronounced before the university upon being inaugurated into office. Placed now in a situation in which his talents could be properly developed, he soon made the botanical chair of Upsal the most famous in that department of science in Europe, and students flocked from all parts of the continent, from the British isles, and even from America, to receive his instructions. Many of these, including Loeffling, Osbeck, Solander (who accompanied Capt. Cook on his first voyage as naturalist), Kalm, Hasselquist, and others, became scarcely less distinguished than their master, and by their explorations in both hemispheres, undertaken at his suggestion, greatly advanced the cause of science. Strangers were even attracted to Upsal solely to see and converse with Linnæus; and so great was the enthusiasm for the study of natural history, that the king and queen of Sweden had their separate collections of rarities, which were arranged and described by him. The academical garden, which had been for many years neglected, became one of the first objects of his attention, and within 6 years he increased the number of exotic plants from 50 to 1,100, beside adding largely to the Swedish plants which it contained. Distinctions of all kinds were showered upon him. He received the much coveted appointment of botanical professor, and in 1746 the rank and title of archiater; in 1757 he was ennobled and took the title of Von Linné; the chief learned bodies of Europe enrolled him among their members; and the king of Spain endeavored in vain, by the offer of a liberal salary and letters of nobility, to induce him to settle in Madrid. His material prosperity kept pace with his fame, and during the last 20 years of his life his leisure hours

were passed in ease and affluence at a country seat purchased by him at Hammarley near Upsal. His literary and scientific labors were pursued with untiring energy, and from all parts of the world he was constantly receiving rare specimens of animals, plants, and minerals to add to the rich collections of the university, and to enable him to perfect and systematize the results of his former inquiries. His chief publications after his establishment at Upsal comprise the *Flora Suecica* (Leyden, 1745); *Animalia Suecica* (Stockholm, 1745); *Fauna Suecica Regni* (Stockholm, 1746); *Hortus Upsaliensis* (Stockholm, 1748), a description of the academical garden; *Amanitates Academica* (Leyden, 1749-'77), a collection of treatises on various subjects bearing the names of his pupils, but inspired and revised by himself; *Materia Medica Regni Vegetabilis* (Stockholm, 1747); *Materia Medica Regni Animalis* (Upsal, 1750); *Philosophia Botanica* (Stockholm, 1751; 4 other editions appeared in the lifetime of the author), the principal work on the Linnæan system of botany, and that from which many popular introductions have been compiled; and the *Species Plantarum* (3 vols. 8vo., Stockholm, 1753), the author's most important contribution to scientific literature. In this last work, which Haller calls *maximum opus et aeternum*, he first adopted trivial names expressing some obvious character to designate species, thus dispensing with the clumsy and tedious descriptions which naturalists formerly employed, and rendering it possible to speak of every known plant in two words. So highly is the work still esteemed that an edition of it, together with the *Genera Plantarum* and other writings of Linnæus in the form in which he left them, was published in Leipsic in 1840, under the title of *Codex Botanicus Linnæanus*, collated by Dr. Hermann E. Richter. A similar improvement was carried out in other branches of natural history, his works upon which, though less important than those devoted to botany, are characterized by the same lucid classification and logical precision. In 1774, while lecturing on botany, he experienced an attack of apoplexy, which incapacitated him for the active discharge of his professional duties. Two years later a second attack paralyzed his right side and impaired his faculties, and the few remaining months of his life were passed in mental darkness, which the sight of flowers and opening buds and other familiar and beloved objects could never wholly dispel. His death was the signal for a general mourning in Upsal; a medal was struck and a monument erected to his memory, and the king of Sweden pronounced a panegyric upon him in a speech from the throne to the assembly of the states.—The sexual or artificial system of Linnæus, though generally adopted soon after its promulgation, has failed to stand the test of time, and has long been replaced by the natural one of Jussieu, De Candolle, and their followers; but it accomplished a useful purpose in reducing to order the chaotic

state in which classification in all branches of natural history was involved, and was applicable to the comparatively few plants then known to naturalists. It does not appear that the author regarded it otherwise than as a temporary expedient. As a promoter of the study of botany, and indeed of all the principal branches of natural history, his merit was transcendent, and the enthusiasm and the systematic spirit of inquiry with which he imbued his pupils raised botany within a brief period to the position of an almost perfected science. In stature he was diminutive, with a large head, and quick, piercing eyes. His temper was irascible, but he was easily appeased, and his relations with his pupils and scientific associates appear to have been on an agreeable footing. He was vain to excess, and is said, at the instigation of his wife, a woman of profligate character, to have persecuted his only son. Five children survived him, one of whom, Elizabeth Christina, inherited much of her father's genius. She was the first naturalist to observe the inflammability of exhalations of certain plants, and also the electric sparks to be drawn from the nasturtium. The son succeeded his father in the botanical chair at Upsal, but was not distinguished by discoveries. The family is now extinct.

LINNET, the name of several birds of the finch family, of the genus *linota* (Bonap.) or *agiothus* (Cab.); the distinguishing characters have been given under FINCH, in the genus *fringilla* of which they are placed by Gray. The common brown linnet of Europe (*L. cannabina*, Selb.) is about 5½ inches long, with an extent of wings of 10 inches; the bill is moderately thick, the head small, the body ovate, the wings and tail moderate, and the tarsi very short and much compressed. In the adult male the winter plumage is reddish brown above with darker streaks, the throat yellowish gray streaked with brown, the forehead and breast reddish with yellowish gray edgings, and the bill dusky above; in the female the upper parts are streaked with dusky brown and grayish yellow, the lower yellowish gray with brownish streaks on the throat, breast, and sides; the young resemble the female. In summer the throat is whitish with brown streaks, the back and wing coverts reddish brown, with the forehead and breast rose red. This is the largest and most robust of the true European linnets, and one of the most lively; it is called brown, gray, or rose linnet, according to the season of the year and the sex. Toward winter they assemble in flocks and visit farm yards in search of seeds, sometimes in company with other finches; the flight is rapid and undulated, and the motions on the ground active; the song is soft and mellow, and so varied and sweet as to render them great favorites as cage birds. They are easily raised from the nest, and eat the same food as the canary, with which as well as with the goldfinch they will pair. The nest is usually in a bush, very neatly made, and the eggs, 4 to 6, are ¼ of an inch

long, bluish white with purplish and reddish brown spots especially at the larger end; there are commonly two broods in a season, the first being abroad by the end of May. As their name imports, they are very fond of the seeds of flax. The mountain linnet or twite (*L. montana*, Selb.) resembles the preceding, but is smaller, with a yellowish bill, and without any red on the head and breast or streaks on the throat. The green linnet has been described under FINCH.—There are two linnets common to northern Europe and America, the lesser and the mealy red-poll linnet, referred, as above stated, to the genus *agiothus* (Cab.). The lesser red-poll linnet (*A. linaria*, Cab.) is 5 inches long and about 9 in extent of wings; these reach to the middle of the deeply forked tail. The color above is light yellowish, with dark brown streaks; the crown crimson, and the upper breast and sides tinged with the same; rump and under tail coverts still lighter with dusky streaks; rest of under parts white, streaked with brown on the sides; lores and chin dusky; cheeks and narrow front whitish; wing and tail feathers edged with white; 2 yellowish white bands across the wing coverts; bill yellowish; this is the winter plumage, there being much more red in the spring. It is a lively, familiar, and favorite bird; the flight is peculiarly buoyant, and the notes clear and loud; in the winter large flocks resort to the woods of birch and alder, on the seeds of which it feeds. It is often kept as a pet in Europe for its lively and gentle disposition; it pairs with the canary and goldfinch. It is distributed generally over the northern and temperate parts of Europe and eastern North America, going south in winter, and is found as far west as Washington territory. The mealy red-poll linnet (*A. canescens*, Cab.) is 6 inches long; the colors are as in the preceding species, but the edges of the feathers are paler and hoary, the rump grayish white, and the lower parts nearly white. It inhabits Greenland and the northern portions of the continent, and doubtless occasionally wanders within the limits of the United States, as it does into Great Britain.—The bird commonly called linnet by dealers in New England is the purple finch (*carpodacus purpureus*, Gray), described under FINCH.

LINSEED OIL, or FLAXSEED OIL, an oil expressed from the seeds of flax, and very extensively employed in the arts, its drying quality adapting it for use in the preparation of paints for woodwork and other surfaces. Thus employed, it makes with the powdered substance called the body a paste, and on drying acts both as a cement and a varnish. The seeds, either in their raw state or roasted, are ground in mills, and the powder is then subjected to powerful hydraulic pressure. By roasting, the gummy matter in the interior coating of the seeds is destroyed, and the oil is obtained more free from mucilage, but it is of higher color and more acrid than that expressed from the raw seeds. The latter is to be preferred when the

oil is required for medicinal purposes, being employed sometimes as a laxative, and as an external application in combination with lime water for burns. Linseed oil freshly pressed is of a golden yellow color, which turns to dark brown with age. It has a peculiar smell and disagreeable taste. Its specific gravity is 0.940. At 600° F. it boils, and at about zero, or 4° below, it solidifies. Exposed a short time to the air, it becomes rancid; but on being agitated with warm water and allowed to stand till the two fluids separate, the oil may be decanted sweet. Its chemical composition, according to Sacc, is that of an oleate and margarate of glycerine, containing no stearate. Beside the uses already named for this oil, it is largely applied in the manufacture of varnishes as a vehicle for the harder resins, to which it imparts softness and toughness. But for the best varnishes it is necessary to clarify the oil by repeated skimming while it is allowed to simmer at nearly the boiling point, afterward boiling it with calcined magnesia, and letting it stand at least 3 months for the impurities to subside with the magnesia. A cheap varnish is also made by adding litharge and red lead to the boiled oil.—Linseed oil is an important commercial product, and is largely imported into the United States from Europe. The English import the seed from the East Indies, Russia, Germany, Holland, and America; the value of the importations in 1856 amounted to £3,195,634. From this they obtain the oil, and make of the residue, called oil cake, an important article of food for cattle. This incidental product of the manufacture of linseed oil is also largely used for the same purpose in the United States.—As the chief use of linseed oil is in decorative painting for the sake of its drying quality, it is essential that it should be free from mixture with other oils of a different nature, and from all other foreign ingredients possessing properties incompatible with this application. It is unfortunately the case, particularly with seed obtained from tropical regions, that other oleaginous seeds of plants that have grown up with the flax are intermixed with those of the latter; and the oil they furnish not possessing the same drying character, the product is thereby seriously impaired. When such compounds are applied in paint work, the effect is most unsatisfactory; while the linseed portion dries, the other oil remains partially fluid and sticky, and moreover subject to changes of color as it oxidizes, producing a mottled and streaked appearance by the irregularity of the chemical changes that take place. It is stated that in the boiling process, which is deemed essential, empyreumatic compounds are generated, which are still more injurious to the color and stability of the paint work; and the drying quality of the linseed portion of the oil is itself impaired by the chemical union induced with the foreign ingredients. But linseed oil is moreover intentionally adulterated, as with common rosin dissolved in it, also with rosin oil, and with va-

rious fats and non-drying oils. The effect of rosin is to render the paint when apparently dry easily affected by warmth, even that of the hand, so as to be softened and made sticky. Great injury has been occasioned to silk dresses and cloth coats by being brought in contact with paint thus adulterated. The common methods of testing linseed oils are very unsatisfactory. The hydrometer and oleometer, which determine merely their specific gravity, afford no indication of the qualities or relative proportions of the adulterants. To detect the presence of rosin or rosin oil, it is sufficient to heat a small portion in a porcelain cup, when the peculiar odor of the substance will be noticed if only $\frac{1}{100}$ part be present. To detect the presence of fats or non-drying oils, the practice is to touch the centre of a drop or two of the oil placed upon a white plate with a drop of sulphuric acid conveyed at the end of a glass rod; changes of color are thereby induced, and the formation of concentric rings of various shades, which suggest to an experienced eye the nature of the oil and of its adulterations. More perfect methods of testing linseed oil are very much to be desired; and still more desirable is some efficient remedy against the production of the injurious mixtures, or some means of purifying the mixed article. For the one purpose it is thought some mechanical method might be devised of sorting the seed, so that the genuine only should be used; and for the latter some chemical processes are wanted, by which the drying oils can be separated from the non-drying, or the effect of the latter in the mixture be destroyed.—The rapid increase in the manufacture of linseed oil in the United States has given a great stimulus to the trade and importation of the seed from Calcutta and other places. In 1856 the importation into Boston was 1,387,944 bushels, valued at \$1,841,719. The whole foreign supply brought to the United States was 1,696,294 bushels, of which 1,691,876 bushels were from the East Indies. The imports of linseed oil in the same year, chiefly from England, were about 1,200,000 gallons, valued at nearly \$700,000. The value of the linseed imported into the United States in the year ending June 30, 1859, chiefly from the British East Indies, amounted to nearly \$2,500,000.

LINTZ, or LINZ, the fortified capital of Upper Austria, beautifully situated at the confluence of the Traun and Danube, distant by steamboat about 100 m. W. from Vienna and S. E. from Ratisbon, and by railway about 50 m. S. from Budweis and 40 m. N. E. from Gmünd; pop. about 30,000. It has 2 suburbs, one of which is separated from the city proper by the Danube. The defences consist of 32 detached forts, which cover a circuit of 9 m., and communicate with each other by covered ways. Woollen, linen, silk, and cotton goods are manufactured. There are two annual fairs, each of which lasts a fortnight. The city and vicinity are celebrated for beautiful scenery.

LION (*leo*, Leach, and *felis leo*, Linn.), the

largest and most majestic of the cat family, an inhabitant of Africa and Asia. Several species are made by some zoologists, and these are even elevated into a genus distinct from *felis* by Leach; but the specific distinctions are doubtful, and it is more consonant with the prevailing tendency of naturalists to consider these as varieties of a single species. The best known variety is the African lion, whose great strength, noble appearance, and assumed magnanimity have been the theme of travellers from time immemorial; the males have a long and thick mane, which gives an appearance of nobleness to the animal which it is far from possessing; the tail has a tuft at the end, which is absent in the tiger and the various spotted cats; the usual color is tawny, with the mane dark approaching to black; in some the color is much lighter, and in others darker, and there is considerable difference in the amplexness of the mane, but the color is always uniform and without spots; the females are destitute of mane. The average length of a full-grown lion is between 6 and 7 feet, exclusive of the tail, and the height at the shoulder nearly 8 feet; specimens are on record considerably larger than this. The chest and shoulders are broader and the neck thicker than in any others of the family, indicating great strength in the anterior extremities; it can carry off a good-sized heifer with ease, and can drag to a considerable distance an ox or a horse. The lioness is smaller than the lion, with more slender and graceful form, and is more agile in her movements and impetuous in her passions. The appearance of the lion when in confinement or unannoyed does not convey the idea of ferocity inspired by the tiger, and his wide forehead, overhanging brows, and shaggy mane give him a majestic look which well entitles him to the appellation of "king of beasts;" but when irritated, there is sufficient evidence that the passion and power of the feline race in him reach their greatest development. In ancient times the lion was far more extensively distributed than at present. They abounded in S. E. Europe, and Herodotus relates that the camels which accompanied the army of Xerxes were attacked by lions while on the march through Macedonia. Pausanias also speaks of lions as inhabiting the mountains between Macedonia and Thessaly. From the Scriptures it is evident that lions were once common in Syria and Palestine, where they are no longer found; and they have also disappeared from other parts of Asia which they formerly inhabited. Their abundance in ancient times is shown by the fact that in 40 years 1,000 lions were killed at Rome in the amphitheatres, where sometimes 100 at a time were exhibited in the arena. The advance of population and civilization, and especially the general use of firearms, have caused their extermination in many countries, and are gradually driving them into narrower limits. At the present day they are found only in Africa and in Arabia, Persia, India, and on the banks of the Euphrates. In Africa there are 4 varie-

ties, the Numidian lion or lion of Barbary, the lion of Senegal, and two varieties of the Cape lion or lion of South Africa. The Barbary lion is brown, and the male has a very thick mane. The Senegal lion is of a yellow hue with a thinner mane. Of the two varieties of the Cape lion, one is yellowish and the other brown, and it is said that some with black manes have been seen in that region. The lion prefers an open level country, such as affords pasture to the immense herds of antelopes, well watered, and with sufficient thicket to shelter him from the midday sun; a favorite haunt is about some spring, where he can easily procure prey as they come to drink. When not pressed by hunger, the lion generally lies concealed during the day, feeding at early dawn and evening, but occasionally prowling during the whole night around the herds of wild animals, the flocks of the inhabitants, or the encampment of the traveller; skulking from man in the daytime, at night he becomes bold, tearing a bullock or a horse from the enclosure, and sometimes dragging a human victim from the midst of a sleeping circle around a watch fire; his most frequent prey, however, are the various kinds of antelopes, zebras, gnus, giraffes, and wild cattle; the horse is believed to be specially relished by the lion. The breeding place is generally in some deep cover, which is carefully guarded by both parents; gestation is about 110 days, and from 2 to 4 young are produced at a time, born with eyes open, but helpless for some weeks; the female is exceedingly ferocious when taking care of her young. Several lions have been born in menageries both in Europe and America, many of which have been raised, though most die at the shedding of the milk teeth, if not in the first few weeks of life, from the neglect of the mother or her inability to supply proper nourishment; the whelps have a frizzled fur, brindled or clouded with dark brown, and with a dark dorsal line; the shaggy mane and tufted tail begin to appear about the 3d year, attaining their full development in the 7th or 8th; the average age of the lion is about 25 years, though individuals have lived in confinement much longer than this. As seen in menageries, the lion is one of the most tractable of the large *felines*, and shows gratitude and attachment to those who treat it kindly; it is susceptible of being trained to perform certain feats, and to permit familiarities with its formidable jaws and claws which make the spectators shudder; whipping, pulling open the jaws, and placing the head within the range of their teeth, evince a rash courage in their keepers which few but a Van Amburgh or Driesbach would care to imitate. The lion of the menagerie is a very different animal when seen in his native wilds; hunting it in Africa is not a very dangerous sport for men of nerve, though it is rarely indulged in for the mere sake of sport unless by a Gérard or a Cumming. The natives occasionally assemble to destroy it, when their flocks have suffered severely; on these

occasions the animal is worried in the daytime, when it is timid and unable to see very clearly, or when satiated with food, by a motley assemblage of dogs and men, and is generally easily killed if the hunters have the courage to approach within gun-shot. Dr. Livingstone, though he has had sufficient reason for dreading the king of beasts, speaks of him in a manner which detracts greatly from his regal and magnanimous character; according to him, the lion fears man, except at night, and never attacks him unless from necessity, a "man-eater" being always an old animal, whose decaying teeth force him to come to the villages in search of prey; seen in the daytime, he finds nothing very majestic in its appearance, but merely an animal somewhat larger than the largest dog, partaking very strongly of the canine features, and very unlike the usual representations; it stands a second or two gazing, turns and walks slowly away for a dozen paces, looking over the shoulder, then begins to trot, and, when nearly out of sight, bounds off like a greyhound. By day there is not, as a rule, the smallest danger of lions which are not molested attacking a man, nor even on a clear moonlight night, unless during breeding time; travellers always tie up their cattle and horses on dark rainy nights, but not on moonlight ones. The approach of the lion is stealthy, and any appearance of a trap will prevent his making a spring. Lions are abundant where game is plenty; 6 or 8, probably one family, occasionally hunt together. Livingstone says: "One is in much more danger of being run over when walking in the streets of London, than he is of being devoured by lions in Africa, unless engaged in hunting the animal." As to the roar of the lion, he says that in a dark and stormy night and in an exposed situation it might inspire fear, but not otherwise, and that the ostrich makes a noise as loud and with difficulty distinguishable from it; as to his prowess, a large buffalo is more than a match for him, as a single toss would disable him; lions never approach a full-grown elephant, and rush off at the very sight of a rhinoceros. Gordon Cumming does not write so disrespectfully of the king of beasts, but is delighted with his noble appearance, regards his roar as extremely grand and powerful, and from personal experience considers lion hunting under all circumstances decidedly a dangerous pursuit. He says, in his "Hunter's Life in South Africa:" "There is something so noble and imposing in the presence of the lion, when seen walking with dignified self-possession, free and undaunted, on his native soil, that no description can convey an adequate idea of his striking appearance. The lion is exquisitely formed by nature for the predatory habits which he is destined to pursue. Combining in comparatively small compass the qualities of power and agility, he is enabled, by means of the tremendous machinery with which nature has gifted him, easily to overcome and destroy almost every beast of the forest, however superior to him in weight and stature.

Though considerably under four feet in height, he has little difficulty in dashing to the ground and overcoming the lofty and apparently powerful giraffe, whose head towers above the trees of the forest, and whose skin is nearly an inch in thickness. The lion is the constant attendant of the vast herds of buffaloes which frequent the interminable forests of the interior; and a full-grown one, so long as his teeth are unbroken, generally proves a match for an old bull buffalo, which in size and strength greatly surpasses the most powerful breed of English cattle; the lion also preys on all the larger varieties of the antelopes, and on both varieties of the gnu. The zebra, which is met with in large herds throughout the interior, is also a favorite object of his pursuit. Lions do not refuse, as has been asserted, to feast upon the venison that they have not killed themselves. I have repeatedly discovered lions of all ages which had taken possession of, and were feasting upon, the carcasses of various game quadrupeds which had fallen before my rifle. The lion is very generally diffused throughout the secluded parts of southern Africa. He is, however, nowhere met with in great abundance, it being very rare to find more than three, or even two, families of lions frequenting the same district and drinking at the same fountain. When a greater number were met with, I remarked that it was owing to long protracted droughts, which, by drying nearly all the fountains, had compelled the game of various districts to crowd the remaining springs, and the lions, according to their custom, followed in the wake. It is a common thing to come upon a full-grown lion and lioness associating with three or four large ones nearly full grown; at other times, full-grown males will be found associating and hunting together in a happy state of friendship; two, three, and four full-grown male lions may thus be discovered consorting together."—The Asiatic variety of the lion is inferior in size, strength, and fierceness, with less ample mane, of a uniform pale fawn color, and with less width of head and nobleness of bearing. Lion hunting in Asia is attended with great pomp and show, and with comparatively little danger on account of the open nature of the districts infested by them, and the consequent fair mark they present to the bullet; occasionally, an enraged and wounded animal gives evidence of his strength by pulling the largest elephants to the ground, to the great peril of his riders. The maneless lion of Guzerat, described by Captain Smee, is probably a variety of the preceding.—Cuvier and others describe a fossil lion (*F. spelæa*) as occurring in the caverns of the diluvial epoch in Europe as far north as Great Britain; some of the fragments found indicate an animal one fourth larger than the existing lion; their remains are found with those of bears and hyænas in the caverns of Kirkdale and Gaylenreuth, though less abundant than those of the last two animals.

LIPARI ISLANDS (anc. *Æolia* or *Lipara insulæ*), a group of volcanic islands situated

between lat. $38^{\circ} 20'$ and $38^{\circ} 55'$ N. and long. $14^{\circ} 15'$ and $15^{\circ} 15'$ E., and between the W. coast of Naples and the N. coast of Sicily, from which they are distant from 10 to 40 m.; aggregate pop. about 22,000, including the town of Lipari. The islands form part of the Sicilian province of Messina, and the 7 principal of them are Lipari, Vulcano, Stromboli, Salini, Panaria, Felicudi, and Alicudi, beside many adjacent islets and rocks. They are all mountainous; the climate is salubrious and the air pure, and the principal products are fruits, wine, cotton, corn, peas, beans, &c. Storms and earthquakes are frequent.—**LIPARI** (anc. *Lipara*), the largest of the islands, is about 18 m. in circuit, and supplies Europe with pumice stone, of which its surface is almost wholly composed. None of the islands except Lipari appear to have been anciently inhabited to any extent. At the commencement of the 2d Punic war a Carthaginian squadron was wrecked on the shores of Lipari and the island of Vulcano. Lipari was prosperous under the Romans, and was sometimes used as a place of exile for political offenders. It was much frequented for its hot springs, one of which still remains in use.—**LIPARI**, the capital of the above group of islands, is situated on the E. coast of Lipari island, in lat. $38^{\circ} 27' 56''$, long. $14^{\circ} 57' 50''$, with a harbor nearly 2 m. in circuit; pop. about 12,000. It has an active trade in the produce of the islands with Palermo, Messina, and Naples. It contains a castle, a bishop's palace, several churches and convents, a hospital, and some remains of antiquity. The greater part of the present fortress was built by Charles V., after the town had been plundered by Khair-ad-Deen Barbarossa in the middle of the 16th century.

LIPPE, or **LIPPE-DETMOLD**, a German principality, bounded N. E. by Hesse-Cassel, E. by Hanover and Pyrmont, and on all other sides by Westphalia; area, 400 sq. m.; pop. in 1858, 106,086. It is traversed by chains of the Teutoburg mountains, called here *Lippe'scher Wald*. The staple productions are flax and timber. The principality comprises the counties of Lippe, Schwalenberg, and Sternberg, and several places in Westphalia, and is governed by Prince Paul, who succeeded his father in 1851. It has formed part of the German confederation since 1815. In 1848 a new constitution was promulgated, but the former and less liberal one was restored in 1853. The revenue and expenditures in 1856-'7 were respectively 450,000 Prussian thalers, and the public debt 350,000. The military force consists (1860) of about 1,000. Capital, Detmold.

LIPPE-SCHAUMBURG. See **SCHAUMBURG-LIPPE**.

LIPPI, **FRA FILIPPO**, an Italian painter, born in Florence in 1412, died in Spoleto in 1469. He was of obscure parentage, and at an early age found refuge in the convent of the Carmelites in Florence, where he was induced by poverty to assume the habit of the order. According to Vasari, he was a pupil of Masaccio.

Impelled partly by a passion for his art, partly by a love of pleasure, he escaped to Ancona when 17 years old, and renouncing his sacred profession, established himself as a painter. While on a sea excursion near Ancona, he was captured by a Barbary corsair and carried into captivity in Africa. Happening one day to draw a sketch of his master in charcoal, the latter was so much pleased with the performance that he released him and sent him home. Fra Filippo visited Naples and Rome, gaining, in spite of the scandal attached to his history and profligate life, so much celebrity that the Medici family recalled him to Florence. Under their protection the runaway monk remained secure, although he made no attempt to conform to the vows he had previously taken, but spent the money obtained for his pictures in the grossest pleasures. In 1459, while engaged in painting the walls of the convent of Santa Margherita in Prato, he seduced a young novice, named Lucrezia Buti, who had sat to him as a model, and carried her away from the convent—a crime which it needed all the influence of the Medici to prevent the community from punishing summarily. A dispensation was finally procured from the pope to enable Fra Filippo to marry Lucrezia; but as he neglected to do so, her family contrived, it is said, to have him poisoned. He is generally considered one of the greatest of the painters before Raphael, and was one of the first to design the human figure of the size of life, and to paint landscape backgrounds with some feeling for nature.—**FILIPPINO**, the natural son of the preceding by the novice Lucrezia Buti, born in Florence in 1460, died in 1505. He followed the profession of his father, though free from his libertine tastes, and was among the first to introduce ornamental accessories from the antique into pictures. He holds a respectable position among the painters of his time.

LIPPINCOTT, **SARA JANE** (**CLARKE**), an American authoress, born in Pompey, Onondaga co., N. Y. Much of her childhood was passed in Rochester, N. Y., and at the age of 19 she removed with her father to New Brighton, on the Beaver river, Penn., about 80 miles below Pittsburg, where, with the exception of a visit to Europe in 1852, she resided until her marriage, in Oct. 1853, to Mr. Leander K. Lippincott of Philadelphia. She published occasional verses at an early age under her own name; but her first prose writings, contributed in 1844 in the form of a series of letters to the "New York Mirror," appeared under the *nom de plume* of "Grace Greenwood," by which she is still generally known. Two series of "Greenwood Leaves," comprising portions of these letters, were published in 1850 (12mo., Boston). Among her other works are: "History of my Pets" (18mo., Boston, 1850); "Poems" (12mo., 1851); "Recollections of my Childhood" (1852); "Haps and Mishaps of a Tour in Europe" (12mo., 1854); "Merrie England" (16mo., 1855); "Stories and Legends of Travel and

History for Children" (16mo., 1858), and "Stories from Famous Ballads" (1860). She is now engaged in editing a juvenile monthly journal in Philadelphia entitled "The Little Pilgrim."

LIQUID AMBER, or LIQUIDAMBAR. See BALSAMS.

LIQUORICE, a medicinal article prepared in various forms from plants belonging to the genus *glycyrrhiza* (Gr. γλυκυσ, sweet, and ρίζα, a root), commonly from the *G. glabra*. This is the Spanish plant; that of Calabria and Sicily is the *G. echinata*. A species called the *G. lepidota* abounds on the banks of the Missouri river, which Mr. Nuttall describes as possessing the taste of the foreign plant. The *glycyrrhiza* is a herbaceous plant of the natural order *leguminosa*, growing in erect stems 4 or 5 feet high, with few branches, leaves alternate, pinnate; flowers violet or purple, formed like those of the pea, and arranged in axillary spikes on long peduncles. The fruit is a smooth pod containing 1 to 4 small kidney-shaped seeds in a single cell. The root, which is perennial, attains the length of several feet, and is sometimes more than an inch in diameter. When 8 years old it is dug, and when cleansed and dried is ready for the market, in which state it is known as stick liquorice; or it is at once cut up and boiled in water to furnish the extract. This is the saturated solution, decanted off and evaporated to proper consistence for forming the substance into cylinders 5 or 6 inches long and an inch in diameter. In this state, rolled in bay leaves, which adhere to the black cylinders, the substance is the crude liquorice of commerce. It is dry and brittle, of shining fracture, of sweet and peculiar taste, and, if pure and genuine, entirely soluble in water. This, however, is rarely the case, for the article is subject to gross adulterations. The Spanish liquorice, according to Accum, is frequently nothing else than a mixture of the juice with the worst kind of gum Arabic, called Barbary gum, imported into England chiefly for making shoe blacking. Metallic copper scraped off the evaporating pans is very commonly present; and starch and flour sometimes constitute nearly one half of the substance. These adulterations Dr. Hassall found extended to the different kinds of roll and pipe liquorice, and Pontefract lozenges, which last, made near Pomfret, Yorkshire, are usually considered as presenting a very pure form of the extract. Liquorice is refined by dissolving the impure extract in water without boiling, separating the insoluble matters and also the acrid oleo-resinous portions which by long boiling were extracted from the root, and reforming the article in cylinders of the size of pipe stems. But in the place of the substances removed others are commonly introduced, as sugar, flour, starch, and gelatine. Liquorice root was first thoroughly analyzed by Dr. Hassall, who gives the following results in his late work, "Adulterations Detected." The peculiar principle, glycyrrhizine, was formerly separated and described by Robiquet:

Constituents.	Fresh root.	Undecorated powder.	Decorated powder.
Glycyrrhizine.....	8.60	10.40	13.00
Gum.....	26.60	48.30	57.10
Resin, &c., soluble in alcohol.....	.75	1.09	.50
Albumen.....	.97	1.50	.50
Starch.....	22.91	24.41	22.26
Woody fibre.....	13.86	15.30	14.58
Moisture.....	26.51	4.10	1.30
Total.....	100.00	100.00	100.00
Ash — 3.07 per cent.			

Of the fresh root 500 parts furnished 175 parts of extract; and the same quantity of the powder of the dried root gave 275 parts of the extract.—Liquorice is used in the form of a decoction of the root, which is an excellent demulcent, applicable in catarrhal affections, and to irritations of the mucous membrane; and the extract is largely employed for similar purposes. It is an important ingredient in cough mixtures, or is taken alone to allay the tickling and irritation of the cough and promote expectoration. It is also used in mixtures to disguise the taste of other medicines; and in pills to give them proper consistence.

LISBON (Port. *Lisboa*), the capital of Portugal and of the province of Estremadura, situated on the N. bank and near the mouth of the Tagus, lat. 38° 42' N., long. 9° 5' W., about 180 m. S. from Oporto, 230 m. N. W. from Cadiz, and 320 m. S. W. from Madrid; pop. in 1857, 275,000; of the district to which it gives its name, 434,080. The city, covering several hills with palaces, churches, convents, and other striking buildings, has a magnificent appearance, which is only surpassed by that of Constantinople or Naples. Many of the streets, however, are in a miserable and filthy condition, particularly in the E. part of the city, which, having escaped from the earthquake of 1755, is the oldest. The other parts, which were destroyed, have been rebuilt more regularly. Lisbon is divided into 6 districts, and contains 89 parishes, including Belem, 854 streets, 216 cross streets, 119 courts or alleys, 12 large squares (the principal and one of the grandest in Europe being the *Praça do Commercio*) and 48 smaller ones, 5 public walks, and 84 fountains. The castle and citadel of St. George occupy the highest point of the city. The cathedral is one of the most ancient edifices of Lisbon. The church of St. Vincent contains the tombs of most of the members of the reigning house of Bragança. The Necessidades palace commands a fine view of the river, and has handsome gardens. The other principal palaces are those of the Ajuda, of Belem, and of Bemposta. The meetings of the cortes take place in the convent of San Bento, the galleries in the hall of deputies and of peers being neatly fitted up for spectators. The aqueduct, erected in the 18th century, bringing the water a distance of several miles from the N. W. side of Lisbon to a reservoir near the *Praça do Rato*, is one of the most noteworthy objects of public interest in Lisbon. The arsenal was at one time one of the finest establishments of the kind in Europe, and

is still interesting from its collection of weapons and engines of war. A naval arsenal was also erected at the end of the 18th century, after the earthquake; a great industrial exhibition was held there in 1849. Lisbon abounds in hospitals and charitable institutions, the most interesting of which is the *Real Casa Pia*, for the accommodation of foundlings, orphans, and abandoned children, and the most extensive the hospital of St. Joseph. Among the other public buildings are the custom house, the exchange, 5 theatres, the royal library, a museum of natural history, and a botanic garden. The English church contains a handsome cemetery, with the remains of Dr. Doddridge and Fielding, in whose honor a tomb was erected in 1830. Among the learned institutions is an academy of sciences, an academy of fine arts, and societies for the improvement of industry and the working classes.—The harbor of Lisbon is one of the best and most accessible in the world. Although its trade has declined since the loss of Brazil, it is still of great importance. The imports in 1857 (chiefly colonial produce, cottons, woollens, metals, &c.) were valued at \$10,000,000, and the exports (wine, spirits, meat, metals, &c.) at nearly \$6,000,000, including \$600,000 in specie. About 5,000 vessels enter and leave annually, half of which are engaged in the coasting, and the remainder in the foreign trade. Of American vessels there were 11 in the year ending Sept. 30, 1858. There are sugar refineries, tanneries, potteries, silk, paper, and soap factories; but the industrial activity is very limited. The goldsmiths and jewellers of Lisbon are among the most skillful workmen of Europe.—Lisbon was originally called *Olisipo*; by the Romans *Felicitas Julia*; and by the Moors *Lishbuna* or *Ashbuna*. The last named captured the city in the beginning of the 8th century, and it remained in their power with some slight exception till about the middle of the 12th, when Affonso I. made it one of the great capitals of Christendom. It reached the zenith of its importance at the beginning of the 16th century under Emanuel the Great, when the Portuguese were distinguished above all other nations for their maritime discovery and commercial enterprise. The most memorable event in the history of Lisbon is the earthquake of Nov. 1, 1755, by which about 60,000 persons lost their lives, and most of the city was destroyed. (See *EARTHQUAKE*, vol. vi. p. 722.) Lisbon has never fully recovered from this calamity, of which vestiges still remain in the desolated aspect of many vacant building sites. The city was occupied by the French in 1807, but delivered by the English in 1808, and protected by the duke of Wellington against the attacks of the enemy by the erection in 1809-'10 of formidable fortifications, extending from the N. of Cape Roca eastward to Torres Vedras (hence called the lines of Torres Vedras), and southward from Alhandra to the Tagus.

LISIEUX, a French town, capital of an arrondissement of the same name, situated in a

fine valley, watered by the small streams Orbec and Touques, in the department of Calvados (Normandy), 118½ m. by railway from Paris; pop. in 1856, 12,651. The principal street, traversed by the highway from Caen to Evreux, is spacious and handsome; the rest of the town is composed of narrow and tortuous streets, and most of the houses are of wood and present a wretched appearance. The finest edifice of Lisieux is the cathedral, a Gothic building of the 18th century. The town contains a handsome chapel of the Holy Virgin, erected by the bishop Peter Cauchon in expiation of the bloody part which he had taken in the execution of Joan of Arc; a public library of 8,000 vols.; and a theatre. The episcopal palace is a fine building with beautiful gardens. Most of the manufactures of the arrondissement, chiefly linen, woollen, cotton, ribbons, &c., amounting to about \$4,000,000 annually, are sold in Lisieux; and there is also a brisk commerce in grain, fruits, cider, hemp, flax, cattle, and the other produce of the country.—Lisieux is a town of great antiquity, and was the capital of the Lexovii. It was pillaged by the Normans in 877, burned by the Bretons in 1130, taken by Philip Augustus in 1203, by the English in 1415, and by Henry IV. in 1589.

LISLE, GUILLAUME DE, a French geographer, born in Paris, Feb. 28, 1675, died Jan. 25, 1726. He was the son of Claude de Lisle, a geographer and historian of some note, and from childhood manifested a strong predilection for the science in which he afterward became so distinguished. At the age of 9 he had constructed several charts of ancient history, and he was not long in forming the design of wholly reconstructing the system of geography then pursued in Europe. This he effected in 1700 by the publication of maps of the world, and of Europe, Asia, and Africa, in which he corrected many of the errors which had been copied with little alteration into all the works on geography since the time of Ptolemy. He also constructed a celestial and a terrestrial globe. These works were the object of general admiration. De Lisle was admitted to the academy of sciences in 1702, and was afterward appointed tutor in geography to Louis XV., who created for him in 1718 the title of "first geographer to the king," with a pension of 1,200 livres. De Lisle drew up several maps for the use of his royal pupil, and the whole number which he made is said to amount to 184. In 1724 he published a corrected edition of his map of the world. He contributed several memoirs to the *Recueil de l'académie des sciences*.—JOSEPH NICOLAS, a French astronomer, brother of the preceding, born in Paris, April 4, 1688, died there, Sept. 11, 1768. He first brought himself into notice in 1706 by an essay on an eclipse of the sun. In 1714 he was chosen a member of the French academy, and in 1724 visited England, where he was well received by Halley and Newton, and elected a fellow of the royal society. On the invitation of Catharine I. in 1726, he went

to St. Petersburg, where he had charge of the observatory until 1747, when ill health obliged him to return to France. While in Russia he had made a collection of objects illustrative of geography and astronomy, which on his return was purchased by Louis XV., and De Lisle charged with the care of it. He also became a professor in the royal college of France, where Lalande and Messier were among his pupils.

LIST, FRIEDRICH, a German political economist, born in Reutlingen, Aug. 6, 1789, died by his own hand in Kufstein, Nov. 30, 1846. He studied political economy, was for two years professor of this and kindred sciences at Tübingen, and officiated as agent of the German commercial union from 1819 to 1821, when he was elected to the Württemberg chambers; but having attacked the government in a petition, he was prevented from taking his seat, and sentenced to 10 months' imprisonment. After fruitless attempts to obtain his pardon, and after several years' exile, he was eventually compelled to pay the penalty of the law by imprisonment in the fortress of Asperg, after which he emigrated to the United States, and settled in Pennsylvania. His "Outlines of a New System of Political Economy" was published in Philadelphia in 1827. He became an extensive holder of land, which he made available for cultivation in concert with other capitalists, and also took an active interest in the establishment of railways. His name was particularly associated with the settlement of Port Clinton and Tamaqua, two towns in Schuylkill co. In 1830 he was appointed U. S. consul at Hamburg; but after a residence in Paris, he came back to Pennsylvania, and finally returned to Europe in 1832, and in 1833 took up his abode at Leipsic, where for some time he officiated as American consul. He advocated the establishment of the Leipsic-Dresden and of other railways, and in 1837 went to Paris, whence he wrote a series of letters to the Augsburg *Allgemeine Zeitung*, subsequently collected in a work, the 1st volume of which was published in Stuttgart in 1841 under the title of *Das nationale System der politischen Oekonomie*, advocating the consistent protection of national industry. In 1843 he established at Augsburg the *Zollvereinsblatt*, in which he proposed the enlargement of the customs union, and the organization of a national commercial system and of a national fleet. In 1844 he visited Austria and Hungary, and in 1846 England with the view of founding a commercial alliance between that country and Germany. He was not successful, and having met with disappointment in many other projects and lost his property in the United States, he blew his brains out. Ample justice has been done since his death to his disinterested and indefatigable exertions. An edition of his complete works, with his biography by Häusser, was published at Stuttgart in 1850-'51 (8 vols. 8vo.).

LISTER, JOSEPH JACKSON, an English microscopist, born about 1800. A merchant by profession, he devoted his leisure to the study of

natural history, and was thus led to the use of the microscope, the imperfections of which turned his attention to its construction. He succeeded in making very considerable improvements, forming a combination of lenses thoroughly achromatic, and capable of admitting observation over a very extensive field. These improvements are described at length by him in the "Philosophical Transactions" for 1829. Mr. Lister is not less distinguished as an observer than as an inventor. He was elected a fellow of the royal society in 1832.

LISTON, JOHN, an English actor, born in London in 1776, died March 22, 1846. He was educated at Dr. Barrow's school, Soho, and subsequently became second master in the grammar school of St. Martin's, Leicester square, founded by Archbishop Tenison. Having been expelled from this establishment for acting in plays with the large boys, he went upon the stage, and for several years appeared in provincial theatres with moderate success. His Digory in "She Stoops to Conquer" first revealed his remarkable comic genius. In 1806 he obtained an engagement at the Haymarket theatre, and by his Gawkey in the "Chapter of Accidents" and Lord Grizzle in "Tom Thumb" established a reputation as one of the first low comedians of the day. In 1809 he attempted tragedy, with but moderate success. His famous character of Paul Pry, first performed in 1823, created at the time an unusual sensation. Among his other principal characters were Mawworm, Tony Lumpkin, Bombastes Furioso, and Billy Lackaday in "Sweethearts and Wives." He retired from the stage about 1837. He was a man of exemplary character.—Mrs. LISTON, wife of the preceding, whose maiden name was Tyrer, born in London about 1780, died Sept. 13, 1854. Though in stature almost a dwarf, she was for many years a favorite with the public in her acting as well as in her songs. Her best part was that of Queen Dollalolla in Tom Thumb. She married Mr. Liston in 1807, and bore him a son, who became a captain in the army, and died in Nov. 1854, and a daughter, who married Rodwell, the musical composer.

LISZT, FRANZ, a Hungarian pianist and composer, born in Raiding, near Oedenburg, Oct. 22, 1811. At 6 years of age he manifested so extraordinary an aptitude for music, that his father, himself a musician of some repute, thenceforth carefully instructed him on the pianoforte. In his 9th year he performed at a public concert in Presburg at which were present several wealthy Hungarian noblemen. The latter, astonished at young Liszt's talents, at once proposed to contribute to his musical education during the next 6 years. In accordance with this proposition Liszt, accompanied by his father, repaired to Vienna and was put under the instruction of Karl Czerny and Salieri, with whom he remained about 18 months, after which he appeared in concerts in Vienna, Munich, and elsewhere, with great success. At Paris, where he arrived in 1823, he received the most flatter-

ing attentions; but his father, who was his inseparable companion, took care that he should not be spoiled by the indiscriminate praises lavished upon him. Although rejected as a pupil by the *conservatoire* on account of his foreign birth, he was carefully instructed in counterpoint by Reicha, and not a day passed in which he did not give many hours of practice to the works of Bach and other eminent composers for the pianoforte. When his education was considered finished, father and son made lucrative concert tours in the provinces and in England. Upon his return to Paris in 1825, Franz produced an opera in one act entitled *Don Sanche, ou le château de l'amour*, which only escaped condemnation on account of the youth of the composer. In 1827 he lost his father, an event which made a deep impression upon him, and under the influence of an unusually active imagination he surrendered himself to gloomy fancies and religious rhapsodies. An unhappy attachment to a woman of rank at the same time prompted him to retire from the world, and for several years he almost wholly relinquished his art. In this interval his plastic mind, quick at receiving impressions, embraced at different times the doctrines of the St. Simonists, the philosophy of Lamennais, and the vivid poetic fancies of Victor Hugo or George Sand. During the revolution of July, 1830, he composed a *Symphonie révolutionnaire*, which, however, was never published. The appearance of Paganini in Paris in 1831 roused him from this mood, and, full of the idea of becoming the Paganini of the pianoforte, he resumed his practice on that instrument. In 1835 he heard of the success of Thalberg in Paris, and, after an interval of 8 years, suddenly made his reappearance there with an éclat which his long absence had in no respect diminished. A contemporary critic, in enumerating the qualities which distinguished both pianists, observed: "Thalberg is the first, but Liszt is the only one." From Paris Liszt proceeded in 1837 to Italy, creating everywhere a sensation not less lively than that caused by Paganini. At Vienna he gave a series of concerts in aid of the sufferers by the great inundation of 1838 at Pesth; and at the solicitation of a deputation of Hungarian noblemen he subsequently visited the latter city, where he was received with extraordinary enthusiasm, and was presented by the inhabitants with a sword of honor and the rights of citizenship. From this period until 1847 his career was a succession of triumphs, and probably no musician has in an equal space of time been more honored, flattered, or caressed by all ranks of society. In the latter year, wearying of the life of an itinerant performer, he retired to a small village in Germany, with the intention of devoting himself to a higher order of composition than the fantasias and other pianoforte pieces which he had previously produced. About this time he accepted an offer from the duke of Weimar to assume the post of conductor of the court concerts and the opera at Weimar, where he has since resided.

In this position he has made Weimar one of the chief musical centres of Europe, and has helped to introduce to notice several of the rising composers of Germany. To his exertions Richard Wagner is in a great measure indebted for the publicity which his operas now enjoy. With characteristic generosity he also affords gratuitous instruction to young pianists, for whose benefit he gives private performances. As a performer Liszt stands at the head of what has been called the "prodigious" school, excelling in the production of difficult and novel effects. His fingering is firm, vigorous, and wonderfully flexible; but he labors under the imputation, not altogether unfounded, of sacrificing grace to strength, and of a desire to astonish rather than to charm by his playing. His compositions are liable of the same criticism. Bach, Handel, Beethoven, and the older composers have, however, had no more eloquent interpreter, notwithstanding he cannot always avoid substituting his own ideas for theirs. As a performer his execution has deteriorated during his retirement, and it is said that he cannot now perform many of his early pieces, distinguished chiefly for their difficulties. He has been an active contributor to musical literature, and is the author of a "Biography of Chopin" (1852), of a work on "The Gypsies and their Music" (Paris, 1859), and of numerous articles on the operas of Wagner and other subjects in the *Neue Zeitschrift für Musik*. His compositions comprise a variety of fantasias, caprices, reminiscences, &c. His personal appearance is striking, and his features, though angular and unprepossessing, thoroughly reflect his genius and energy of character. He possesses many engaging personal qualities, and is distinguished by an almost profuse liberality.

LITCHFIELD, a N. W. co. of Conn., bordering on N. Y.; area, 885 sq. m.; pop. in 1850, 45,253. It is watered by the Housatonic, Naugatuck, and Farmington rivers, with their branches, which supply extensive water power. The surface is uneven, in some parts mountainous, and the soil good. Iron ore abounds and is extensively manufactured. The principal productions in 1850 were 279,186 bushels of Indian corn, 91,224 of rye, 299,483 of oats, 293,511 of potatoes, 109,288 tons of hay, 1,246,588 lbs. of butter, and 143,518 of wool. There were 17 grist mills, 10 iron foundries, 16 woollen factories, 5 cotton factories, 89 tanneries, 104 churches, and 8,828 pupils attending public schools.—LITCHFIELD, a township and the capital of the preceding county; pop. in 1850, 3,953. The village is pleasantly situated on an elevation which commands a view noted for its beauty. It contains a court house, gaol, 4 churches (Congregational, Episcopal, Methodist, and Roman Catholic), a private lunatic asylum, 2 academies, and a newspaper office. It was formerly the seat of a celebrated law school, established in 1784 by the Hon. Tapping Reeve, but discontinued after his death. Of late years it has been a favorite summer resort.

LITERARY HISTORY, the history of books, treating therefore the attainments and progress of the human mind in every department, and the characteristic tendencies and opinions of every age. Political and ecclesiastical histories deal chiefly with events; literary history, with thought; each merges into the other, and they are necessarily connected in any complete narrative. Bibliography, biography, and even special criticism are but the subordinate parts of literary history; its main object is to show the general progress and phases of intellectual development and of æsthetic and moral culture. The ancients left no example of this species of history. It consists in large part of generalizations from literary phenomena, of which Paterculus gives one early instance. He shows by a historical review that the great men of antiquity seem often to have come in clusters, appearing almost contemporaneously in particular places. Quintilian also introduces the principal authors of Greece and Rome together in a single chapter. But the classical and mediæval authors rendered scarcely any service to this department, except by leaving materials. From the 16th century many more or less comprehensive histories of European literature have appeared, and the present century especially has produced valuable synoptical views both of European and oriental literature. Notwithstanding the *Bibliotheca Universalis* (1546-'55) of Conrad Gesner, and the *Bibliotheca Selecta* (1598) of the Italian Jesuit Possevin, Hallam follows Lord Bacon in the assertion that no real history of letters had been written up to his time. Bacon compares the world, lacking this, to a statue of Polyphemus wanting his single eye. He gives the outlines of a scheme which should contain "the antiquities and originals of knowledges, and their sects, their inventions, their traditions, their divers administrations and managings, their flourishings, their oppositions, decays, depressions, obliivions, removes, with the causes and occasions of them, and all other events concerning learning, throughout the ages of the world." Such a history, he says, would "make learned men wise in the use and administration of learning." The principal attempts in the 17th century were the *Prodromus Historiæ Literariæ* of Lambecius (1659), in which the design of a universal account of literature is completed only as far as the times of Moses and Cadmus, and the *Polyhistor Literarius* of Morhof (1688), a work of erudition and judgment, which was enlarged by Fabricius, and remained long in esteem. A more complete and regular synopsis was the *Origine, progresso e stato attuale d'ogni letteratura* (1782-'99), by the Jesuit Andres, displaying extensive learning, but little philosophical thought. A history of modern arts and sciences was meantime projected in Germany. These several departments were distributed among 11 savants, and J. G. Eichhorn undertook the general survey. He afterward published a history of letters from the earliest ages (1805-'11), more methodical and specific than any that had

preceded it, but showing a less thorough acquaintance with science and the modern languages than with oriental and theological literature. Of subsequent general literary histories, the most important are Wachler's *Handbuch der Geschichte der Literatur* (8d enlarged ed., 1838), and Grässe's *Handbuch der allgemeinen Literaturgeschichte* (1837-'55). The Italians have excelled in histories of their own literature. Tiraboschi (1772-'82) applies himself particularly to the exposition of facts, and makes but a sparing use of criticism; Corniani (1804-'13) more frequently analyzes books, and critically appreciates the writers; and the French author Ginguené (1811-'19) includes both the Latin and native literature of Italy. Sismondi's history of the literature of southern Europe is full and pleasing. There is no esteemed complete history either of French or English literature. The colossal literary history of France undertaken by the Benedictines in 1733 is still continued by the academy of inscriptions and belles-lettres. Demogeot in 1857 published a brilliant summary in one volume. Warton's history of English poetry, extending only to the reign of Elizabeth, has remained a favorite work. Hallam's "Introduction to the Literature of Europe in the 15th, 16th, and 17th Centuries" is hardly surpassed in respect of learning and philosophical criticism by any literary history. In Germany, Brucker, Tennemann, Buhle, and others, have written histories of philosophy. Menzel is the principal general historian of German literature (1828), Bouterwek of modern poetry and eloquence (1801-'19), Wilhelm von Schlegel of dramatic literature (1809-'11), and Ferdinand Wolf of Spanish and Portuguese literature (1859). The most authoritative history of Spanish literature is that by George Ticknor (8 vols., New York, 1849).—The works of chief importance on the literatures of different nations are referred to at the close of the articles under their several heads.

LITHARGE. See LEAD.

LITHGOW, WILLIAM, a Scotch traveller, born in the parish of Lanark in 1583, died there in 1640. He was of humble parentage, and as soon as he attained manhood commenced a pedestrian tour on the continent. After travelling in Germany, Bohemia, the Netherlands, Switzerland, and France, he proceeded to Italy, then visited Greece, western Asia, and Egypt, and returned to England, bringing with him "certain rare gifts and notable relics" from Jordan and Jerusalem, which he presented to King James and the queen. Having remained a year in London, he set out for western Africa, and traversed Morocco, Algiers, Tunisia, and Tripoli, returning home through Hungary, Poland, and Germany. His reputation as an adventurous traveller had by this time become so great that the court and people of London regarded him as a public curiosity, the king honoring him with frequent and familiar audiences, while the nobles and gentry entertained him as a guest. In 1619 he departed on a third tour,

bearing recommendatory letters from James to all kings, princes, and potentates. These documents however did not much avail him, for on arriving at Malaga in Spain he was arrested as a spy, and subjected to torture; his limbs were mangled and crushed, and his body lacerated with tightened cords. Through the intervention of the British consul, he at length obtained his liberty, and was conveyed to England in 1621, a helpless invalid. His condition was so deplorable that he had to be presented at court reclining on a feather bed. On recovering his health Lithgow was so imprudent as to assault the Spanish ambassador in the presence chamber, which outrage consigned him for 9 months to the Marshalsea prison. His latter days were passed in Scotland. The first edition of his "Travels" was published in London in 1614, the latest in 1814. He was also the author of a history of the siege of Breda (1637).

LITHIA (Gr. *λίθος*, a stone), the oxide of the metal lithium, discovered by Arfwedson in 1818 in the mineral petalite, since found in lepidolite, spodumene, and in several varieties of mica; symbol LO, chemical equivalent 14.5. It is an alkaline substance closely allied to potash and soda. It is separated by igniting the pulverized minerals that contain it with twice their weight of quicklime, treating first with hydrochloric and then with sulphuric acid. The sulphate of lithia, being soluble, is thus separated from the insoluble sulphate of lime, and is afterward decomposed by baryta water, the hydrate of lithia after filtration being recovered by evaporation; this fuses below redness; but as the alkali powerfully attacks platinum, the capsules employed should be of silver. Lithia forms several salts, which in general are remarkably fusible.—The metal LITHIUM (symbol L, chemical equivalent 6.53) was first obtained by Davy. It is most easily reduced from the chloride by the galvanic current. It is a soft, ductile, white metal, susceptible of being welded and drawn into wire, but has less tenacity than lead. It fuses at 356°, and is not volatilized at a red heat. It is the lightest solid body known, its specific gravity being only 0.5936. It burns brilliantly, floats upon water, and soon abstracts its oxygen, its behavior being like that of sodium.

LITHOGRAPHY (Gr. *λίθος*, a stone, and *γραφω*, to write), the art of producing designs upon stone, and transferring them to paper in the ordinary method of taking impressions. It may be called a branch of engraving; and to some extent in France, Germany, and Austria, for maps, botanical illustrations, &c., which require very minute and distinct lines, stones are cut with fine gravers of steel or diamond points in the same manner as copper plates are engraved. The cost is less than $\frac{1}{4}$ that of copper-plate engraving, and from 10,000 to 12,000 impressions may be taken from a stone without deterioration. But in the usual practice of the art, the lines which receive the ink are composed of some greasy substance, which is applied with a pen, crayon, or brush to the stone.

The inky material is then washed with a weak acid solution, which has the effect of hardening it, and also eating away slightly the stone not protected by the ink. Water is then applied, which wets the clean portions of the stone, leaving the greasy lines dry; and after this the lithographic ink laid over the whole adheres only to the greasy lines. The art was invented at the close of the 18th century by Aloys Senefelder, a Bavarian, who, too poor to publish his works, experimented with a view to discover some cheap method by which he could print them himself. (See *SENEFELDER*.) The process was suggested to him by his having casually made for his mother a memorandum of clothes to be sent to the washerwoman by writing upon a slab of stone, which he intended to copy. As it lay before him he thought to try the effect of applying printer's ink to the lines and thus taking an impression, and in 1796 succeeded in printing a piece of music from lines drawn in slight relief. Long before this, in 1728, a member of the French academy of sciences, named Dufay, described in the *Mémoires* of the academy a method of engraving in relief upon marble and some other stones, by which, with the use of a varnish to protect the portions to be left raised, and of acid to eat down the other portions, he produced upon the stone the most delicate designs; but this was applied to no further purpose. Senefelder obtained a patent for his process in several of the German states, and in 1802 engaged to some extent in the work at Vienna. He made use of his art as a cheap method of copying music, and thus invented that department of it known as autography or transferring, which even in 1799 he had extended to the copying of old engravings, the method being nearly the same with that now in use. He also devised at the same time the several modes of drawing with the pen, and the crayon or chalk, and the point engraving. He labored to extend his art throughout Europe, and was continually devising new modes of its application. It was introduced into Rome and London in 1807, and into Paris in 1814. Everywhere it met with great favor, and especially in Paris. Artists of distinction practised and aided to perfect it; and it was fashionable for the nobility to design on stone. It is said that this was skilfully practised by the duchess de Berry, and that the duke de Bordeaux pulled proofs, and the duke of Orleans illustrated "Gulliver's Travels." Lemercier cultivated the art with the most distinguished and long continued success. He contrived a new autolithographic paper, by the use of which painters and designers can work at once upon paper without fear of their productions being injured in the process of transferring them to stone. In the great exhibition at Paris in 1855 the medal of honor was awarded to Lemercier, who was then conducting a large establishment containing more than 100 presses and employing about 200 workmen. Count de Lasteyrie invented the method of facsimile printing, appli-

cable to the obtaining copies of characters that cannot easily be brought into ordinary typography, and also to maps in which all the details are lithographic, while the names of places are first produced upon the paper by ordinary printing. Engelmann by his knowledge of chemistry was able to give a great impulse to the art of lithographic printing in colors, or chromolithography; and by the science brought to bear upon lithography generally in Paris, it has there been carried to a higher degree of perfection than elsewhere. Full treatises were published upon it in 1819 by Count Raucourt and Senefelder. The lithographic art was introduced into the United States in 1821, and was practised by Messrs. Barnet and Doolittle in New York. There is a favorable notice of it with some of the earliest specimens in the 4th volume of the "American Journal of Science" for 1822. This country cannot boast of its progress or of any works of merit in the art. In England its productions have been of a high order, especially in landscapes; and the establishment of the Ackermanns in London was long famous for the fine specimens it furnished in immense numbers in this department, including the productions of Hughe, Ward, Westall, Harding, Lane, and others. In all civilized countries it is practised to a very great extent as a cheap method of furnishing prints and facsimiles, and forms of checks, bills, and other papers used for commercial purposes.—The best stones employed in lithography are slabs of a light-colored, slaty, argillaceous limestone, found in very extensive beds at Solenhofen, near Pappenheim, on the Danube. The rock belongs to the upper oolite, and occurs in sheets and slabs of various thicknesses. It is exceedingly fine-grained, formed evidently of the finest sediments; its fossils are many of them of the most delicate character, among them being found insects intermixed with other animal remains of marine character. The quarries had long been worked to furnish flooring slabs before this more valuable application of the stone was discovered. Other countries also have furnished lithographic stones, as those from the cretaceous formation of Belbèze, Haute-Garonne, in the French Pyrénées, claimed by some to be harder and better than the Bavarian. Those of Châteauroux in France are much used for lithographic writing. Others have been obtained near Bath in England, in Canada, and many other places. But after a careful examination of samples, at the French exhibition of 1855, from Algeria, Italy, Portugal, France, and Canada, the jury awarded the superiority in the aggregate of good qualities to those of Bavaria, such as were first used by Senefelder. The most perfect stones are required for crayon drawings. They should be of close and uniform texture, free from all spots, stains, and colored veins, and are of a pearl gray tint or light buff. For pen and brush drawings stones of somewhat inferior quality will answer; and for engraving the hardest are used without much regard to the veins and other similar de-

fects. To prepare them for use, they are first ground to a smooth and perfectly even face and polished; and then, according to the degree of fineness of the intended drawing, they are grained by rubbing the faces of two stones together with the intervention of finely ground silicious sand. To produce the precise grain required is a matter involving much care and skill. Stones that have been once used are treated in a similar manner to obliterate all the old marks and prepare them for use a second time.—The next requisite to that of a proper stone is a suitable ink or crayons for producing the drawings. Of these the mode of preparation is very variable; but the essential ingredients are chiefly soap, white wax, and Paris black. Various other substances are also employed, as tallow, mastic, shell lac, Venetian turpentine, carbonates of soda and potash, Brunswick black, &c. A mixture is made and melted together over the fire, and the materials are thus well incorporated together. More tallow gives a softer crayon or "chalk," and shell lac adds to its hardness. The mixture is cast into moulds, and the pieces may afterward be pointed and used as pencils, or be dissolved in water in the same way as India ink is rubbed. The latter is used chiefly on the polished stones, and may be applied with fine camels' hair brushes, or with fine steel pens, the outlines of the drawing being first transferred to the stone from paper. The crayons are used only upon grained surfaces, as their material would not adhere when rubbed upon smoothly polished surfaces. Their points soon become dull, and large numbers are kept ready sharpened at hand. The shading is effected precisely as in other drawings by the varying thickness or distance apart of the lines. With skilfully drawn lines in ink upon smooth surfaces, as fine an effect may be produced as upon copper. Drawings are sometimes transferred to stone from paper. For this purpose they are first made in a kind of copying ink, called autographic ink, upon paper prepared with a peculiar kind of size, and when used are laid face down upon the stone and pressed.—When the stone has received the design, the next operation is to fix it by destroying the solubility of its materials, so that it may not be entirely removed by water. This is effected by different chemical applications, among which nitric or hydrochloric acid may advantageously be used. The former, largely diluted with water, is commonly preferred, and its application is called etching. It is washed over the stone, and acts in several ways to perfect the operation. It dissolves out the alkali of the ink, leaving the insoluble portion to harden upon the stone; it attacks the calcareous material of the stone, and thus lowering the clean portions raises the inked portions in relief; it renders the parts it attacks porous and more susceptible of absorbing water, the benefit of which will be seen in speaking below of the process of printing; and by uniting with the lime it forms a film of calcareous salt, which

effectually covers the clean stone and prevents the appearance of spots and blemishes that form wherever the hand touches the stone, or any greasy matter reaches it in the course of its preparation. The stone is next washed with pure water and afterward with gum water; the object of the latter is to prevent the coloring matter from spreading under the pressure to which the stone is to be subjected in printing, and to retain the acid that adheres to the greasy substance, the quality of which it is designed to change. The roller charged with printing ink is then passed over the stone till the ink is found to adhere to the drawing. An application of gum Arabic in water is next made, and the stone is put away for a day or two that the ink may become well incorporated into it. When required for printing, it is secured in a suitable press, and backed if necessary to strengthen it with a bed of plaster of Paris. The gum is loosened by a sprinkling of clean water, and removed by passing a wet sponge lightly over it, and the ink, worked up on the color table close by, is rolled over the whole surface. That this may adhere only to the drawing, the stone must be kept uniformly wet, and some gum must always be present, though it may be in so small a quantity as not to be perceptible. If the ink is found to stain the stone in any part, it must be scraped off and gum water applied; and if this does not prove sufficient, it will be necessary to touch these parts with acid, and afterward with gum water. When the ink is properly distributed, the paper is laid upon the stone and the impression is taken. With each one the moisture is removed from the stone to the paper, and must be renewed. The ink employed for lithographic printing is a peculiar preparation, a receipt for which is given in the article *INK*. It must be thick enough to prevent its spreading too readily, so as to run upon the clean parts of the stone; and it must not be so thick as to adhere firmly to the paper and take up with it portions of the chalk or crayon. When this occurs the drawing is spoiled after a few impressions. In very warm weather it is sometimes found impossible to go on with the ink ordinarily employed. At other times it is occasionally found necessary to lay aside the stone for a few days to give the drawing time to reharden; but it must not be allowed to become too hard, as it would then refuse to take the ink. A special preserving ink or varnish is made use of to protect the drawing from becoming too hard, when it is desirable to leave it for a long time.—The quality of the paper is a matter that requires attention. If it contain any gritty substances, it will soon act upon the stone; plaster in its composition soon causes the lines to be clogged; and alum attacks the gum and ruins the drawing. It is even better to use unsized paper whenever the strength of this is sufficient. The printer should be able to appreciate the character of the work in hand, for upon his manner of applying the ink the general tone of the impressions may in great

part depend. Their perfection is also in part due to the condition of the paper as to proper amount of moisture, and to his manner of regulating the press. The apparatus employed for this purpose, though greatly improved from that formerly in use, has still the appearance of clumsiness and imperfection. The stone is set in a table, which can be run upon rollers turned by a hand crank under a fixed wooden scraper edge. This presses down upon the leather sheet or tympan that covers the moistened printing paper and its paper backers, which are first laid upon the face of the stone. Better results are thus attained than by the use of machinery worked by steam, which to some extent is applied to this process. With each impression the stone is wetted and inked. The number of perfect copies obtainable from crayon drawings upon stone is from 500 to 1,500. Fine ink drawings furnish about 6,000, and those in coarse lines have afforded as many as 80,000 without deterioration. Transfers from steel and copper plates and engraved stone to plane stone yield from 1,000 to 5,000 prints, varying with the quality of the drawing, &c. These are much used for printing maps and commercial blanks, of which very large numbers are required. The method is to take an impression from the original plate or engraved stone in transfer ink on paper prepared with a soluble coating of gum, starch, and alum. This is laid face downward upon the stone, and run through the press. The back of the paper being wet, the moisture partially dissolves the sizing, so that the ink is left upon the stone, when the paper is stripped off, and a further application of water completely dissolves and removes the sizing. The ink is then treated as before described.—Chromolithography, which has been most successfully practised by Engelmann in Paris, is a method of printing colors by the use of a succession of blocks, each having a single color distributed in its appropriate places, a process very similar to that described in *CALICO PRINTING*. The effect desired may be attained partly by the superposition of properly selected colors as well as by their juxtaposition. Some examples of printing in this branch of the art are particularly described in the work of Mr. Digby Wyatt, "The Industrial Arts of the Nineteenth Century," 1851; also in the London "Athenæum," June 18, 1853.—Senefelder made many experiments upon zinc as a substitute for stone in the processes peculiar to lithography. The metal in many respects is extremely well adapted for this use; and at the close of their report upon the specimens of the lithographic art in the Parisian exhibition, the jury expressed the opinion that the great advantages offered by the art called zincography are little appreciated. Zinc plates cost but little, are very easily prepared, and designs upon them are made with great facility. The metal takes fat inks, and its polished surface rejects water, while, when roughened by graining with sand and water or by acid or other agent, it is wetted almost as

well as lithographic stone. Prepared by aid of an alkaline solution, its surface becomes so hard, owing to the formation of a suboxide, that it will give from 6,000 to 8,000 good impressions. The art of drawing upon it can easily be learned in two days by a skilful operator. It is especially adapted for drawings of machinery and for architectural designs.—Lithography derives a new interest from the application of photography in furnishing its designs. Mr. Macpherson of Rome was the first to obtain photographs on stone for the purpose of printing them in the ordinary method of treating other designs. He called the art photolithography, and by the French, who have also cultivated it with great success, it is named *lithographie*. He obtained a coating of bitumen, sensitive to the action of light, by Niepce's method of pouring its solution in sulphuric ether upon the stone and allowing the ether to evaporate. To this coating a negative on glass or waxed paper is applied, and by exposure to the full rays of the sun a faint impression is obtained. By sulphuric ether the bitumen is all removed except the portion acted upon by the light, which by this agent has been made insoluble in ether. The stone, being washed, is ready for the ordinary operations of the lithographer. Messrs. Cutting and Bradford of Boston, Mass., have devised a method which promises to be of great importance in obtaining directly exact copies of objects either in reduced or enlarged scale. The stone is coated with a film obtained from a mixture of 4 oz. of gum Arabic with a quart of water and 160 grains each of sugar or molasses and bichromate of potash. The object of the sugar is to prevent the gum from attaching itself too directly to the stone, and the chromic salt has the effect of rendering the portions of gum acted upon by the light to some extent insoluble or fixed. After being exposed in the camera or placed under a negative, the stone is washed with a solution of soap, which removes all but that portion of the film which the light has touched. Upon the preserved portions an insoluble soap is formed, upon which the ink is afterward received. By the process of M. Poitevin the stone is covered with one or more films of a mixture of albumen or gelatine, and a concentrated solution of bichromate of potash. It is then exposed while moist in the camera, or is dried to receive a negative picture. It is afterward moistened with a sponge to receive the lithographic ink, which will adhere only to those parts upon which the light has acted—an effect just the reverse of that in the process of Messrs. Cutting and Bradford. This branch of the art is regarded as particularly appropriate for topographical maps, which, being drawn originally on a larger scale than required, may be very fully illustrated, and all their perfection be retained, in the reduced scale. The lettering on the original can be drawn so small as not to interfere with the topographical features. The whole being then reduced, perfect distinctness

is retained, while the letters, which are properly no part of such a map, may require a microscope to bring their forms into view.

LITHOTOMY, and LITHOMERY. See STONE.

LITHUANIA (Pol. *Litwa*), a large tract of land in eastern Europe, now belonging to the Russian empire, with the exception of a small part included in the East Prussian district of Gumbinnen, but which in the middle ages formed an independent state, and subsequently a great principality or grand duchy united with Poland. At the period of its greatest power in the 14th century it extended from the shores of the Baltic to those of the Black sea, and from the northern Bug to the Don. At the time of the first dismemberment of Poland, in 1772, it consisted of the palatinates of Wilna, Troki, Novogrodek, Brzesc, Vitebsk, Polotzk, and Mstislav, and the duchy of Samogitia; almost the whole of these territories is now included in the Russian governments of Wilna and Grodno, or Lithuania proper, of Vitebsk, Mohilev, and Minsk, and in the government of Augustowo in the Russian kingdom of Poland. Lithuania is generally a flat and low country, covered in great part with sand heaths, forests, marshes, and fens. The marshes of Pinsk, in the government of Minsk, are very extensive, and form a kind of dreary and gloomy desert. The principal rivers are the Niemen, Duna, Wilia, Dnieper, Beresina, and Pripetz, all of which abound in fish. The chief exportable productions are grains, flax, hemp, honey, timber, cattle, and horses. Among the wild animals are bears, wolves, elks, lynxes, wild hogs, foxes, and the aurochs or European bison, which is now confined exclusively to the forests of Bialowica in the government of Grodno. The climate is moderate and healthy. The inhabitants consist chiefly of Lithuanians proper, Poles, Russians, Tartars, and Jews.—Lithuania is first mentioned under this name about the beginning of the 11th century, when the inhabitants were little more than half savages living on the rude products of their extensive forests. They were long tributary to various neighboring Russian principalities, and, having recovered their independence, became involved in the 18th century in a long struggle with the knights sword-bearers, who established themselves on the shores of the Baltic, and in connection with the Teutonic order subdued and converted the kindred pagan tribes of the Prussians and others. Though inferior to their enemies in the art of war, the Lithuanians not only maintained their freedom, but also commenced a series of aggressive wars with their eastern neighbors, and rapidly grew in power. Ringold appears as the first great prince or grand duke of the united country before the middle of the 13th century. His son Mindog received the royal diadem from the pope after having adopted the Christian religion, and was crowned at Novogrodek, but soon relapsed into paganism. Under Gedimin, in the earlier part of the 14th century, Lithuania became a powerful state by the conquest of Volhynia, the principalities of Kiev and

Tchernigov, and others. His son and successor, Olgerd, even thrice appeared before the gates of Moscow. The son of the latter, Jagiello, who married Hedvig, the daughter of King Louis of Poland, becoming king of that country, united with it Lithuania, and converted his hereditary subjects to Christianity. Under the last king of his house in Poland, Sigismund II. Augustus, the two countries were still more closely united in 1569, though Lithuania retained separate armies, finances, and laws.—The LITHUANIAN LANGUAGE, the Lettic, and the now extinct old Prussian, form the Lithuano-Slavic group of the Indo-European family of languages. The Lithuanian is spoken in parts of East Prussia, and of the kingdom of Poland, in Samogitia, and in Lithuania proper. Its close affinity to the Sanscrit and relation to other languages have been established by Bohlen, Bopp, and others. The Latin form of writing was introduced with the religion of Rome. The vowels are the Italian *a, e, i* (or *y*), *o, u*, the pronunciation of which is determined by the use of the 3 French accents (‘, ‘, ‘), and *u* (*uo*). The consonants are: *b, c* (as in Polish, the German *z*, like *ts* in English), *č* or *cz* (the Polish *cz*, Eng. *ch*), *d, g* (hard), *i* before vowels (Pol. *j*, Eng. *y* consonant), *k, l, t* (resembling *rl*), *m, n, p, r, s* (as in Polish, and at the beginning of English words), *ś* (Eng. *sh*), *ś, v* (Eng. *v*), *s* (as in Polish and English), *š* (Eng. *j*). There is no letter *h*. A dropped nasal sound is marked by a little line in the vowels. Like the Slavic tongues and the Latin, the Lithuanian has no article, and 3 genders for nouns and adjectives. There are 7 cases of declension, the same as in Polish: nominative, genitive, dative, accusative, vocative, instrumental, and locative. The noun has 5 forms of declension, depending upon the termination and gender. There are 8 numbers, singular, dual, and plural. The declension of the adjective resembles that of the noun. The comparative degree is formed by *zemia* or *cena*, the superlative by *ausas* or *ausa*. The numerals are: *wienas* (Lat. *unus*), *du* (Lat. *duo*), *trys* (Lat. *tres*), *keturi* (Lat. *quatuor*, Pol. *cateru*), *penke* (Pol. *pięć*), *szesci* (Lat. *sex*, Pol. *sześć*), *septyni* (Lat. *septem*), *astuni* (Lat. *octo*, Ger. *acht*), *dewyni* (Pol. *dziewięć*), *desimti* (Pol. *dziesięć*, Lat. *decem*), &c. The pronouns resemble those of most Indo-European languages. The tenses of the verb are the present, imperfect, perfect, pluperfect, and future; it has conjunctive, factitive, inchoative, frequentative, and reciprocal forms, various participles, and a passive formed by auxiliaries. The language is rich in formatives and particles of every kind. Prepositions govern the cases of declension. Grammars have been published in German by Rubig (1747), Ostermeyer (1791), Mielcke (1800), and others; dictionaries by Rubig (1747) and Mielcke (1800); a Polish-Latin-Lithuanian dictionary by the Jesuit Schyrnoid (died in 1681), whose sermons are the earliest extant work printed in the language. There is hardly any Lithuanian literature, the principal productions being pop-

ular songs, religious and liturgical hymns, riddles, and other poetry.

LITMUS, a blue coloring substance, obtained from the lichen *roccella tinctoria*, which is collected on the Canary and Cape Verd islands and the coasts of N. Africa, and brought to Holland. The plants, being cleaned from earthy matters, are coarsely powdered and macerated for several weeks, with occasional agitation, in a mixture of urine, lime, carbonate of ammonia, and carbonate of potash. By the reaction of these substances upon the acid properties of the plants, which are themselves without color, their peculiar coloring matters are developed. The mass as it ferments is first red, and then becomes intensely blue. After this change it is mixed with chalk or other earthy substance to give it consistence, and the preparation is completed by moulding it into little rectangular cakes. In this state it is the commercial litmus. The cakes are of indigo blue or deep violet color, and of friable texture. The coloring matter is extracted by alkalies, partially by water and alcohol. The aqueous infusion is used to prepare the slips of litmus paper, which are employed by chemists as a test of acids and alkalies. Unsized paper is either dipped into the liquid, or this is brushed over its surface; and when the paper has been dried it is carefully preserved in well stopped vials. A bit of it moistened and exposed to acid vapors, or to any liquid having the slightest acid reaction, is immediately changed from blue to red; and thus changed, it becomes a test of alkalies, the effect of which is to restore its former color. It differs from most other vegetable blues, which by the action of alkalies are generally rendered green.

LITRE, the French elemental unit of liquid and other measures of capacity. It is the cubic *décimètre*, equal to 61.02705 cubic inches, which is nearly $\frac{1}{16}$ or 0.22 of an imperial gallon. The kilolitre is of the capacity of a cubic metre.

LITTA, POMPO, count, an Italian historian, born in Milan, Sept. 27, 1781, died there, Aug. 17, 1852. Enlisting in 1804 as a common soldier, he attained a high position in the French army, which he left in 1814. Under the revolutionary government of Lombardy in 1848 he officiated for a short time as minister of war and commander of the national guard of Milan. He is the author of *Famiglie celebri Italiane* (1819-'52), containing the history of 75 eminent Italian families, and as renowned for its superb execution as for its historical accuracy.

LITTLE FALLS, a township and village of Herkimer co., N. Y., on the line of the New York central railroad, and on the Erie canal, which here passes through a picturesque defile about 2 miles long; pop. of the township in 1855, 4,980; of the village, 8,984. The Mohawk river has here a fall of 42 feet in $\frac{1}{4}$ of a mile, furnishing great water power. The village contains 4 paper mills, 2 woollen factories, 2 flouring mills, a starch factory, 8 large shoe manufacturing factories, a bank, and 9 churches.

LITTLE ROCK, a city of Arkansas, capital

of the state and of Pulaski co., situated on the S. bank of the Arkansas river, about 800 m. above its mouth, and about the same distance below the point where it enters the state; lat. 34° 40' N., long. 92° 12' W.; pop. in 1860, about 4,000 or 5,000. It is built upon the first bed of rocks that is met with in ascending the Arkansas. Its elevation is not more than 40 or 50 feet; but, about two miles above, the opposite bank of the river rises abruptly into a precipitous range of cliffs, some 400 or 500 feet in height, known as the Big Rock. The name Little Rock is antithetical to this. On some of the earlier maps it is laid down as Acropolis, or Arcopolis. This name was given to it by an act of the territorial legislature, which has never been formally repealed; but it never obtained popular recognition. The growth of the city has been retarded by the lack of facilities for trade with the interior and for communication with other places, and by the fact that the title to a large portion of the ground on which it is built has been in litigation until very recently. The navigation of the Arkansas river is uncertain, and during a great part of the year it is often entirely closed. At present, however, a railroad to Memphis is constructing, and other improvements of the same kind are contemplated. A company has also been organized for the establishment of a line of telegraph to Memphis, with several branches. The state capitol, of brick, stuccoed, occupies a commanding position on the bank of the river. Among other public buildings are the United States arsenal, and Campbellite, Episcopal, Methodist, Presbyterian, and Roman Catholic churches. The state penitentiary is about a mile from the city. There are several flourishing academies and schools, and 2 or 3 weekly newspapers. A gas company has been formed, and it is expected that the works will be in operation in the course of the present year (1860). Quarries of excellent slate are found in the immediate vicinity of Little Rock, and even in the bank on which the town is built. The country around is generally poor, except in the Arkansas bottom. The situation of the city itself is dry, and generally healthful. A brook, forming a considerable valley, flows through the city. There are some handsome private dwellings; and the wide streets, spacious grounds and gardens, and profusion of shade trees and shrubbery, give it, especially in summer, a very pleasant and picturesque appearance. Little Rock was founded about 1820, and in Oct. 1820 was made the seat of the territorial government.

LITTLETON, or LYTTLETON, SIR THOMAS, an English jurist, born in Devonshire early in the 15th century, died in Frankley, Worcestershire, Aug. 28, 1481. His father's name was Westcote, but he substituted for it that of his maternal grandfather. He most probably received his collegiate education at Cambridge, whence he afterward removed to the Inner Temple, where he was nominated reader of law lectures. Henry VI. made him steward (or judge of the court of the palace or marshalsea) of the king's

household, and on May 18, 1455, a king's sergeant, in which capacity he rode the northern circuit as judge of assize. On the deposition of Henry, his successor Edward IV. confirmed to Littleton all the offices and honors he had received from the Lancastrians. In 1466 he was appointed one of the judges of the court of common pleas. His famous treatise on "Tenures," originally written in Norman French, and translated into English in 1539, from the great changes in the law of real property, no longer receives as much attention from the student as formerly. It is a model of logical deduction of consequences from premises; but its symmetry is obscured by the learned commentary of Sir Edward Coke, which usually accompanies it.

LITTORALE, or properly LITORALE (Lat. and It., belonging to the sea shore), the name of two strips of land on the northern shores of the Adriatic sea, of which the eastern, known as the Hungarian Littorale, has often figured as a province in Austrian history. It formerly belonged to the Croatian military district, was converted into a civil district of Hungary by Maria Theresa, formed a part of the French province of Illyria under Napoleon, was retaken by Austria in 1814, reannexed to Hungary in 1823, occupied by the ban of Croatia, Jellachich, in the war of 1848, and attached to that province by Francis Joseph in 1849. Its principal places are Fiume, Buccari, and Porto Re; area about 130 sq. m.; pop. about 25,000.

LITTRÉ, MAXIMILIEN PAUL ÉMILE, a French publicist and philologist, born in Paris, Feb. 1, 1801. He was educated for the profession of medicine, but his attention has always been given chiefly to philosophical and literary pursuits. After the revolution of July, 1830, in which he was an active participant, he became one of the contributors to the *National* newspaper, the organ of the democratic party, his connection with which lasted until its suppression in 1851. He wrote a number of papers for the *Dictionnaire de médecine*, among which is an important article on Asiatic cholera. In 1837, in concert with M. Dezeimeris, he established a medical and surgical journal, and at the same time was employed in editing and translating the works of Hippocrates. The first volume appeared in 1839, and procured his admission to the academy of inscriptions. Eight volumes had appeared in 1853, and the work is still unfinished. In 1839-'40 Littré published a translation of Strauss's "Life of Jesus." He became a prominent promoter of the doctrines of Auguste Comte, of which he gave a clear synopsis in his work *De la philosophie positive* (Paris, 1845), and which he has defended and elucidated in a series of pamphlets. In 1844 he had been appointed by his colleagues of the institute successor to Fauriel for continuing the *Histoire littéraire de la France*, the 21st, 22d, and 23d volumes of which are indebted to him for important contributions. In 1847 he published in the *Revue des deux mondes* a paper entitled *La*

poésie Homérique et l'ancienne poésie Française, with a translation in verse of the first book of the Iliad into the French language of the 18th century, which attracted considerable notice. In 1848 he mingled actively in politics, and held the honorary office of municipal councillor of Paris, and in 1849 published his *Application de la philosophie positive au gouvernement des sociétés, et, en particulier, à la crise actuelle*. In 1854 he was appointed editor of the *Journal des savants*. Among his other works are a translation of Pliny's "Natural History," which appeared in Nisard's *Collection des classiques Latins* (1848); *Conservation, révolution et positivisme* (1852); *Sur la mort de M. Auguste Comte* (1857); *Paroles de philosophie positive* (1859); *Dictionnaire étymologique de la langue Française* (1860).

LITTROW, JOSEPH JOHANN VON, a German astronomer, born in Bischofteinitz, Bohemia, March 13, 1781, died in Vienna, Nov. 30, 1840. He studied at Prague from 1793 to 1798, but in 1807 became professor of astronomy at Cracow. The war of 1809 caused the dissolution of the university there, and Littrow accepted an appointment in that of Kasan. In 1816 he became superintendent of an observatory on the Blocksberg in Buda, and some years later professor of astronomy in the university of Vienna. The excellence of the observatory of Vienna is chiefly due to his exertions. He wrote many valuable works on astronomy. His eldest son, KARL LUDWIG, was his assistant from the year 1831, and after his death succeeded him as superintendent of the observatory.

LITURGY (Gr. *λειτουργία*, a public act or service), in general, the totality of the prayers and ceremonies which are used by a church for the celebration of divine worship. More commonly, however, it is taken in a narrower sense, and denotes those formularies or books which contain these prayers and ceremonies. Those who administered the liturgy were called in the ancient church *λειτουργοί*, a term which denoted in Athens the managers of public spectacles, but was later taken exclusively in an ecclesiastical sense. Some scholars have made the doctrine of liturgies a special branch of practical theology, called *liturgics*, which contains 8 parts, viz.: dogmatical, or an investigation into the essence and nature of liturgy (divine service); historical, or the history of the various liturgies; and practical, or the application of the results of the two former parts to the present condition of divine worship. Christian liturgies are divided into 3 classes, those of the eastern, of the Roman Catholic, and of the Protestant churches. I. *Eastern Church*. Among the liturgies ascribed to Sts. Peter, Matthew, Mark, and James, the last is the most important. It is the liturgy of the church at Jerusalem. The original may date as far back as the 2d century, but many additions have been made in later times. The liturgy of Mark (Alexandrine liturgy) is ascribed to Cyril of Alexandria, and still forms the main part of the Coptic and Ethiopian

liturgies. A 8d very important liturgy is contained in the Apostolic Constitutions (l. viii.); tradition ascribed it to Clement of Rome, but modern investigations have shown that its origin must belong to a later period. The liturgies of Basil and Chrysostom are revisions of the liturgy of James, and are the main sources of the liturgy of the Russian church. Branches of it are the Armenian and Nestorian liturgies and several others of minor importance. II. *Latin Church*. The first beginnings of the Roman liturgy undoubtedly reach back to the days of the earliest bishops. History can trace them as far as Leo I., or at least Gelasius I. (492-'96). In the language of the church, the word liturgy applies only to the mass. Gregory I. gave it its name, and brought it in main into that shape which it still has. Pius V. in 1570 established it as *Missale Romanum*, which was revised by Clement VIII. and Urban VIII. The Ambrosian liturgy, the palladium of the church of Milan, is referred by tradition to Barnabas as its author. It differs but little from the Roman, and it still remains in use in the churches of Milan. The Mozarabic liturgy in Spain had undoubtedly a very early origin; it was approved by Isidore of Seville and the 4th council of Toledo. The Gallican church had a Gallican liturgy, among the authors of which Hilary of Poitiers is named. It was gradually supplanted by the introduction of the Roman liturgy after the time of the Carolingians. III. *Protestant Churches*. Luther, Zwingli, and Calvin published new liturgical works for the Protestant churches; but in the reformation of divine worship no uniformity was aimed at by them, and a great variety of liturgies prevailed. The liturgies of the 16th century were in the main retained until the close of the 18th century, when the ascendancy of a new theology (rationalism) produced a radical change both in the spirit and the form of divine worship. At the present day the churches of Germany and Switzerland have in many points returned to the liturgy of the 16th century, and the Lutheran theology especially has begun to lay great stress on the liturgical parts of divine service. A number of new liturgies were published, and frequent changes in the state churches took place, which, however, generally gave rise to violent controversies, as most of the advocates of the modern Lutheran liturgies were charged by their opponents with leaning toward the views of the Roman Catholic church.—The most celebrated among the liturgies of the Protestant churches is that of the church of England. The first draft of it was composed in 1547 by a committee of bishops and other learned divines. A new commission finished the whole liturgy by drawing up public offices for Sundays and holidays, for baptism, matrimony, burial, and other special occasions. The liturgy, having thus been compiled, was revised and approved by the archbishops, bishops, and clergy of the provinces of Canterbury and York, and then confirmed by Edward VI. and 3 estates in parliament (1548). In 1550 Arch-

bishop Cranmer proposed a revision, and in accordance with the suggestions put forth by him, by Calvin, and several other learned men, some important changes were made. Some rites and ceremonies which had been retained at first, such as the use of oil in confirmation, the unction of the sick, prayers for departed souls, and the invocation of the Holy Ghost at the consecration of the eucharist, were abolished, and the habits which were prescribed in the former book were also laid aside in this. The liturgy, thus altered, was again confirmed by parliament (1551), with the declaration that the alterations proceeded from curiosity rather than any other worthy cause. Both these liturgies were abolished by Queen Mary in 1553, but the latter was reestablished upon the accession of Queen Elizabeth, with a few alterations and additions aiming at a reconciliation of the parties in the church. Under King James, in consequence of a conference held before him by some bishops and divines of the church of England on the one side and some Puritans on the other, several slight changes were made. An attempt of Charles II. to have a new revision made by a joint commission of Episcopalians and Presbyterians, upon which both denominations might agree, failed. The Episcopal divines of the conference proposed some particular alterations which were agreed to by the whole clergy in convocation. Thus the liturgy was brought to that state in which it still stands in England. It was unanimously subscribed by both houses of convocation of both provinces, Dec. 20, 1661, and confirmed by both houses of parliament in March, 1662. Many petitions have since been made for a revision, but without success. During the last few years a revision has repeatedly been moved in the lower house of parliament, but the bishops have unanimously declared themselves opposed to it.—The first legislative convention of the Episcopal church in the United States, assembled in Philadelphia in Sept. 1786, appointed a committee to propose such alteration in the "Book of Common Prayer" as the American revolution and the constitution of the several states made necessary. The first American edition of the "Book of Common Prayer" was then issued, but never widely introduced. A new revision was made by the convention of 1789, and the "Book of Common Prayer" published in that form in which it is still used.

LIVADIA, the modern name, derived from that of the town of Lebedea, of the northern division of the kingdom of Greece, or of its continental part, though in a wider sense it also embraces the island of Negropont or Eubœa. Beside this island, it comprises the provinces of Attica and Bœotia, Phocis and Phthiotis, and Ætolia and Acarnania—that is, the territory of ancient Hellas proper—being bounded N. by Turkey, E. by the waters of the archipelago under various names, S. by the gulfs of Ægina, Lepanto, and Patras, and the isthmus of Corinth, and W. by the Ionian sea.

LIVER, an organ characterized by the presence of cells secreting bile, and found in some form or other throughout almost the whole animal series. These cells may be scattered over the intestinal canal, restricted within its follicles, contained in elongated branching tubes or cæca, or collected in loosely lobulated masses, as in invertebrates; or they may be clustered together with no immediate relation to the ducts, and be consolidated into a firm and compact organ, as in man and other vertebrates. The liver in man occupies the right hypochondriac and epigastric regions, below the diaphragm; it is above the stomach, duodenum, arch of the colon, gall bladder, and right kidney, and in front of the aorta and lower vena cava. Its size is large, and its normal weight from 3 to 5 lbs.; its form is irregular, being elongated transversely, flattened from above downward, very thick behind and thin in front; its tissue is dense and of a reddish brown color. The upper surface is convex, in contact with the diaphragm, and divided by the suspensory ligament or fold of peritoneum into 2 unequal parts, of which the right lobe is considerably larger than the left. The lower surface is irregularly concave, presenting from left to right a superficial depression corresponding to the upper wall of the stomach; the antero-posterior or longitudinal fissure, which lodges in the foetus the umbilical vein and the *ductus venosus*, shrunk into mere fibrous cords in the adult; the transverse fissure, at right angles to the preceding, in which are situated the vena portæ, the hepatic artery and canal, and numerous nervous filaments and lymphatic vessels; the short fissure for the vena cava, near the posterior border; the small lobe of Spigelius, an irregularly triangular portion behind the transverse fissure; the 4th lobe, in front of the transverse fissure, the gall bladder lying between it and the *lobulus caudatus*; and on the right lobe, depressions corresponding to the right portion of the transverse colon, and to the right kidney and supra-renal capsule. In the carnivora and rodents, portions of the liver rudimentary in man are highly developed; in these there are 5 distinct parts, a central or principal lobe, and a right and left lateral lobe, each with a lobular appendage. According to Carpenter, the human liver is chiefly composed of the central lobe, the lobe of Spigelius being the rudimentary right lateral lobe and the *lobulus caudatus* its lobular appendage, the left lateral lobe and its appendage being altogether undeveloped. The liver is in great part covered with a shining peritoneal or serous envelope; an investment of areolar tissue also is spread over the organ, extending into the interior, and forming thin but dense sheaths to the vessels and canals, called the capsule of Glisson.—The blood vessels of the liver are the hepatic artery and veins and the vena portæ; in the foetus the maternal blood is brought to the liver by the umbilical vein; the lymphatics are numerous, and the nerves are supplied from the pneumogastric and phrenic and the hepatic plexus. The

proper tissue of the liver is composed of a great number of granular bodies of the size of millet seed, generally called lobules and sometimes *acini*, of a foliated appearance from the branching distribution of the hepatic veins to the centre of each; in the spaces left between the polygonal lobules lie the branches of the vena portæ, hepatic artery, and duct, each lobule giving the characteristic structure of the organ. The vena portæ, which receives the venous blood from the digestive organs, divides and subdivides in the liver like an artery, till it reaches the interlobular spaces, forming a freely anastomosing network throughout the organ, and constituting the interlobular veins; after ramifying on the capsules they enter the lobules and become lobular veins, their terminal branches ending in the intra-lobular or hepatic vein. The hepatic artery, a branch of the great coeliac axis from the aorta, sends its branches to all parts of the organ, supplying the walls of the vessels and ducts, and the lobules through the interlobular spaces; whether they terminate in the portal plexus or the hepatic vein is still a matter of dispute; this is an interesting physiological question, as in the former case (maintained by Kiernan) its blood can only be subservient to the secretion of bile by passing into the portal plexus, and in the latter (the opinion of Müller) this secretion is to a great extent independent of arterial blood; the weight of evidence seems to be in favor of the former hypothesis. The hepatic veins which occupy the interior of the lobules are called intralobular veins; these converge to form larger vessels, and terminate in a main trunk which pours its blood into the ascending vena cava. The blood of the vena portæ differs from that of the hepatic vein, and both differ from ordinary venous blood. The portal blood is made up of that coming from the walls of the alimentary canal, modified by the digestive process, and of that which has circulated through the spleen. In the early part of the digestive process, the gastric and mesenteric bloods have less solid constituents from the imbibition of liquid, especially in the corpuscles, and a greater relative proportion of albumen; the quantity of extractive is usually increased, and sugar, dextrine, gelatine, and other organic matters are found in solution; the fibrine is not perfectly elaborated, and the albuminous matter is called by Mialhe albuminose, differing from albumen in the facility with which it traverses organic membranes, as in albuminuria and dropsies. The splenic blood, on the contrary, has its red corpuscles diminished, while the albumen and fibrine are increased, though the latter is imperfectly elaborated. According to Bernard, the blood of the hepatic vein contains an increased amount of sugar and fat, both these substances being generated in the liver from amylaceous, saccharine, and even azotized compounds. According to Lehmann, the blood of the hepatic differs from that of the portal vein in having from $\frac{1}{2}$ to $\frac{1}{4}$ less water, in being far richer in blood cells (which are poorer in fat, salts, and

iron, and richer in extractive), in its more bulky and readily breaking clot, and in its denser plasma.—The excretory apparatus of the liver consists of the hepatic, common, and cystic ducts, and the gall bladder, the last of which has been treated under its own title. The hepatic duct arises by very fine twigs upon the outside of the lobules (according to Kölliker), the bile secreted in their interior being transmitted outward from cell to cell as fluids are in the closed cells of plants; from the interlobular spaces they unite to form larger and larger branches, until they become 2 principal trunks, one from each lobe, which unite at a right angle in the transverse fissure; the duct is about $1\frac{1}{4}$ inches long and 2 lines in diameter, descending inward and joining the cystic duct, which is a continuation of the neck of the gall bladder. These two by their union form the common duct (*ductus communis choledocus*), about $\frac{3}{4}$ inches long, and opening into the last curvature of the duodenum. The biliary cells are of a flattened spheroidal form, from $\frac{1}{100}$ to $\frac{1}{75}$ of an inch in diameter, each nucleated and containing yellow amorphous biliary matter, with oil globules varying in number according to the nature of the food and other circumstances, an abnormal accumulation giving rise to the condition called "fatty liver." The venous blood of the liver contains not only fat but sugar, these being generated in the organ from farinaceous and even from nitrogenized compounds; the production of fat is to a certain extent vicarious with that of sugar, the former being characteristic of herbivorous and the latter of carnivorous animals.—For details on the structure of the liver, see the memoir by Mr. Kiernan in the "Philosophical Transactions" for 1833; Todd's "Cyclopædia of Anatomy and Physiology," article "Liver;" Dr. Leidy's memoir in the "American Journal of Medical Sciences," Jan. 1848; and Carpenter's "Physiology," and the works there referred to.—The liver performs the double function of assimilation and secretion, having the structural characters of both the vascular and ordinary secreting glands; the blood in passing through it not only becomes purified by the elimination of the biliary secretion, but its albuminous constituents are more highly elaborated; there is also evidence that the liver is subservient to the vital transformations of the components of the blood. The properties and physiological importance of the biliary secretion are given in the article BILE, and its course and action in the digestive process under CHYLE, CHYME, DIGESTION, and GALL BLADDER. Some of the pathological conditions of the liver have been noticed under CONGESTION. Cirrhosis is a granular degeneration of the lobules, often the result of inflammation; the organ is contracted, denser in structure, with the surface roughened by projections varying in size from a pin's head to a hazel nut, and of a yellowish color; one form is very common among spirit drinkers. The disease called fatty liver is frequent in phthisis and other diseases of de-

ficient respiration, and is a sign of inactivity rather than of increased action of an organ which has some of the functions of the lungs to perform; still there is an undoubted connection between deficiency of respiration and the presence of fat in the liver, discernible throughout the animal series. The retention of the materials of the bile in the blood acts like a poison upon the nervous system, and, if the suspension of the secretion be complete, death soon takes place; much of the cerebral disturbance accompanying dyspepsia, some forms of which are popularly called "liver complaint," is doubtless due to deficiency of the biliary secretion and the non-elimination of certain deleterious constituents. In certain climates and constitutions there is a constant tendency to bilious congestion, and this, in many cases, not so much from functional inactivity of the liver as from an excess of excrementitious matters brought to it in the form of stimulating hydro-carbonaceous food and drink, which indisposes to the active exercise which increases the amount eliminated from increased respiration; this points to the hygienic treatment of such cases, in preference to stimulating the liver to abnormal activity by mercurial and similar preparations. The liver is relatively very large in the foetus, in which it can serve neither the purposes of respiration nor digestion; it must act here as a purifier of the blood. In ordinary cases of jaundice the bile is properly secreted, but from obstruction of the ducts the flow into the intestinal canal is more or less interfered with, and it is consequently reabsorbed into the blood; this is far less injurious than the retention of the materials and non-secretion of the bile. The liver, then, is an assimilating organ, assisting in the conversion of nutriment into blood and solid tissues; it is also a secretory organ, separating the hydro-carbonaceous compounds, which are superfluous or effete, under the forms of sugar, fat, and bile; the first two, if not at once removed by the blood, remain stored in the liver as food for respiration, while the latter performs its office in the digestive process, after which it is in great part reabsorbed, and its oxidated components eliminated as water and carbonic acid by the lungs, and as sulphuric acid by the kidneys.

LIVERMORE, ABIEL ABBOT, an American clergyman, born in Wilton, N. H., Oct. 30, 1811. He was graduated at Harvard college in 1833, studied in the Cambridge divinity school, and was ordained as pastor of the Unitarian church in Keene, N. H., Nov. 2, 1836. This connection was dissolved in May, 1850, when he became pastor of the Unitarian church in Cincinnati, which office he held till the summer of 1856. He became editor of the "Christian Inquirer" in New York, Jan. 1, 1857, and in June of the same year pastor of the first Unitarian Congregational church in Yonkers. His principal works are: "The Four Gospels," with a commentary (2 vols., Boston, 1841-'2; Belfast, Ireland, 1844); "The Acts of the Apostles," with a commentary (Boston, 1844; London, 1846); "Lectures

to Young Men on their Moral Dangers and Duties" (1846); "The Marriage Offering," a compilation of prose and poetry (1848); "The War with Mexico Reviewed," a prize essay (1850); "Discourses" (1854); "Christian Hymns," a compilation in conjunction with other editors (5th ed. 1859). He has also contributed to the "North American Review," "Christian Examiner," "Christian Repository," and other periodicals.

LIVERPOOL, a borough town, and the principal seaport of England, situated in Lancashire, on the river Mersey, 4 m. above its mouth in the Irish sea, 201 m. by railway N. W. from London and 31 m. W. by S. from Manchester; pop. in 1851, 875,955; in 1860, estimated as high as 600,000. Its contiguity to the ocean and to the British manufacturing districts, as well as the enterprise of its inhabitants, gives to Liverpool a foremost position in the trade of the world. Nearly one half of all the products exported from England are shipped from this port. According to the board of trade returns, the exports, exclusive of foreign and colonial produce, and solely of British produce and manufactures, were valued in 1858 at nearly £51,000,000, and in 1857 at a little over £55,000,000. The principal articles exported in 1858 were: cotton manufactures, £22,300,000; woollen manufactures, £5,600,000; iron and steel, £3,700,000; cotton yarn, £2,800,000; linen manufactures, £2,500,000; hardware and cutlery, £1,900,000; haberdashery and millinery, £1,600,000; tin, £1,200,000. There are 6 articles of which more than half the entire imports into the United Kingdom were brought to Liverpool, viz: cotton, madder, palm oil, bacon, lard, and rice. The registered shipping belonging to the port in 1856 was 2,040 sailing vessels, tonnage 830,000, and 180 steam vessels, tonnage 58,300. In 1860 the total tonnage will probably reach 1,000,000. The amount of custom house duties received in 1855 was £3,520,913; 1856, £3,816,076; 1857, £3,621,409; 1858, £3,622,508. The entrances of British and foreign vessels coastwise with cargoes in 1856 was 9,569, tonnage 1,455,162; and the clearances 10,248, tonnage 1,378,911. The principal transactions with the United States arise from the cotton, flour, grain, and provision business, and from the exportation of manufactured goods. The exports of cotton to Great Britain, chiefly to Liverpool, were 2,450,000 bales in the year ending April 11, 1860, 2,019,000 in 1859, 1,810,000 in 1858, and 1,429,000 in 1857. There are sugar refineries and other manufactures in Liverpool, and that of soap is most extensively carried on. Ship building is also a profitable source of activity, and not only sailing vessels and steamers, but government ships of war are occasionally launched from the slips in the different parts of the town. The bulk of the 5,000,000 emigrants who left the shores of Great Britain from 1815 to 1860, sailed from Liverpool. Even the tide of German emigration flows now through Liverpool in preference to

Hamburg and Bremen.—The splendid docks of Liverpool cover a space of 400 acres of water along the Mersey, and extend on the Liverpool side of the river a distance of 5 m., and 2 m. on the Birkenhead side. The lineal quay space on the Liverpool side is 15 m., and on the Birkenhead side it will be when completed 9 m. The amount of capital invested in the docks is £10,000,000, of which £7,000,000 is in Liverpool proper. The sea wall along the Liverpool side, by which shipping in the docks is protected against the elements, is a stupendous work, upward of 5 m. in length, 11 feet in average thickness, and 40 feet in average height from the foundations. Upward of 80 pairs of gates have been erected within the last 30 years, some of which reach to the enormous width of 100 feet. (See Docks.) On Jan. 1, 1858, when the Mersey docks and harbor act came into operation, the tonnage dues, which up to that time had to be paid by all vessels entering the port whether they used the docks or not, were abolished, so that no vessel or steamer, entering the river Mersey and not going into dock, has now any other dues to pay than those appertaining to lights, buoys, or anchorage. The receipts and disbursements of dock and light dues have amounted within the last few years respectively to about £1,200,000 annually.—Liverpool resembles in its bustle and animation more an American than an English town. It has wonderfully improved within the last 50 years, and contains now a number of wide and handsome streets. Many of the principal avenues diverge from the open space partly occupied by St. John's church and the railway station; as Dale street, running S. W. to the town hall and exchange buildings, and continued under the name of Water street to St. George's docks; Whitechapel and Paradise street, leading to the custom house; Lime street, Renshaw street, Berry street, and Great George street, running almost S. in the direction of Toxteth park and the London road, following an eastward course toward the zoological gardens. Other principal streets are Castle street, opposite the town hall, Lord street, Church street, Hanover street, Bold street, Rodney street, Mount Pleasant, St. Anne's street, and Vauxhall road. The best known squares are St. George's, Queen's, Abercrombie, Clayton, and Cleveland. The town is abundantly supplied with water and gas. Meat, poultry, fruit, and garden vegetables are daily sold in St. John's market, which covers an area of 1½ acres, being 550 feet long and 135 wide, and supported by 116 pillars. There are other market places in different parts of the town. Among the principal public buildings is the custom house, in the Ionic style, with a lofty dome, and the town hall, with statues of Canning and of Roscoe by Chantrey. The exchange buildings form 3 sides of a square, of which the town hall constitutes the 4th. The quadrangular area, with a monument in honor of Nelson, is used as an exchange, and presents in business

hours a most animated appearance. On the E. side of this exchange area is a news room filled with the principal journals of the world, and above it are the underwriters' and cotton sales rooms. The W. and N. sides are occupied by the American and Liverpool chambers of commerce and by merchants' counting houses. Most of the business of Liverpool is transacted in this vicinity. There is a distinct market for the corn trade in Brunswick street.—The most celebrated public building in Liverpool is St. George's hall, opened in 1851; it is a commanding edifice in the Corinthian style, with columns 45 feet high, and having two large rooms appropriated for the holding of assizes, and the great hall 161 feet long and 75 in width and height, used for public meetings, concerts, &c. The sailors' home, adjacent to the custom house, commenced in 1846, was a fine building, which cost £30,000; it was burned April 29, 1860. There are over 50 churches belonging to the established church, and as many to other Protestant denominations; also a number of places of worship for Roman Catholics and Jews. The principal educational institution is the elegant Church of England college, fronting Shaw street, with ample provision for many branches of instruction, a sculpture gallery, a music hall, a laboratory, and a lecture hall holding over 2,000 persons. It was built in the Tudor style from a design of the architect of St. George's hall, the late Mr. Elmes. The foundation stone was laid in 1840 by Lord Stanley, now earl of Derby. It comprises 3 distinct day schools, and evening schools for adults. There are many other schools, several of which are attached to the mechanics' institution and to the royal institution. The latter owes its formation to the exertions of Mr. Roscoe, who was born near Liverpool, and contributed much to encourage among his townsmen a taste for literature and the fine arts. There are also schools for the deaf and dumb and the blind, and numerous charitable schools. The royal institution possesses a museum of natural history and collections of fine arts, mineralogy, &c. There are associations for the promotion of the various branches of science, literature, and art, and a philharmonic society which is in a very flourishing condition. The foundation stone of a free library and museum, to which Mr. William Brown contributed £30,000, was laid in 1857; and Mr. Joseph Mayer has offered to deposit in it his extensive collection of Egyptian and other antiquities and articles of *verru*, the money value of which is estimated at nearly £40,000. The new museum will also be enriched by the donations and bequests of the late earl of Derby, and by the now existing collections in the different museums of the town. Liverpool abounds with institutions for the relief of the distressed sick, and for the reform of criminals, and with well attended public baths, wash houses, and drinking fountains. There are several theatres and music halls in the town, a botanic garden at Edgehill, and a zoological garden in West Derby road, whose

attractions have been increased by the munificence of the late earl of Derby. The hotels of Liverpool, as the Adelphi, &c., present extraordinary scenes of excitement on the arrival of American steamers with their loads of passengers. The necropolis on Low hill near the zoological gardens, and the St. James cemetery, with the remains and statue of Mr. Huskisson, are the principal burial places. St. James's walk, near the cemetery, and the Princes' parade on the river bank, are well kept promenades. The environs are dotted with many elegant residences of the opulent merchants and the nobility, as Knowsley hall, belonging to the earl of Derby; Croxteth park, to the earl of Sefton; Childwall hall, to the marquis of Salisbury; Speke hall, to R. Watt, Esq.; Hale hall, to I. T. Blackburne, Esq., &c.—The parliamentary borough of Liverpool is governed by 16 aldermen and 48 councillors, one of whom is mayor, and returns 2 members to the house of commons (in 1860, Joseph O. Ewart, a liberal, and Thomas B. Horsfall, a conservative politician). The church livings are in the archdeaconry of Liverpool and diocese of Chester. The corporation of Liverpool is distinguished for its wealth and liberality. The value of the corporation estates is estimated at £3,000,000. There are over 80 consuls of foreign nations resident in Liverpool.—The first authentic record relative to Liverpool is contained in a charter of Henry II. (1173), in which the privileges of a seaport are conferred upon the town. King John granted to it a municipal charter, Aug. 28, 1207. It was constituted a free borough by Henry III. in 1227. It continued, however, in a state of stagnation for many centuries. During the contest between Charles I. and his parliament the town held out for the latter nearly a month. Having been finally taken by Prince Rupert, a great number of the inhabitants perished by the sword, and others soon afterward by pestilence and famine. Its population in the middle of the 17th century was insignificant, and was not much above 5,000 in 1699, when the town, which up to that time had been a chapelry attached to the parish of Walton, became an independent parish. The budding manufactures of Lancashire, Yorkshire, and Cheshire, and above all the plantations and the rise of America, gave a powerful impetus to its commercial activity, and the profitable and conspicuous part taken by the merchants and ship owners of Liverpool in the slave trade added considerably to the wealth of the town. The imports of American cotton, consisting of 5 bales in 1785 and 100 in 1787, rose to 100,000 in 1801, and now sometimes exceed 2,000,000 bales annually. The entrances in 1757 were about 1,400; in 1800, nearly 5,000; in 1880, 10,000; and in 1860 they will probably reach about 25,000 vessels. At the beginning of the 18th century Liverpool possessed only one single dock. Between 1830 and 1860 over 25 new docks and basins were opened, and several are now in course of construction; the corporation purchased in 1854

the Birkenhead dock and estates for about £1,100,000, and are now actively engaged in making these docks available for the constantly increasing demands of trade. The railway to Manchester was commenced in 1826; in 1829 the directors awarded a prize for the speed of Stephenson's locomotive engine; the railway was opened Sept. 15, 1829, and in 1837 also that to Birmingham. The London railway was completed Sept. 17, and that to Preston Oct. 31, 1838. At present Liverpool is the focus of a net of railroads encircling the whole United Kingdom. A telegraph line from Holyhead to Liverpool was opened April 18, 1860. The first California gold was received in Liverpool, June 21, 1849; California and soon afterward Australia gave another stimulus to the energy of the inhabitants. The Australian trade is steadily increasing, and promises to make of Liverpool the greatest wool market in the world. After the abolition of the monopoly of the East India company in 1833, Liverpool began to rival London in the trade with the East. On the whole, however, the town may be said to have advanced in proportion to the progress of the United States, upon the trade with which country the prosperity of Liverpool is chiefly dependent.

LIVERPOOL, CHARLES JENKINSON, 1st earl of, a British statesman, born May 16, 1727, died Dec. 17, 1808. He was the eldest son of Col. Charles Jenkinson, was educated at the Charterhouse, and at University college, Oxford, and entered parliament in 1761 as member for Cocker-mouth. In the same year he was appointed under secretary of state, and in 1778 secretary at war, a position which he retained until the close of Lord North's administration. Adhering thenceforth to the party of Mr. Pitt, he was appointed in 1784, under his auspices, president of the board of trade. After 17 years' tenure of this office he retired in 1801. He was a man of respectable attainments, but was to an unusual degree the object of popular dislike on account of his supposed undue influence with the king. He is the author of several political works, the most important of which is "Discourse on the Conduct of Great Britain with respect to Neutral Nations" (3 vols. 8vo., 1785), of "Treaties between Great Britain and other Powers, 1648-1783" (8 vols. 8vo., 1785), and "Treatise on the Coins of the Realm" (Oxford, 1805), the preparation of which occupied him subsequent to his retirement from office. He was created Lord Hawkesbury in 1786, and in 1796 earl of Liverpool.—**ROBERT BANKS JENKINSON**, 2d earl of, eldest son of the preceding, born June 7, 1770, died Dec. 4, 1828. He was educated at the Charterhouse and at Christchurch college, Oxford. In 1790, before he had attained his majority, he was elected to parliament as member for Rye, and upon taking his seat in the succeeding year proved himself a ready debater, and an efficient supporter of the ministry. Upon the retirement of Mr. Pitt in 1801 he was appointed foreign secretary in the Addington cabinet, in

which capacity he conducted the negotiation which terminated in the treaty of Amiens. Upon the return of Pitt to power he took office as home secretary, and in the latter part of 1808 was called to the house of peers as Lord Hawkesbury, in virtue of his father's barony of that name. The death of Pitt interrupted his official career, and although offered the premiership he preferred to remain in opposition during the Fox and Grenville administration. Upon its dissolution he again declined to form a ministry, but returned to his former post, which he retained until the assassination of Mr. Perceval. At the request of the prince regent, whose fullest confidence he always enjoyed, he then accepted, although with reluctance, the vacant premiership. His administration extended from 1812 to 1827, a longer period than that of any other modern British premier, except Walpole and Pitt, and was rendered permanent and successful mainly through the efforts of Castlereagh and Canning in the foreign office. The military successes of England brought him at the outset considerable popularity; but the distresses which followed after the war, and the severe measures which government adopted to repress internal disturbances, subsequently aroused against him a strong feeling of dislike, which was increased by the introduction of the bill of pains and penalties against Queen Caroline. To liberal opinions he was always steadfastly opposed, and his efforts, extending over a period of more than 80 years, greatly contributed to retard Catholic emancipation, parliamentary reform, the emancipation of the slaves in the West India colonies, and other kindred measures. His private character was above reproach, and few ministers holding such extreme views have been more respected by political adversaries. He was attacked by paralysis, Feb. 17, 1827, and passed the last three months of his life in a state of utter helplessness and mental imbecility.

LIVERWORTS, the common name of certain cellular cryptogams, constituting the natural order *hepatica* or *Jungermanniaceae*, ranking next to the lichens, and in a higher development of their several organs foreshadowing the true mosses or *musci*. They grow on the ground or on trees and decaying wood in damp places, having an axis or stem which sends out roots from its under side, and which is furnished with distinct leaves, or else with leaves so intimately united to each other as to assume the form of a frond, the epidermis of which is pierced with stomates. The tissue is eminently and loosely cellular. The reproductive organs, differently situated in different species, are of two kinds, viz.: the *antheridia* or male-like flowers, and the *pistillidia* or female-like flowers. From the pistillidia originate the capsules or fruit-bearing organs, which contain spores or seed-like bodies, whose germination and primary growth are similar to those of the ferns. The liverworts are natives of all climates where there is sufficient moisture and shade. In an economical point of view they are of very little

known utility. Some are slightly fragrant, with a sub-acrid taste. De Candolle conjectures that the larger kinds would be found to resemble the foliaceous lichens in their qualities. The term liverwort is derived from the superstitious idea that they must be efficacious in complaints of the liver, from a fancied resemblance to that organ which some of them were supposed to bear. According to Burnett, the *Marchantia* is still retained in Germany as an official plant, and in parts of England and Ireland the liverworts have always maintained their reputation. The liverworts were first distinctively noticed by Micheli in 1729. Since the publication of Linnæus's *Species Plantarum* (1753), when there were only 44 species known, the number has greatly increased; and, according to Montagne, the number of known species in 1842 was more than 600. The names of the most distinguished naturalists are connected with their investigation, structure, classification, and enumeration. The arrangement of Nees divides the liverworts into the following tribes: 1, *Jungermanniaceae*; 2, *Marchantiaceae*; 3, *monocleaceae*; 4, *anthoceroceae*; 5, *Ricciaceae*. Each of these tribes is again divided into a number of subtribes. The *Jungermanniaceae* are called scale mosses from their resemblance to the true mosses, and have either a frondose vegetation, i. e., the stem and leaves confluent in a frond, or a foliose vegetation, i. e., the stem and leaves distinct. The fruit is solitary, capsule-formed, and 4-valved (rarely more), and contains within it numerous seeds (spores) borne among spiral threads (elaters) which serve to disperse the seeds by their elastic properties. The *Marchantiaceae* have a frondose vegetation; the capsules are numerous, and are suspended beneath a stellar, peltate, stalked receptacle; on bursting they do not regularly dehisce into 4 valves; the elaters are present, and the spores are mixed among them. The *monocleaceae* have a somewhat thickened, coriaceous-foliaceous, succulent, flat, procumbent vegetation; the capsules are univalved, opening on one side only; they are peduncled, and spring from the edge of the frond; the seeds are numerous and lodged among the elaters. The *anthoceroceae* resemble the last; the frond is small; the capsules spring from the central portions of the frond, and are borne upon tall peduncles ending in a two-valved part, and bearing within numerous spores lodged around a central column; the elaters are wanting. *Ricciaceae* have the capsules immersed in the frond; they are of a globular shape and valveless, with both column and elaters deficient. The liverworts of the northern United States have been treated by Sullivant in Gray's "Manual of Botany," giving 123 species. They are to be met with in almost every situation—near springs of water, in the beds of rivulets which become dry in summer, on wet rocks, on the faces of cliffs in exposed situations, and on the bark of trees; they vary in size, from a length and breadth of several inches to almost microscopical proportions. There are several other frondose

liverworts, which, if gathered at the time of the development of the fruit, can be watched by placing them under a bell glass covering a little water in a saucer in which the plants are placed; they thus afford an interesting spectacle in the rapidity with which they grow, and in the delicacy of their fruit-bearing apparatus.—See Schwägrichen, *Historia Muscorum Hepaticarum Prodrumus* (Leipsic, 1814); Hooker, "British Jungermanniæ" (2 vols. fol., London, 1818, a beautifully illustrated work); Schweinitz, *Hepaticæ America Septentrionalis* (Raleigh, N. C., 1821); Nees von Esenbeck, *Hepaticæ Javanicæ* (Breslau, 1831), and *Naturgeschichte der Europäischen Lebermoose* (4 vols. 8vo., Berlin and Breslau, 1833-'8); Montagne, *Essai d'organographie de la famille des hépatiques* (Paris, 1845); *Hepaticæ*, in "Catalogue of Plants of Cincinnati," by Thomas G. Lea (1849), and in "Memoirs of the American Academy," new series (1850); Sullivan, in Gray's "Botany of the Northern United States" (New York, 1856), &c.

LIVERY, the distinctive dress delivered by masters to their servants. The term is derived from the French *livrée*, a word designating the clothes given by the early kings of France to their dependants, or from the custom of cavaliers distinguishing themselves at tournaments by wearing the livery or badges of their mistresses. The liverymen of London are the freemen of the 81 city companies, embracing the various trades of the metropolis, and who are so called from their privilege of wearing the livery of their companies.

LIVERY OF SEISIN (Fr. *livrée de seisin*; Lat. *deliberatio* or *traditio seisinæ*). A change of possession naturally accompanies, as it is indeed the best evidence of, a transfer of property. Personal chattels may be corporeally exchanged; but the alienation of immovable property must be certified by some ceremony or act sufficient to express the change of ownership. Under the system of feudal tenures, the possession of lands was delivered by the lords to their vassals, by the solemn and public act of investiture. This ceremony took place upon the land itself, in the presence of the peers of the lord's court, and, originally, by merely personal acts, without writing. The possession which complete investiture gave to the vassal was called his seisin, and this delivery of it by the superior was the livery of seisin. The design of the ceremony was to notify the transmission of the fee from one hand to another. For the lord, the peers of his court could bear witness to the obligations of servitude which the vassal had assumed, and to the conditions and limitation of the gift, if any had been annexed to it. For the tenant, they could testify to the fact of the grant in the event of a dispute respecting the freehold, and, in other respects, their testimony sufficed to assure his rights. But to make the evidence of these rights more certain, and to define more exactly the conditions of the fact, writings came to be introduced, declaring the tenor and terms of the investiture. In the gen-

eral feudal law, such writings were called *brevis testata*; that is to say, short written memoranda, attested by witnesses. They bore no date, nor were they executed or sealed by the parties themselves; their authority rested altogether in the testimony of the witnesses. When then, in England, some more precise evidence of the agreement between lord and tenant had come to be required than the mere parol testimony of the peers of the court, these *brevis testata* were imitated, and a charter of feoffment (*charta de feoffamento*) was executed and delivered to the new possessor of the lands, at the same time with the livery of seisin. This charter of feoffment was the evidence of the gift or grant, and the livery of seisin was only the transfer of the possession. Livery was of two kinds: livery in deed, and livery in law. The former was made, in the words of Sir E. Coke, "by delivery of the ring or haspe of the doore, or of a branch or twigge of a tree, or of a turfe of the land, and with these or the like words, the feoffor and feoffee both holding the deed of feoffment, and the ring or haspe, and the feoffor saying: 'Here I deliver you seisin and possession of this house, in the name of all the lands and tenements contained in this deed, according to the form and effect of the deed.'" Livery in law was not upon the land, but in sight of it, and the feoffee's title was not good until the livery was perfected by his actual entry upon the land during the feoffor's life. These charters of feoffment which accompanied livery of seisin were in early times but rarely signed. Sealing however became common, and nearly universal, and imported the assent of parties to the instrument thus attested. This custom of affixing a seal remained long after the occasion for it had passed away, and founded the present rules of law in this respect. As these written charters or deeds (for they are nothing else) became more perfect, the more formal ceremonies of investiture were dispensed with. The doctrine of seisin, however, maintained its place in the English law until very lately. In respect to descents its importance was modified by the statute 3 and 4 William IV.; and in regard to conveyances, lands might still be conveyed by a verbal contract alone, provided it was attended with public delivery of possession, until the latter part of the reign of Charles II., when the statute of frauds and perjuries enacted that there must be thenceforth some evidence in writing to support the grant. (See FRAUDS, STATUTE OF.) From this time forward until the statute 7 and 8 Victoria, c. 76, it was still possible to convey land by deed of feoffment and livery of seisin, though indeed this method was generally displaced by the forms of conveyance which had been framed upon the statute of uses.—Livery of seisin is entirely foreign to the American system of conveyances. Under the laws for the registration of the evidences of title, the record alone of a deed gives all that notoriety to the transfer of property which was the essential object of a public delivery of the possession. In-

deed, it is the general doctrine that registration is designed as a substitute for livery of seisin. In this country, therefore, a deed properly executed, delivered, and recorded, gives seisin in deed without entry; nor, generally, is the entry of an heir required to give him actual seisin.

LIVIA DRUSILLA, the wife of the emperor Augustus, born in 56 or 54 B. C., died in A. D. 29. She was the daughter of Livius Drusus, and was married first to Tiberius Claudius Nero, who, having fought against Octavius in the Perusian war, was afterward compelled to divorce his beautiful wife in favor of the victorious triumvir. She had already borne her husband the future emperor Tiberius, and a few months after her 2d marriage she bore another son, Drusus. She retained the affections of the emperor, by whom she had no children, till his death, owing to her fidelity, fascinating manners, and indulgence of conjugal derelictions on his part. She was skilled in the arts of dissimulation, and stands accused of having caused by foul means the deaths of various persons of the family of her husband who stood in the way of the succession of her own children. She was even suspected of having hastened by poison the death of Augustus himself. On the accession of Tiberius, when she believed she had finally attained the aim of her desires, imperial sway, she soon learned that she had misunderstood the disposition of her son, whose jealousy removed her from the court, and whose hatred persecuted her even after her death.

LIVINGSTON, the name of counties in 6 of the United States. I. A W. co. of N. Y., watered by the Genesee river and a number of creeks, and traversed by the Genesee valley canal and several railroads; area, 509 sq. m.; pop. in 1855, 89,256. Its surface is an upland, rolling in the N. and hilly in the S., and its soil is of exceeding fertility. It contains Conesus and Hemlock lakes, and mineral springs at Avon, a well known watering place. The productions in 1855 were 1,094,779 bushels of wheat, 481,464 of Indian corn, 261,990 of oats, 123,255 of barley, and 182,256 of potatoes. There were 35 saw mills, 18 furnaces, 7 tanneries, 3 paper mills, 4 newspaper offices, 86 churches, and 14,255 pupils attending public schools. Capital, Geneseo. II. A S. E. parish of La., intersected by the Tickfah river; area, 780 sq. m.; pop. in 1855, 8,958, of whom 1,140 were slaves. Lakes Maurepas and Pontchartrain are on its S. E. border. It has a level surface and a moderately fertile soil. The productions in 1855 were 861 bales of cotton, 227 hhds. of sugar, 352 barrels of molasses, 65,085 bushels of Indian corn, and 595 barrels of rice. Capital, Springfield. III. A W. co. of Ky., separated from Ill. on the W. by the Ohio, bordered on the S. by the Tennessee, and intersected by the Cumberland river; area, 245 sq. m.; pop. in 1860, 6,578, of whom 1,118 were slaves. The productions in 1850 were 331,436 bushels of Indian corn, 25,718 of oats, 41,200 lbs. of tobacco, and 5,888 of wool. There were 9 grist

mills, 8 saw mills, 8 tanneries, 14 churches, and 447 pupils attending public schools. Capital, Smithland. IV. A S. E. co. of Mich., drained by Huron, Shiawassee, and Red Cedar rivers; area, 576 sq. m.; pop. in 1850, 18,485. The surface is undulating, and the soil, which consists of a rich black sandy loam, is very fertile. The productions in 1850 were 304,588 bushels of wheat, 174,022 of Indian corn, 87,609 of oats, and 89,991 lbs. of wool. There were 11 grist mills, 8 saw mills, 4 iron foundries, 8 churches, and 4,465 pupils attending public schools. Capital, Howell. V. A N. E. co. of Ill., drained by the Vermilion and Mason rivers; area, 1,026 sq. m.; pop. in 1855, 4,606. The surface is undulating and the soil fertile. The productions in 1850 were 15,577 bushels of wheat, 129,785 of Indian corn, 25,409 of oats, and 6,815 lbs. of wool. There were 8 saw mills, and 200 pupils attending public schools. The Chicago and Mississippi railroad passes through the county. Capital, Pontiac. VI. A N. W. co. of Mo., watered by Grand river and its branches the Crooked Fork and Medicine and Shoal creeks; area, 510 sq. m.; pop. in 1856, 6,495, of whom 658 were slaves. The surface is level and the soil fertile. The productions in 1850 were 32,233 bushels of wheat, 270,270 of Indian corn, 39,881 of oats, and 13,558 lbs. of wool. Capital, Chillicothe.

LIVINGSTON, the name of a family which has possessed considerable social and political influence in the province and state of New York, and various members of which have been distinguished in American history. John Livingston, the common ancestor of the family, and a lineal descendant of the 4th Lord Livingston, was an energetic preacher of the reformed church in Scotland, and, having been banished in 1663 for nonconformity to prelatical rule, took refuge in Rotterdam, where he died in 1672. Of his 7 children, his son Robert emigrated to New York about 1675, and in 1686 received from Gov. Dongan a grant of a large tract of land, which was in 1715 confirmed by a royal charter of George I. erecting the manor and lordship of Livingston, with the privilege of holding a court leet and a court baron, and with the right of advowson to all the churches within its boundaries. This tract embraced large portions of what are now the counties of Dutchess and Columbia, N. Y., and is still known as the Livingston manor, though the greater part of it has long since passed out of the hands of the family. He was a man of influence in the colony, and procured the fitting out of the ship with which Capt. Kidd undertook to restrain the excesses of the pirates. He was connected by marriage with the Schuyler family, and had 3 sons, Philip, Robert, and Gilbert, from whom the most distinguished members of the family in America are descended. I. PHILIP, a signer of the declaration of independence, son of Philip and great-grandson of John Livingston, born in Albany, N. Y., Jan. 15, 1716, died in York, Penn., June 12, 1778. He was graduated at

Yale college in 1787, subsequently embarked in business in the city of New York, and between 1754 and 1758 served in the capacity of alderman. In the latter year he was returned to the colonial house of assembly from the city of New York, and continued a member of that body until 1769, when in consequence of his strong whig views he was unseated by the tory majority. He was chosen a member of the first and second continental congresses, and affixed his signature to the declaration of independence. He subsequently served in the New York provincial congress, in the state assembly and senate, and at the time of his death was a delegate from New York to the continental congress then sitting in York. He was one of the purest and most devoted patriots of the revolution, and rendered important service to the country in his legislative capacity. II. WILLIAM, LL.D., governor of New Jersey, brother of the preceding, born in the province of New York in Sept. 1728, died in Elizabethtown, N. J., July 25, 1790. He was graduated at Yale college in 1741, and subsequently became an eminent member of the bar in New York and New Jersey. Having early espoused the cause of the colonies, he was elected a delegate to the first continental congress from the latter province in 1774, and after the deposition of William Franklin in 1776 succeeded to the office of governor, which he retained to the close of his life. He was an upright public magistrate and a devoted republican, and during the period in which the Jerseys were the principal seat of the war was indefatigable in his efforts to keep the militia in a state of efficiency. In 1787 he was a delegate to the convention which framed the federal constitution. He was the author of a poem called "Philosophical Solitude," a funeral oration on President Burr of Princeton college, and a variety of political and miscellaneous tracts. III. BROOKHOLST, LL.D., a soldier and jurist, son of the preceding, born in New York, Nov. 25, 1757, died in Washington, March 18, 1828. He was graduated at Princeton college in 1774, and in 1776 became a member of the family of Gen. Schuyler, whom he attended in the capacity of aide-de-camp during the operations of the army in the north. He was subsequently attached to the suite of Gen. Arnold with the rank of major, was present at the surrender of Burgoyne, and before leaving the army was promoted to a colonelcy. In 1779 he went to Spain as private secretary to Mr. Jay, who had married his sister. Returning home after 3 years' absence, he studied law, was admitted to the bar in 1783, was appointed judge of the supreme court of the state of New York in Jan. 1802, and in Nov. 1806 was raised to the bench of the U. S. supreme court. He enjoyed a distinguished reputation as an advocate, a judge, and a scholar. IV. ROBERT R., a statesman and jurist, grandson of the second Robert Livingston, born in the city of New York in 1747, died Feb. 26, 1818. He was graduated at King's (now Columbia) college in 1765. He studied and practised law in New

York, and in 1778 was appointed recorder of that city, a judicial office of which he was soon deprived on account of his participation in the measures which ended in the declaration of independence. He was a member of the second continental congress, and was one of the committee of five appointed to draft the declaration of independence. He was prevented from signing that instrument by a necessary absence from Philadelphia; but he furthered the cause with zeal and efficiency throughout the war, being a member of congress again in 1780, and secretary of foreign affairs for two years commencing in Aug. 1781. He was also a leading member of the Kingston convention which framed the first constitution of the state of New York, adopted in April, 1777. Thereupon he was appointed the first chancellor of that state, and held the office till 1801, acquiring in it a high reputation as a jurist, though his decisions have not been regularly reported or preserved. The constitutional oath of office taken by Washington on first assuming the duties of president, April 30, 1789, was administered by Chancellor Livingston. Washington afterward tendered to him the post of minister to the court of France, which he declined. On Dec. 14, 1800, Mr. Jefferson, being assured of his election to the presidency, wrote to Chancellor Livingston inviting him to a seat in the cabinet as secretary of the navy, but the offer was not accepted. In the following February he was once more requested to reside in France as minister plenipotentiary, and he now accepted the place. In April, 1803, he completed the purchase from that country of Louisiana, embracing all the territory now belonging to the United States west of the Mississippi river, excepting Oregon and the region since acquired from Mexico. Mr. Monroe had been despatched as special envoy to assist him in the negotiation, but it was so far advanced before the arrival of the latter that the treaty of cession was signed a few days afterward. Mr. Livingston resigned his post in 1804, and after travelling over the continent, returned home the next year. During the remainder of his life he was actively engaged in introducing into the state of New York several improvements in agriculture, and in measures for the encouragement of a taste for the fine arts among his countrymen; and he was particularly serviceable to his friend Robert Fulton, with both counsel and material aid, in the early experiments in steam navigation. V. EDWARD, brother of the preceding, an American jurist and statesman, born in Clermont, Columbia co., N. Y., May 26, 1764, died in Rhinebeck, N. Y., May 23, 1836. He was graduated at Princeton college in 1781, studied law at Albany, and, on his admission to the bar in 1785, commenced practice in the city of New York, where at an early age he attained high rank as a jurist and advocate. In 1794 he was elected a representative in congress from the district including the city of New York, and was reelected successively to the following two

congresses, in which he was an opponent of the administrations of Washington and Adams upon the various party questions of the period. In March, 1801, he was appointed by Mr. Jefferson U. S. district attorney for the state of New York, then composing but one judicial district. He was also elected mayor of the city of New York for two years, commencing in 1801. By virtue of the latter office he was at the same time judge of an important municipal court of record. A volume of reports of his judicial opinions, delivered in that court during the year 1802, edited by himself, was published at New York in 1803. During his mayoralty, the city was visited by yellow fever, when his benevolence and intrepidity in remaining at his post nearly cost him his life. He now found his private affairs so involved, through the fault of others it is said, that he was unable to pay his debts, including a considerable balance due to the general government. He promptly resigned his offices and removed to New Orleans, in hopes to retrieve his fortunes by fresh exertions in a new field. In this he succeeded thoroughly, paying his debt to the government in full, principal and interest, and making head against great difficulties, not the least of which was a severe controversy respecting the title which he had acquired to some lands at New Orleans formed by gradual deposits from the annual inundations of the Mississippi river, and called the Batture—a controversy in which, among other opposition, he encountered that of the federal government under the personal management of Mr. Jefferson himself. This matter was the subject of a special message to congress of March 7, 1808, and of a pamphlet by the president, as well as of a pamphlet by Mr. Livingston in reply. The latter eventually triumphed in the courts, though the "law's delay" was such that the complete pecuniary fruits of the victory only came to his family long after his death. Many years later Mr. Livingston and Jefferson became heartily reconciled. The former volunteered the necessary overture at a time when his old enemy had long been a private citizen, depressed in fortune, and while his own career, already brilliant, was still fast brightening. At the battle of New Orleans, Mr. Livingston acted as aide-de-camp to Gen. Jackson. Soon after his arrival in the territory, the legislature of Louisiana commissioned him to prepare a system of judicial procedure, which was adopted in 1805, and continued in force until 1825, when it was superseded by the new and elaborate code of practice. In 1823 he was appointed, conjointly with Mr. Louis Moreau-Lislet, to revise the civil code of Louisiana, a work which was completed the next year, and substantially ratified by enactment. In the mean time, in 1821, Mr. Livingston was intrusted solely with the task of preparing a code of criminal law and procedure. The next year he made a report of his plan for this work, which was soon afterward reprinted in London and Paris. The work itself was submitted to the legislature in 1826, but was never

directly acted upon by that body, although by a joint resolution of March 21, 1822, the plan had been approved and its completion "earnestly solicited." However, the author derived from its publication great celebrity, both in America and in Europe. It was published at Philadelphia in 1823, in 1 vol. 8vo. He had completed his draft in 1824, and a copy had been made for the printer, when both copies were destroyed by fire. The next day, at the age of 60 years, he commenced the reconstruction of the work, and in two years more it was again complete. Upon this performance the best part of Mr. Livingston's fame rests. It is a comprehensive code, or series of codes, of crimes and punishments, of evidence, of procedure, of reform, of prison discipline, and of definitions, and is characterized throughout by the simplicity of its arrangement and by the wisdom and philanthropy of its provisions. It has visibly influenced the legislation of several countries, and portions of it have been enacted entire by the republic of Guatemala. All these juridical works were required to be prepared in both French and English, and called for the exercise of profound and philosophical knowledge, not only of the laws of England and the United States, but of the French, the Spanish, and the civil law. In 1823, on his retiring from the bar, Mr. Livingston was elected a representative in congress from Louisiana, in which office he continued till 1829, when he was made a U. S. senator from the same state. In 1831 he succeeded Mr. Van Buren as secretary of state of the United States, and in 1833 was appointed by President Jackson minister to France, where he resided until 1835, managing with success several affairs of more than ordinary importance and difficulty. On his return home, he retired to Rhinebeck in his native county. An eloquent eulogy upon his life and works was pronounced by M. Mignet in 1838 before the French academy of moral and political sciences, of which he had been chosen an associate a few years before. Mr. Livingston was a man of very social tastes, great gayety of manners, and perfection of temper. Amiability and goodness of heart are always the terms first employed in describing his character by those who remember him. VI. JOHN H., D.D., grandson of Gilbert Livingston, born in Poughkeepsie, N. Y., May 30, 1746, died in New Brunswick, N. J., Jan. 20, 1825. He was graduated at Yale college in 1762, and began the study of law, but resolved to devote himself to the ministry in the Reformed Dutch church. He studied theology at Utrecht in Holland, where he received the degree of D.D. in 1770; and in the autumn of the same year, having previously been ordained by the classis of Amsterdam, he returned to America, and, in compliance with a call tendered to him while abroad, at once became pastor of the Dutch church in New York city. In 1775 he was married to his third cousin, the daughter of Philip Livingston; and in 1776, having removed from New York on the occupation of that city by the

British, he accepted a call to Albany, where he remained 3 years. He then preached successively at Kingston and Poughkeepsie, and at the close of the war returned to New York. On the recommendation of the theological faculty of Utrecht and the classis of Amsterdam, he was appointed by the general synod of America in 1784 their professor of divinity, but it was not until 1795 that a regular seminary was opened under his direction at Bedford, L. I. This establishment was closed after two years for lack of support. Dr. Livingston then resumed his labors in New York. In 1807 the professorate was united to Queen's college, New Brunswick, N. J., and Dr. Livingston was appointed president and professor of theology. He removed to New Brunswick in 1810, and there passed the rest of his life. His published writings comprise "A Funeral Service;" "Incestuous Marriage," a dissertation on marriage with a sister-in-law (1816); and some occasional pieces. There is a memoir of his life by the Rev. Alexander Gunn (8vo., New York, 1829).

LIVINGSTONE, DAVID, a Scottish traveller and author, born at Blantyre Works, near Glasgow, in 1815. He was descended from a family which had for many generations been established in Ulva, one of the Hebrides group of islands, where his grandfather cultivated a small farm. Finding this occupation inadequate to the support of his family, he removed to Blantyre Works, and with his sons received employment in the cotton mills established there. At 10 years of age David Livingstone was placed in the cotton factory as a "piecer," and in the intervals of his daily labor pursued an extended course of self-instruction, not only studying by night, but contriving while occupied at the spinning jenny to employ much of his time in reading. Partly in this manner and partly by his attendance at an evening school he acquired a knowledge of Latin and Greek, and of various branches of natural science, including botany and geology. In his 19th year he was promoted to be a cotton spinner, and the remuneration for his labors was still steadily devoted to his education. About this time he conceived the idea of going to China as a medical missionary, with which object he attended lectures on medicine and divinity at the university of Glasgow in the winter, resuming his occupation at the mills during the summer vacation of the classes. Having been admitted a licentiate of the faculty of physicians of Glasgow, he prepared to sail for China under the auspices of the London missionary society; but being frustrated in that intention by the breaking out of war between Great Britain and China, he turned his attention to southern Africa, where the labors of the Rev. Robert Moffat were accomplishing favorable results among the natives, and, after a further course of theological instruction in England, embarked in 1840 for Cape Town, which he reached after a voyage of 8 months. From thence he proceeded by the way of Algoa bay to the interior, and passed several years at Kuruman and other places,

studying the language and customs of the Bakwains, a tribe of the Bechuanas, among whom he proposed to establish himself. In 1848 he removed to Mabotsa (lat. 25° 14' S., long. 26° 30' E.), where he founded a missionary station, and during the next 6 years labored in his calling there and at Kolobeng, a station about 50 miles further north. In June, 1849, in company with Messrs. Oswell and Murray, two English gentlemen, Dr. Livingstone started on his first exploring expedition into the interior, and on Aug. 1 reached Lake Ngami over the Bakalihari desert, which had for a long time presented insuperable obstacles to persons approaching in that direction, and along the Zouga, a large river issuing from the lake. The position of the lake had previously been pretty accurately defined on the maps, but Dr. Livingstone and his companions were the first Europeans who visited it. The party returned to Kolobeng in October, and in the succeeding year Livingstone made another journey to the lake, but was prevented by the prevalence of fever and of a species of fly very troublesome to cattle from proceeding to the northward of it. In 1851, in company with Mr. Oswell, he again started for the north, and, proceeding in a more easterly direction, reached the great river Zambesi, flowing in the centre of southern Africa. In April, 1852, he accompanied his wife (a daughter of Mr. Moffat) and his children to Cape Town, and, having witnessed their departure for England, returned to Kuruman with the intention of selecting a locality for a new station, which should be free from the annoyances of the Boers, who looked with suspicion upon his efforts to civilize the natives. While at this place he heard of a cruel attack by a party of 400 Boers upon Kolobeng, resulting in the slaughter of 60 natives, the seizure of several hundred women and children as slaves, and the plunder of his own house and many others. In Jan. 1853, he departed on his most important northern tour, and in May reached Linyanti (lat. 18° 17' 20" S., long. 28° 50' 9" E.), the principal town of the powerful Makololo tribe, at which he was enthusiastically received by the chief, Sekeletu, and the entire population. Departing thence in November, he proceeded up the Leeambye river and its affluent, the Leeba, to Lake Dilolo (lat. 11° 32' S.), and thence with considerable difficulty and peril across the Congo river to Angola, at the capital of which country, Loanda, on the western coast of Africa, he arrived May 31, 1854, and was kindly received by the Portuguese authorities stationed there. Leaving Loanda in the ensuing September, he reached Linyanti in Sept. 1855, and thence proceeded down the Leeambye and Zambesi rivers, which he found to be identical, to Quilimane on the Indian ocean, reaching that place May 20, 1856, just 4 years from the time of his last departure from Cape Town. Within that period he had traversed from ocean to ocean a portion of the continent never previously described by Europeans, and had travelled prob-

ably upward of 9,000 miles. At Quillimane he was received on board the British gun brig *Frolic*, in which he was conveyed to Mauritius, whence he returned by the Red sea and the overland route to England, arriving there Dec. 12, 1856. Owing to his long absence from England and his constant intercourse with savage races, his mother tongue had become so unfamiliar to him that at the public meetings given in his honor he found difficulty in expressing himself with fluency. In 1857 appeared his "Missionary Travels and Researches in South Africa," a work devoted more particularly to an account of his last great expedition. Having seen this through the press, he sailed in March, 1858, for Quillimane, of which place he had been appointed consul, and subsequently departed on a new exploring expedition up the river Zambesi with a party of scientific men. Occasional accounts have been received from him, by which it appears that the production of cotton, and the overthrow of the slave traffic by the opening of commercial intercourse between the African tribes of the south and European nations, two projects in which Dr. Livingstone has taken a great interest, are likely to be much advanced by the expedition.

LIVONIA, a W. province of Russia, bounded N. by Esthonia, E. by Lake Peipus and the government of Pskov, S. by Vitebak and Courland, and W. by the gulf of Livonia or bay of Riga; area, 18,188 sq. m.; pop. in 1856, 868,085. It includes the islands of Oesel, Mœen, &c., lying at the entrance of the gulf. The surface is level or gently undulating. There are a few hills, which rarely exceed 100 feet in height, although the Mesenberg, the highest, has an elevation of 1,200 feet. A considerable proportion of the land is occupied by forests and marshes. The soil on the sea coast is very sandy; in the interior, sand, clay, loam, and moorland alternate; but there are many very fertile tracts. There are 1,120 lakes, the principal of which is Lake Peipus (1,086 sq. m.), united by a narrow channel with Lake Pskov (93 sq. m.) on the S. E., and by the Great Embach with Lake Werzierwe, about 100 sq. m. in extent, in the middle of the province. The principal river is the Duna, which is the boundary toward Courland, and receives from Livonia the Ewest and the Oger; there are more than 800 smaller streams, among which are the Embach, Boulder-Aa, Salis, and Pernau. The climate is cold and raw till the end of May, but very hot in the 8 summer months. Agriculture is the chief industry. The country produces rye, barley, flax, hops, hemp, and linseed. The live stock is generally poor, or what good stock is kept is possessed by the nobles. Bears, wolves, lynxes, and foxes are numerous; and on the islands and sea coast seals are taken, and fish of various kinds are abundant. Potters' clay and limestone are obtained. Coarse woollens and cloths are made, and there are numerous distilleries. The rural population consists of Letts, Livs or Livonians proper, and Esthonians,

while Germans, Swedes, and Russians form the nobility, clergy, and burghers; there are also a few Jews. The great majority of the people are Lutherans. The principal towns are Riga, the capital, Pernau, Wenden, Dorpat, which has a university, and Arensburg in the island of Oesel. Livonia was first made known to western Europe by Bremen merchants about the middle of the 12th century. At the beginning of the 18th the order of knights sword-bearers was founded there, which in connection with the Teutonic order gradually subdued all the territories surrounding the gulf of Riga. The possession of the province was subsequently long disputed by Russians, Poles, and the knights, and finally also by Sweden, to which it was ceded by the treaty of Oliva in 1660. The treaty of Nystadt in 1721 annexed it to Russia.

LIVRE. See FRANCO.

LIVY (LIVIVS ANDRONICUS). See ANDRONICUS, LIVIVS.

LIVY (TITUS LIVIVS), a Roman historian, born in Patavium (Padua) in 59 B. C., died A. D. 17. All that is known concerning his life is that he resided during the greater part of it in Rome, that he was married and had at least one son and one daughter, that he enjoyed the patronage and friendship of Augustus, that by his advice the future emperor Claudius was induced in early life to attempt historical composition, that his reputation as an author was so widely extended that a Spaniard went from Cadiz to Rome solely for the purpose of seeing him, and that he returned to his native town some time before his death. Beside his history, which is his great work, he wrote epistles, dialogues, and a treatise on philosophy, not a fragment of which remains. His history of Rome, termed by himself *Annales*, was in 142 books, and embraced the period from the foundation of the city to the death of Drusus in 9 B. C. Only 35 of these books have been preserved; but we have dry epitomes of the whole, compiled by an unknown author, probably not much later than the volumes which they abridge, which are valuable as furnishing a complete index to the whole period of Roman history, and as being the sole authority for some periods. The original work has been divided into decades, or groups of 10 books each, from the circumstance that the 1st, 21st, and 31st books mark the beginning of important epochs, and are opened with a short introduction. This division was not introduced until after the 6th century. The 1st decade is preserved entire, extending to the final subjugation of the Samnites in 294 B. C. The 2d decade, embracing the period between 294 and 219 B. C., is altogether lost. The 3d decade, comprehending the period of the second Punic war, from 219 to 201 B. C., is entire. The 15 books which form the 4th decade and the first half of the 5th, and comprehend the period from the conclusion of the 2d Punic war to the conquest of Macedonia in 167 B. C., are entire. The remaining books are altogether lost, with the exception of unimportant fragments, and of

a few chapters of the 91st book, concerning the fortunes of Sertorius. The books which are now extant were brought to light at various dates from the revival of learning to the year 1615, the earliest editions having included only 29 books. Many of the fragments have been since discovered, two of the most interesting of them having been first published by Niebuhr (Berlin, 1820). Great exertions were made by Leo X. and by other potentates as late as Louis XIV. to recover the lost decades. Perfect copies were affirmed to exist at Iona in the Hebrides, in Obios, in the monastery of Mt. Athos, and in the seraglio of the Turkish sultan; there is reason to believe that such a prize was destroyed at the siege of Magdeburg, and there is little doubt that a manuscript containing at least the whole of the 5th decade was once in existence at Lausanne. The pursuit, however, always proved a vain one, and has long since been abandoned. The singular beauty of Livy's style, his easy, graceful, and energetic narrative, his skill in giving full relief to the leading features without neglecting minor incidents, and in maintaining a constant interest while relating a long series of dull events, have hardly been questioned. His characterizations and his descriptions are alike animated. His speeches, while they have been admired as models of eloquence, have been criticized as too polished and rhetorical to be suited either to the characters to which they are ascribed or to the audiences to which they are represented as addressed. It does not appear to have been his aim to write a critical history, but rather to give his countrymen a clear and pleasing narrative, and to exalt the fame of the Roman people. He moulded the rude records and fables of the older chronicles into a symmetrical and somewhat poetical form. He never displayed a diligent and painstaking care in consulting authorities and weighing conflicting testimonies. He never ascended to the original sources, tested the records by the monuments of remote antiquity, investigated the antiquities and traditions of the various Italian tribes, or inquired how far the rites and customs of his own time might explain the institutions of the past. He makes mistakes too from lack of a thorough acquaintance with the military art, jurisprudence, political economy, and even geography. These deficiencies, which result in many contradictions and inconsistencies, are not due to want of good faith, but to his indifference to historical thoroughness, and his desire for literary rather than critical elaboration. With the exception of a general tendency to eulogize the heroism of his countrymen and the military glory of Rome, he seems to have written with liberality and impartiality. Quintilian twice mentions a certain "Patavinity" in his style, but scholars have been unable to discover to what he alludes. The best editions are by Drakenborch (7 vols., Leyden, 1738-'46) and Alchefsaki (Berlin, 1841 *et seq.*). There are English translations by Philemon Holland (London, 1600-

'59), Baker (1797), one published by John Hayes (1744-'5), and a literal one forming 4 vols. in Bohn's "Classical Library" (1850).

LIZARD, the common name of several families of saurian reptiles, but properly restricted to the family *lacertini*, or the autosaurian group of Duméril and Bibron. Many iguanas, geckos, monitors, and skinks have been called lizards; the green anolis and the blue-tailed skink are familiar examples in this country. The lizard may be defined as a scaly reptile, with elongated body, 4 feet armed with 4 or 5 unequal and free toes, long conical tail clothed with scales disposed in parallel rings; head protected by horny plates, flattened and narrow in front; the tympanum membranous and distinct, and the eyes generally with 3 movable lids; the mouth wide, surrounded by large scales above and below; teeth of unequal size and shape, inserted on the internal border of a common groove in the projecting portion of the maxillary bones, and frequently also on the palate; tongue slender, free, fleshy, more or less extensible and forked at the point; the scales without prominent crests, those of the abdomen large; the neck without dewlap, but often with one or two transverse folds covered with tubercles or broad scales which form a kind of collar separated from those of the abdomen by smaller ones; the false ribs do not make a complete circle. The family of lizards may be divided into 2 sub-families, according to the structure and mode of insertion of the teeth; the 1st, according to Duméril and Bibron, is the pleodont, and the other the colodont; in the pleodonts the teeth are solid, and firmly fixed by their edges and external surface to the jaws in a hollow of the interior border; in the colodonts the teeth have an interior canal, and are slightly attached to the jaws. The pleodonts are further subdivided into the flat-tailed and conical-tailed groups; and the colodonts into the smooth-fingered and the serrated-fingered groups, distinguished also by their habits. The 1st group pass most of their lives in the water or inundated places; the 2d avoid wet situations; the 3d frequent woods and gardens, and the last dry and desert localities. Nineteen genera are described, established on the form of the tongue and teeth, the situation of the nostrils, the presence or absence of femoral pores, the form and distribution of the abdominal plates, and the characters of the tympanum and collar; for details the reader is referred to the work above cited. This family is one of the best known among reptiles, as its members are for the most part easily obtained in Europe and America; they vary in length from a few inches to 3 or 4 feet; the colors are often pleasing, but the tints vary much according to sex, age, and season. Lizards are very rapid in their movements for short distances, both on land and in the water; the loss of the tail is frequent from various accidents, but it is very soon replaced; from their scaly covering the sense of touch must be dull; so also are smell and hearing; the moist and

movable tongue indicates greater development of the sense of taste; vision is generally very good. Various shades of green, yellow, gray, black, white, blue, and red are found in the family; the epidermis is ordinarily renewed several times a year, being detached in fragments or plates, and at each moult the colors appear brighter, especially in the males. Lizards drink by lapping; their favorite food consists of insects, terrestrial mollusks, worms, eggs, and for the larger species small birds, reptiles, and mammals; the muscles of the jaws are powerful, and their bite is severe and long continued; most genera are oviparous, but one genus brings forth the young alive; the flesh of some of the larger species is considered a delicacy in South America. All the pleodonts belong to the new world, and all the colodonts to the continents of Europe, Asia, and Africa; the 6-lined ameiva only is found in North America. —The flat-tailed pleodonts or crocodilurians, embracing the genera *crocodilurus* (Spix), *thorictes* (Wagler), and *neusticurus* (Dum. and Bibr.), with a single species each, are among the largest of the family; they may be recognized by the crocodilian form of the tail, surmounted by 2 serrated crests, a powerful swimming organ; though the feet are not palmated, these reptiles pass most of their lives in the water, in the rivers, lakes, and swamps of tropical South America; some attain a length of 2½ feet, of which the tail is about two thirds. Of the conical-tailed pleodonts the best known genus is *ameiva* (Cuv.), more numerous in species, not partial to moist places, living on worms, insects, mollusks, and even on vegetable food. The common 8-lined ameiva (*A. vulgaris*, Licht.) attains a length of 1½ feet, and is a native of Brazil and Guiana. The 6-lined ameiva (*A. sex-lineata*, Holbr.), common in the southern states, is the only representative of the true lizard in this country; the usual length is about 10 inches, of which the tail is two thirds; the color is dark brown above, marked with 6 yellow longitudinal lines, and silvery white below. It is very active, frequenting dry and sandy places; it is very timid, and feeds on insects, which it generally procures toward the close of the day. The great American safeguard or teguexin, the largest of the ameiva lizards, grows to a length of more than 4 feet; it is voracious, and preys upon mice, frogs, and animals of similar size, and its white flesh is esteemed by the Brazilians; it is a swift runner, and when pursued will bite and strike severely with its tail; it is the *tejus monitor* (Merr.), and frequents the woods and dry places of tropical South America. —The colodonts, or hollow-toothed lizards of the old world, are all terrestrial in their habits; the smooth-fingered group are excellent climbers on trees and walls, of mild disposition, and generally looked upon as friends of man. This includes the typical genus *lacerta* (Cuv.), or the lizards properly so called; they have distinct eyelids, femoral pores on the inside of the thighs, and a collar of scales larger than the

rest under the throat; the form is generally slender and graceful, and the motions very quick. The European sand lizard (*L. stirpium*, Daud.; *L. agilis*, Linn.) has the back reddish brown, sometimes with blackish spots, the sides green with brown spots, and the lower parts chiefly white; it is about 8 inches long, and of rather stout form; it is found in Europe (except in the northern parts), near the Caspian sea, and in Asia, in level and hilly districts, in which it digs a hole at the foot of a bush or tree; it passes the winter in a dormant state, and feeds in the warm season on insects and larvae; the female lays about a dozen cylindrical eggs. The viviparous lizard (*L. vivipara*, Jacquin; genus *ootoca*, Wagler) is about 7½ inches long, of which the tail measures two thirds; the back is olive or reddish brown, with a black band on each side bordered with white above and below, and a black dorsal streak along the spine; the under parts are orange yellow with black spots. The tail does not diminish in thickness until about its middle. It is found most frequently in mountainous regions of Europe, but occasionally in dark and damp woods; it is timid, very active, and feeds principally on dipterous insects. Toward the month of June the female lays 5 to 7 eggs, from which the young come forth in a few minutes perfectly developed, and sometimes, it is said, the eggs are entirely hatched within the oviducts. The green lizard (*L. viridis*, Daud.) attains a length of about 18 inches, of which the tail is a foot; the color above is either uniformly green, or brown spotted with green, or the latter spotted with yellow, and the under parts yellow; there is considerable variation, and some specimens are marked with white and black streaks. It is generally distributed over Europe (except in the northern parts), northern Africa, and western Asia. The handsomest of the European species is the eyed lizard (*L. ocellata*, Daud.), about 16 inches long, of a green color, with spots, eyes, and reticulations of black, and rounded blue spots on the sides; it inhabits central and southern Europe and northern Africa. The wall lizard (*L. muralis*, Merr.) is only about 8½ inches long; the colors vary much, but the most common tint is an olive gray above, with brownish, whitish, and greenish tints, and a whitish yellow below; it is found over all Europe and western Asia. The other group of colodonts have the fingers with lateral serrations or inferior ridges, by means of which they can run rapidly over the arid sand in which they generally live. The genus *ophops* (Menest.) is remarkable for the absence of lids, giving to the head a snake-like appearance; it is found in south-western Asia. *Psammotromus* (Fitz.) is European; *calosaurus* (Dum. and Bibr.) is Asiatic; *acanthodactylus* (Fitz.) is African and European; *scapteira* (Fitz.) is also African; *eremias* (Fitz.) has 13 species, found in Africa and Asia, the best known being the variable lizard (*E. variabilis*, Fitz.), 6½ inches long, from Asia, grayish with black spots having a white centre.

LLAMA (*auchenia*, Illiger), a ruminant animal representing the camel family in the western hemisphere. The dentition is as follows: incisors $\frac{3}{3}$, the upper placed at the side of the intermaxillary bone close to the canines, which they much resemble; of the 6 lower incisors, the 4 median are very broad, curved, and gouge-shaped, the two external near to and resembling the canines; canines $\frac{1}{1}$; molars $\frac{3}{3}$. There is no hump on the back; the soles are divided into 2 toes, each with a strong horny nail or hoof with a thick pad beneath; the ears long, pointed, and movable; the upper lip is swelled and cleft, the head camel-like, the orbits prominent, and the nose small; the form is less heavy and the appearance less stupid than in the camel; the head is carried nearly perpendicular; the size and strength are much inferior to those of the camel; there is a conformation resembling the camel's hump in the shape of a thick bed of fat under the skin; as they kneel down like the camels, they have callosities on the knees of the fore legs; the stomach has a system of superficial cells, which in some degree may be considered equivalent to the water reservoirs in the camel. The structure of the feet is not adapted for travelling on sandy wastes, but for securing a firm hold among the mountains where they dwell; their native region is the slopes of the Andes, especially in Peru, and, though in a tropical latitude, often within the limits of perpetual snow. In the wild state they are vigilant and shy, living in flocks upon the mountains, and descending into the plains in search of food. When irritated they eject the contents of their mouth, which are very disagreeable, upon their assailant; they have the habit of dropping their excrement in particular spots, and from this propensity the natives are able to collect considerable quantities, which they use as fuel. There appear to be 3 species of the genus, viz.: the wild guanaco (*A. guanaco*, Tschudi), of which the llama is probably the domesticated variety; the alpaca or paco (*A. alpaca*, Tschudi), described in its alphabetical order; and the vicuña (*A. vicugna*, Tschudi). These are easily tamed, and are susceptible of considerable attachment to their keepers. The guanaco is found in the Andes from northern Peru to the neighborhood of the straits of Magellan, in the former inhabiting the mountains in small companies, but in Patagonia frequenting the plains in considerable herds. About 3 feet high at the shoulder, the head is carried at the height of about 5 feet; the color is reddish brown, and the hair tolerably long; they are hunted for the skin and flesh. Living at an elevation of 8,000 to 12,000 feet above the sea, they feed chiefly upon tough grassy reeds, mosses, lichens, and such shrubs as will grow at low temperatures; they do not require drink as long as succulent herbage can be obtained; their chisel-shaped and strong lower incisors, interlocking with the upper teeth and meeting the firm pad of the upper jaw, enable them to feed upon vegetable substances too

hard for ordinary cattle; and their long neck, cleft lip, pointed nose, and extensile tongue permit the collection of food in the interstices of rocks, and from the tops of tall shrubs. Sensitive to heat, they increase in situations where an arctic temperature prevails, even though under a tropical sun, far above the abodes of man. The young may be hunted with dogs and the lasso, but the adults must be shot; the flesh of the young is tender, but that of the old only fit for drying and salting. The domesticated llama (the *A. lama* of such as consider it a distinct species) takes the place of the camel and the horse among the Indians of Peru and Chili; it is of about the size of the guanaco, but of somewhat more compact form, and the hair is varied with black, white, gray, and other colors, as in other domesticated animals. From the elevation of the abdomen in the pelvic region the posterior portion of the body seems weak; 90 or 100 lbs. is as much as they can easily carry, but the ability to travel over rugged declivities made them valuable beasts of burden to the natives; their place is now to a great extent supplied by mules; their rate of travel is only 10 or 15 miles a day. They are valued principally for their long woolly hair, from which the Indians make articles of clothing; the skin makes good leather, the dung is used for fuel, and the flesh and milk as articles of food. They require very little care; at night they are put into an enclosure, where they sleep without protection, though the temperature falls even in summer below the freezing point; allowed to wander among the mountains during the day in search of food, they return like cattle at night to their enclosures. The alpaca, noticed under that title, considerably smaller than the llama, is domesticated by the Peruvians, though not used as a beast of burden; it is valued principally for its long and silky hair, which is made into the fine cloths familiar to all. The vicuña is the smallest species, about 2½ feet high at the shoulder; the color is reddish yellow on the back, and whitish on the belly; it is a wild animal, of great value for its very fine hair. The llama and alpaca have a period of gestation of 11 or 13 months, and only one is usually produced at a birth; they are weaned when 6 months old, and begin to bear at the age of 2 years; the former are not put at work till the end of the 3d year. From the fact that when the three animals above mentioned can be made to breed together the offspring is sterile, it is inferred that they constitute different species; these hybrids are much handsomer, and have longer and heavier fleeces than the original stocks.—There have been several attempts to introduce the llama into the United States and Europe, but as yet with little success; though thriving for a time on the usual food of cattle and sheep, they begin to fail unless they can browse on the inferior kinds of grass, with a supply of succulent roots instead of rich food and grains; in Peru, maize or millet in the soft milky stage

is frequently given to them; in Chili they eat a coarse clover, and here would thrive on the same, as well as pea vines, bean stalks, buckwheat straw, and such other coarse food as our cattle would reject; they invariably suffer from disease of the skin when confined in low places, and can only be restored by pure mountain air and frequent bathing. A sketch of the attempts to introduce the llama into the United States is given in the agricultural portion of the patent office report for the year 1857; none of these having been successful, probably from the unsuitableness of the climate and elevation in the Atlantic and gulf states, it is there advised to place them on the vast and high plains at the east of the Rocky mountains, between long. 20° and 30° W., extending from Texas to the arctic regions; here the nature of the soil, the climate, and the herbage (particularly the buffalo grass) seem specially suited for the llama; here, with the herds of wild cattle, horses, buffaloes, antelopes, deer, and other ruminants, if unmolested for a few years, they would probably increase immensely, affording a great source of wealth in their skins, flesh, and wool, beside being useful as beasts of burden in places inaccessible even to mules. In the autumn of 1857, 88 llamas were imported into New York from Peru, and, having been kept during the winter at the "Dyckman farm" in the city, near King's Bridge, were offered at auction in March, 1858. The flock was 72 when it started from Peru; exposed to the perils of the isthmus of Panama in the hottest season, to the railroad transit, and to a crowded passage in a small vessel, with insufficient and improper food, it was no wonder that about half of them died before reaching New York. They wintered as well as sheep of the same condition, though fed on dry forage; the flock were all broken to the halter and the pack, and were docile, tractable, intelligent, in color resembling brown and black sheep; they did not bring \$100 each (the price demanded) at this sale, though some were subsequently sold to go to Australia at a little more than this; what became of the flock is not definitely known. Though possibly the llama might be used for carrying supplies in some of the mining regions of the country, and afford a not very palatable food to the inhabitants of arid districts, it would be kept principally for its fleece. The latter, 4 to 6 inches long, fine and soft with a few longer coarse hairs, resembles that of a black sheep; an average fleece will weigh 10 lbs., and its value is greater than that of wool; the excellence and durability of alpaca cloth are well known. It would be a subject worth the attention of agricultural societies, to ascertain if somewhere in this vast country the llama and alpaca cannot be introduced to advantage among our fleece-bearing domesticated animals.

LLORENTE, DON JUAN ANTONIO, a Spanish writer, born in Rincon del Solo, Aragon, March 30, 1756, died in Madrid, Feb. 5, 1823. He came of a noble though not wealthy family,

studied at Tarragona and Madrid, and received in 1776 the degree of LL.B. with an ecclesiastical benefice. In 1779 he was ordained priest, in 1780 he was made doctor of canon law at Valencia, and in 1782 he became vicar-general of the bishop of Calahorra. Already at this time he seems to have been unsettled in his faith; at least we know from his own account that in 1784 he had arrived at the conclusion "that there is no authority outside of us which has the right to subjugate our reason." Notwithstanding these views, he accepted in 1785 a situation as commissary, and in 1789 as secretary-general of the inquisition. By the liberal inquisitor-general Manuel Abad de Sierra he was charged with drawing up a plan of a total reformation of the inquisition, but this attempt failed. A second attempt, made by Llorente in union with the bishop of Calahorra and the minister of justice, Jovellanos, was no more successful, and ended in the exile of Jovellanos and the arrest of Llorente. He was, however, recalled to Madrid in 1806 by the Prince of the Peace, who commissioned him to write, in favor of a greater centralization, a work against the old liberties of the Basque provinces (*Noticias historicas sobre las tres provincias Bascongadas*, 3 vols., Madrid, 1806). Several lucrative offices were the reward of this work. After the invasion in 1808 Llorente became one of the most devoted partisans of the French. King Joseph made him a state councillor, and, after the suppression of the inquisition, placed all the papers of that tribunal at his disposal, and charged him with writing its history. For two years Llorente was occupied, aided by several assistants, in copying the most important documents. At the same time he was charged with the execution of the decree which abolished all convents, and also accepted the supreme administration of the so called national property. He was accused of having embezzled 11,000,000 reals, and lost his offices for a time; but as the charge could not be proved, he was restored. Being exiled as an adherent of the French by Ferdinand VII. in 1814, he went to Paris, where, after a short journey to England, he took up his permanent abode. Here he finished his most celebrated work, the "History of the Spanish Inquisition." Not being perfectly master of the French language, he published it in Spanish, but it was at the same time translated into French under his superintendence by A. Pellier (*Histoire critique de l'inquisition d'Espagne*, 4 vols., Paris, 1817-'18). The work was very soon translated into German, Italian, English, and Dutch, and made a profound sensation. That it is very deficient as a work of art is admitted by all; and also that the author evinces but little knowledge of general history. The accuracy of his citations from the documents of the inquisition is still disputed. Modern Catholic writers, especially Hefele in his "Life of Ximenes," have contested it, while Protestant historians are generally of opinion that no sufficient reason has yet been adduced to doubt it.

Immediately after the publication of the work he was suspended from the exercise of all ecclesiastical functions. He then endeavored to support himself by giving instruction at a literary institution in Paris, but this also was soon forbidden by the Paris university. In 1822 he published his *Portraits politiques des papes*, a work which was regarded as even more hostile to the Roman Catholic church than his history of the inquisition. Being ordered by the government to leave France within three days, he returned to Madrid, where he found a cordial reception, but died soon afterward. Beside the works already mentioned, he wrote: *Mémoires pour servir à l'histoire de la révolution d'Espagne, par Nellerto*, an anagram of his name (3 vols., Paris, 1815-'19); *Discours sur une constitution religieuse* (2 vols., Paris, 1819); *Œuvres complètes de Barth. de Las Casas* (2 vols., Paris, 1822); and *Observations critiques sur le roman de Gil Blas* (Paris, 1822), in which he sought to prove that Le Sage took his celebrated work from a Spanish manuscript. He published an autobiography, *Noticia biográfica* (Paris, 1818), which is reprinted in full in Mahul's *Annuaire nécrologique* (5th year).

LLOYD, HENRY, an English soldier and author, born in Wales in 1729, died at Huy in the Netherlands, June 19, 1783. He went abroad at the age of 16, and was present at the battle of Fontenoy. He afterward entered the Austrian service, rose to the command of a body of cavalry, and subsequently resigned his commission in disgust, and entered the service of Prussia. He made two campaigns in the capacity of aide-de-camp to Prince Ferdinand of Brunswick, and on the commencement of hostilities between Russia and Turkey in 1768 he entered the Russian service as major-general. He distinguished himself at the siege of Silistria and elsewhere, and subsequently participated with credit in the war with Sweden. After more than 80 years' absence he returned to England, and having made a survey of the coast prepared a memoir on the "Invasion and Defence of Great Britain," which was published in 1790. He wrote also "The History of the late War in Germany, 1758-'59" (2 vols. 4to., London, 1766-'90), and "A Treatise on the Composition of different Armies, Ancient and Modern," both of which were translated into French and German. It has been said, but upon doubtful authority, that his continuation of the history of the 7 years' war and history of the wars in Flanders were bought up and suppressed by order of the British government.

LLOYD'S, the name of subscription rooms on the first floor of the London exchange, where merchants, shippers, and underwriters attend to obtain shipping intelligence, and where the business of marine insurance is carried on. One large room with small rooms attached to it is occupied by the underwriters, the object of whose association is to limit the interest of every individual underwriter to a moderate amount, say £50, £100, or £150, rarely exceed-

ing £200; so that in case of casualties the loss, instead of falling upon one, is divided among hundreds. The underwriters of Lloyd's have agents in all parts of the world to report on casualties and to attend to their interests. Their affairs are managed by a committee of 9 members; the chairman is elected annually. Another large room, called the merchants' room, is provided with newspapers from all parts of the world, and open to subscribers, who for the use of this room alone have to pay 2 guineas, and for the whole establishment 4 guineas annually. The third room is called the captains' room, to which a bar is attached, where captains and merchants meet in a more social manner, and where ship auctions are held.—This use of the name Lloyd or Lloyd's arose from the circumstance that the head-quarters of the London underwriters were originally in Lloyd's coffee house; it has now become a generic term for similar associations in many parts of Europe. An Austrian Lloyd's (*Lloyd Austriaco*) was established in Trieste in 1833 by Baron Bruck, who committed suicide in April, 1860, on being dismissed from the office of Austrian minister of finance. It is not, like its London namesake, an association of underwriters, but for general commercial and industrial purposes. In 1836 it established a journal, in 1837 a line of steamers, and in 1849 an institution devoted to printing and art.

LOACH, a soft-rayed cyprinoid fish, of the genus *cobitis* (Linn.). The common loach of Great Britain (*C. barbatula*, Linn.) is 3 or 4 inches long, with a small head, elongated body very little narrowed at the tail, and covered with minute and slimy scales; the mouth is small, without teeth, the upper lip having 4 barbules in front and one at each corner; the ventral fins far back, placed under the single small dorsal; gill openings small, and branchiostegous rays three. It is common in shallow clear streams, where it delights to lurk under stones, and is very restless and active when disturbed. Like other species with barbules, it is a ground fish, feeding on worms and aquatic insects; a common name for it is mud creeper; it is very prolific, spawning in March or April, and its flesh is considered a great delicacy. The air bladder is contained in a bony cavity attached to the anterior vertebrae, and is supposed by Weber to be connected with the organ of hearing; there is also said by Yarrell to be a deficiency in the upper wall of the skull between the parietal bones. The spined loach (*C. tentia*, Linn.; genus *botia*, Gray) is rather smaller and more slender, without barbules, but with a forked and movable spine behind each nostril on the suborbital bone; this is a rarer fish in Europe, but several allied species are found in the Ganges. The color in both these species is yellowish white above, clouded and spotted with brown, but unspotted beneath. The lake loach of Europe (*C. fossilis*, Linn.) is about the same size. All the species of loach are peculiarly restless during stormy weather, especially

when accompanied by thunder and considerable electrical changes in the air; they have been regarded as a kind of living barometers, which, from their being ground fish with a low degree of respiration and consequent great muscular irritability, may be explained on philosophical principles; the peculiarity of the air bladder may enable them to perceive thunder either by the sense of hearing or feeling. According to some writers the lake loach, which is very tenacious of life, comes to the surface in order to swallow air, from which it extracts the oxygen, giving out carbonic acid by the vent, performing a kind of supplementary intestinal respiration. There is a very curious fish called the 4-eyed loach or peeper, ranked by Linnaeus in the genus *cobitis*, but now placed in the genus *anableps* (Artedi). It belongs to the allied family of cyprinodonts, having maxillary teeth and 5 branchiostegous rays. The most striking peculiarity is the protuberant eyes, the cornea in which is divided transversely into 2 nearly equal parts by a horizontal opaque band; the iris also appears to be double, forming a double pupil, but in reality the sides of the former are only drawn together under the transverse corneal band, as may be seen in young fishes; the lens is pear-shaped, and the internal structure of the eye offers nothing peculiar; the fish swims with this corneal band at the surface of the water, so that it appears to have 4 eyes, the upper 2 of which serve for atmospheric, and the lower 2 for aquatic vision. The best known species (*A. Gronovii*, Valenc.; *A. tetraphthalmus*, Bloch), found in the rivers of Surinam and Guiana, and about 10 inches long, has the oviduct dilated into a sac, in which the eggs are retained until they are hatched, and the young escape alive; their method of viviparous reproduction has been described in the article *Fishes* (vol. vii. pp. 534-5).

LOADSTONE. See *Iron*, vol. ix. p. 592.

LOAN, in law, the delivery of an article to a borrower, who is to use it without paying therefor. The rights and obligations of the lender and of the borrower have been much considered from Bracton's day to this, but more by text writers than in adjudged cases. These are rather few in number, not because loans are unfrequent, for they certainly are very common; but perhaps because the legal rights growing out of the relation of lender and borrower have usually been settled by the parties, and therefore have not come into litigation. I. *Rights of the Borrower*. He has a right to receive and hold the thing borrowed, but only as the property of the lender. For many purposes his possession is, in the eye of the law, the possession of the owner, the borrower being for this purpose the agent of the owner. Still the possession of the borrower would confer upon him some of the rights of an owner as against every one but the owner. Thus he might maintain, in his own name, an action against a wrongdoer. The borrower has a right to use the article borrowed, but only to use it. He can no

more lend it than he can give or sell it; and if he should do either of these, the owner may take it as his own property from the hands of the person to whom the borrower has delivered it; and if a borrower lent to another the thing he borrowed, without the leave of the owner, and the thing while in the hands of the second borrower was destroyed or injured by inevitable accident, the first borrower would be liable to the owner, while the second borrower would not be liable to the first borrower. Neither can the borrower pawn the thing borrowed, nor, it is believed, can he hold it as a security for a debt due to him from the lender; nor can he use it except for purposes for which he borrowed it, or for those which naturally belong to it, or, as it is expressed in the code of Louisiana, for its "natural destination." It is important to determine what degree of care a borrower must take of the article borrowed; or, in other words, for what loss of or injury to it he is responsible. A loan is a bailment, but it is one for the sole and exclusive benefit of the borrower; therefore it is one which binds the borrower to the utmost care of the thing, and to a responsibility for even slight negligence. How this care may be precisely defined, it would not be easy to say. The best definition, or that most generally accepted, is, such care as any person not fatuous would take of the thing if it were his own property under like circumstances. Hence it has been said that a borrower must take as good care of what he borrows as if it were his own. But this is by no means a sufficient rule. If a man borrows a valuable book, and puts it among his own in his library, and by his carelessness the whole library is destroyed, he certainly is not discharged from the duty of paying for the book by the fact that his own were destroyed. Suppose, however, that without fault on his own part the library takes fire, and by great efforts he saves a part of his books and does not save the borrowed book because he could do so only by abandoning one of his own. Here we have no doubt that he would be responsible; and we should say the same thing even if he could only save the borrowed book by the sacrifice of others much more valuable, although this is much questioned. But he is not bound to take the greatest possible care, and therefore is not liable if the borrowed property were lost by robbery, or violence, or theft, or any cause not reasonably to be anticipated, provided no imprudence or negligence of his own enters as a cause into the loss. If the thing be lost, and the borrower pays for it to the satisfaction of the lender, and the thing is afterward found, we should say that the lender may elect to keep the money (always supposing no fraud) or to return it and demand the thing lent. But it has been thought that this election lay with the borrower. As the borrower takes the thing to use, and the lender consents to this, the borrower is not liable for such injury as naturally results from the use of it; or, to use a common phrase,

from the natural wear and tear of use. But, on the other hand, he is bound to pay all the expenses or charges which naturally result from or accompany the use. So he is bound to pay, in the first place, all extraordinary charges which become unexpectedly necessary to the preservation of the thing. But of these expenses he may demand repayment from the lender, and he has a lien on the thing borrowed as his security for them. Thus, if A borrows a horse of B, A must see that he is properly fed, shod, and groomed, and all this at his own expense. So if the horse becomes suddenly ill, A must provide all proper medical advice and medicines, and for these also he must pay; but he may demand them of B, whether the horse lives or dies; and if he lives, A may keep the horse until B repays him these expenses, in the same way he would if it were pledged to him for the sum. II. *Rights of the Lender.* If a borrower keeps the thing borrowed after it is his duty to return it, his relation to the owner is changed at once; and it is therefore necessary to determine when he is bound to return it. Upon the important right of redemanding the thing lent at pleasure, the Roman civil law held a different doctrine from our own common law. By that law, if one lent a thing for an indefinite period, he might reclaim it when he would, or perhaps within any reasonable time. But if he lent it for a time certain, this was a valid contract, and the borrower had a right to retain it against the will of the lender during that time. The common law however does not regard it as a valid contract, for the reason that no consideration passes; and therefore the lender, however specific may have been the terms of the loan, may rescind and cancel them at his pleasure and demand a return of the thing. Now, we have seen that if the borrower keeps the thing after he was bound to return it, his relation to the lender changes totally; and this change takes place as soon as a definite period for which the thing was lent expires, whether the thing be demanded or not; and as soon as it is demanded, whether the period for which it is borrowed have expired or not. Hence, as soon as it should be returned and is not, the borrower becomes at once liable for any loss or injury, although wholly without his fault; as if, for example, he had kept it when he should not, and then was robbed of it by overwhelming force. In fact, if he keeps it when he should return it, he holds it entirely without right, and is just as liable as if he had originally taken it without right. But there must be a reasonable construction of this rule. Thus, if a lender meets a borrower in the street and demands an article lent, which the borrower very properly has at his house, and proposes to return as soon as he can with reasonable diligence, and before it is returned, but without any improper delay on the part of the borrower, the article is destroyed without the fault of the borrower, he would not be responsible. If, however, by his sudden demand, the lender puts the borrower to much

inconvenience and even loss, and compels him to change all his arrangements, as, for example, to delay a journey to his own great detriment, there is no rule of law which would allow him to keep the thing for that reason, however a jury might view the case if he did keep it for a short time and was sued by the lender. So too, if he gave up the thing at once, and suffered the loss, there is no rule of law which would permit him to maintain an action for damages against the lender. A lender has no right to compensation for want of the care or skill which he had no right to expect. Thus, it has been said in illustration of this rule, that if one lends a fiery horse to one who ought not to be supposed capable of using it with safety, the lender has no claim for compensation for damages caused by the want of the extraordinary skill or strength required. By the same reason, if a lender knows of defects or tendencies to mischief in the thing lent which are not obvious, and does not disclose them, he has no claim for damages thence resulting. And if he lends the thing for an illegal act, he is no longer a lender in the eye of the law, but an accomplice in the wrong done.—In all that we have said we have considered as a loan only that which is so by legal definition. But the common use of the word is very different. Thus one is said to lend his money for so much per cent., or to lend an article for such a compensation. But the moment any compensation of any kind is paid by the borrower, it ceases totally from being a loan, and becomes a contract of hiring, which is an altogether different thing. The Roman civil law, in its exquisite classification, recognized another form of loan, under the name of *mutuum*, for which we have no word in English, either in law or in usage. A loan, in law, is a delivery for use by the borrower, as already defined; but a *mutuum* may be defined as a loan for consumption, and not for use. Thus one lends so much bread, or wood, or wine, which the borrower is to use at his pleasure, and in the use consume, and repay by an equal quantity of a similar article. But no compensation whatever is to be made, or this also would become, instead of a *mutuum*, a hiring. Such contracts cannot be uncommon in practice, and would undoubtedly be governed by the same rules as the contract of loan, varied only as the different nature of this contract required. It is obvious also that a contract might be in part a loan, and in part a *mutuum*. Hence if A lent B a cask of wine for a certain occasion, B to use what he chose, and to repay that by a similar quantity, and to return the rest, this would be a *mutuum* as to all that was used, and a loan as to all the remainder.

LOANDO, ST. PAUL DE. See ST. PAUL DE LOANDO.

LOANGO, a maritime district of S. Africa, fronting on the Atlantic ocean, and extending from the equator to the river Congo or Zaire and inland for 200 m.; area, 80,000 sq. m. The coast is high, and in the interior there are co-

siderable mountains. None of the rivers have long courses, and only the Congo on the S. border comes from the great central table-land. The climate is hot and moist, and vegetation extremely luxuriant. Rain rarely falls, and the deficiency is compensated by heavy dews. The greater part of the surface is covered with forests, in which the tiger, hyæna, and other animals prowl, and which produce valuable timber and dye woods. The rivers and lakes abound with fish. Iron and copper are the only minerals known to exist in this region, and are most abundant near Mayomba. Ivory and gums are also articles of commerce. Manioc, maize, pulse, potatoes, and yams are cultivated for food, and the sugar cane grows well. The Chinese hog is used as a domestic animal. Loango, the capital, Mayomba or Majumba, Cabenda, and Embomma are the chief places. Loango is situated on a fine bay of the same name in lat. 4° 40' S., and Embomma is a commercial town on the Congo, 60 m. above its mouth. The people are idolaters, and are governed by an absolute monarch.

LOBAU, GEORGES MOUTON, comte de, a French soldier, born in Phalsbourg in 1770, died in Paris in 1838. He enlisted as a volunteer in 1792, and fought in the 2d campaign of Bonaparte in Italy. He was aide-de-camp to Joubert in 1798, and was attached to the emperor in the same capacity in 1805. He shared in all the subsequent campaigns; obtained the rank of general of division in 1807 at the battle of Friedland; stormed in 1808 the town of Merida in Spain, and contributed to the fall of Burgos; distinguished himself at Eckmühl and Essling in 1809, and by his indomitable firmness preserved a corps of the French army that had been left on the island of Lobau. For this exploit he received the title of count of the empire. He accompanied Napoleon in his Russian campaign, and after the disastrous retreat assisted in the formation of a new army. After the battle of Leipsic and the capitulation of Gouvion St. Cyr, he was made a prisoner and sent to Hungary, where he remained until the first restoration of the Bourbons. He joined Napoleon on his return from Elba, was appointed commander of the 1st military division, headed the 6th corps of the French army at Waterloo, and fell into the hands of the English. Being liberated, he was not permitted to return to France till 1818, and for the 10 following years he lived in retirement. In 1828 he was elected by his department to the chamber of deputies, and took an active part in the revolution of 1830, being appointed a member of the municipal commission. He sided with the friends of the duke of Orleans, and was rewarded by a peerage, the grand cross of the legion of honor, the chief command of the national guard (Dec. 1830), and finally in 1831 received the rank of marshal of France. He suppressed by his energetic measures the republican insurrections in 1832 and 1834.

LOBEIRA, or LOVEIRA, VASCO DE, a Portu-

guese writer, born in Oporto about 1270, died in 1325, according to Bouterwek, while Ticknor places him a century later, giving 1408 as the date of his death, which is said to have taken place at Elvas. In 1386, according to the latter, he was knighted by John I., on the field of battle at Aljubarotta. He is however almost solely known as author of the celebrated romance "Amadis de Gaul." Southey, who translated it, has apparently proved that it was original with Lobeira, and not a translation from the French. The Portuguese original existed until 1753, and it probably perished in the earthquake and fire which destroyed the Arveiro palace at Lisbon.

LOBEL, MATTHEW, a Flemish physician and botanist, born in Lille in 1538, died near London in 1616. Having emigrated to England, he superintended for some years a garden of medicinal plants at Hackney, and ultimately became physician and botanist to James I. The most important of his works are, *Stirpium Nova Adversaria* (London, 1570), and *Plantarum Historia* (Antwerp, 1576), a systematic work, illustrated by figures.

LOBELLIA, a genus in botany, so named by Linnæus in honor of Matthew Lobel, constituting the type of the natural order *Lobeliaceæ*. The lobelias are herbaceous plants or shrubs, with a milky juice, alternate leaves without stipules, axillary or terminal flowers having a superior 5-lobed calyx, a monopetalous, irregular, 5-cleft corolla, 5 stamens whose anthers cohere, and a many-seeded capsular seed vessel, which splits open at its apex. From the close approximation of the anthers to each other, the mode of the flowers reminds us of *compositæ*, though they approximate likewise to the *campanulaceæ*. Unlike the latter, however, they prefer the borders of the tropics, abounding in the West Indies, in Brazil, in the Himalaya, at the Cape of Good Hope, in the Sandwich islands, Chili, and New Holland. The species are prized as ornamental plants, from the gracefulness of their growth and the splendor of their blossoms. For the most part they have tall erect forms, and flowers borne in spikes; but some are particularly slender and trailing, and are fitted for pendent ornaments. Of these, the well known *Lobelia gracilis*, or the *L. erinoides* and its varieties, with small pretty foliage and rich blue flowers, may be cited. One known as *L. erinus*, var. *grandiflora*, is highly commended in Paxton's "Botanical Magazine" for May, 1843. Some species are dwarf but upright-stalked aquatics, of which we have in the United States *L. Dortmanna* (Linn.), with a naked scape bearing a few pale blue flowers; its foliage consists of linear, terete, hollow leaves, which are all clustered around the base of the flower stalk (scape), and grow under water; hence the plant bears the name of the water lobelia. The bog lobelia (*L. paludosa*, Nutt.) is similar, but its leaves are flattened and scattered, linear, spatulate. This species is to be found in Delaware and southward. Growing in dry soils, in our pastures and by the roadsides, may be found in summer the spiked

lobelia (*L. spicata*, De Lamarck), with wand-like, simple stems two or more feet in height, bearing spatulate leaves, which are obtuse at their apices, and flowers of a beautiful blue, borne in a long terminal spike on short peduncles. There are other species of similar mode of growth and habits, but they occur westward and southward.—The term lobelia in common usage is however applied to a different species (*L. inflata*, Linn.), called also Indian tobacco, which has an erect, hirsute, paniculately branched stem, subsessile, lanceolate, dentate, pilose leaves, leafy racemes bearing small axillary pale blue flowers, succeeded by smoothish, swollen, thin, and membranaceous capsules, which are filled with minute seeds. This plant possesses acrid, emetic, cathartic, and narcotic properties, and is largely employed by certain medical practitioners. It is sometimes called eyebright (Thurber), and by some persons is highly esteemed for its reputed virtues, but overdoses prove decidedly poisonous. It is said to produce excessive ptialism in horses, when they have inadvertently eaten it. Few other plants have such decided friends and enemies. The great lobelia (*L. syphilitica*, Linn.) is a much more showy plant, growing 2 to 3 feet high in rich soils, with an erect, hirsute stem, oval, lanceolate, crenulate leaves, leafy racemes, hirsute calyx, and large blue (rarely white) corolla, flowering from July to September. Its roots are perennial, which, beside its beauty, fits it well for the garden, in which it will flourish if undisturbed for many years. Its properties are diuretic, and if of any value as an antisyphilitic, as once supposed, it is due to this fact alone.—The most gorgeous flowered species is the cardinal flower (*L. cardinalis*, Linn.), found plentifully upon the borders of ponds and of muddy streams in New England, and even ranging, according to Elliott, as far as South Carolina. Its stem is erect, its leaves broad-lanceolate, serrated; its spikes of flowers are terminal. The flower consists of a long-tubed corolla ending in 5 spreading segments, the 8 lowest ones widest. No blossom can be more splendid, its hue defying the artist's imitative skill. Its roots are strongly fibrous and grow loosely in the mud, from which they may be easily removed at any season of the year for transplanting. Once established in the garden, an abundance of new plants can be obtained by the freedom with which the seeds vegetate spontaneously sown, growing best in very wet or at least in shaded ground. This species can be cultivated in large pots, or tubs filled with peat and kept very wet, and this treatment is often very propitious to their growth and beauty. Instances have been known of rose-colored flowers occurring on wild plants of this species, which tint is very beautiful; a natural variety with pure white flowers, treated with a careful pot culture, has produced at one time more than 300 fine blossoms.—The fulgid lobelia (*L. fulgens*) and the splendid lobelia (*L. splendens*), both from Mexico, are very magnifi-

cent bloomers, with scarlet-corolled flowers rivaling the hues of the most brilliant geraniums. These, under the influences of a rich cultivation, have produced stems measuring 5 feet or more in height; yet with all these merits they cannot be said to equal the cardinal flower. A fine variety, once known as the showy lobelia (*L. speciosa*) of the flower catalogues, has rich purplish-tinted corols. According to Hovey, the Mexican species are tender plants, and require the protection of a frame or of a greenhouse during the winter, which may be the reason why they are not seen more plentifully. Something like the following method may be pursued in their treatment, if very superior specimens are wanted. The young plants or the offsets from the old roots may be placed in suitable pots, which, well drained, should be filled with equal parts of loam and bog earth or leaf mould, to which should be added river sand in the proportion of one fourth. As the roots outgrow the pots, the plants should be shifted from time to time, being finally placed in pots of 10 inches diameter (6th size), in which they may be expected to flower. Pans should now be placed under each pot, and these constantly supplied with soft water; a cool and rather shady situation is also found advantageous to the duration of their blossoms. A variety known as the Victoria, treated somewhat in this mode, produced flowers of extraordinary size and splendor. When raised from seeds, a great difference will be found in the seedlings; but when they come into flower in the second season, the finest sorts only should be saved for future culture.—As a natural order, the *Lobeliaceae* contain species eminently dangerous, or at the least suspicious on account of the acridity of their milky juice. The tenacity of the milky fluid of the *siphocampylus* gives to one of its species the trivial name of *S. caoutchouc*. A dangerous poison is obtained from the *tupa Feuillai* of Chili. *Isotoma axillaris* bears a pretty blue flower, and is cultivated; but a co-species, *I. longiflora*, is so venomous that it proves fatal to horses that eat it, swelling them till they burst; it is also a violent cathartic, the effects of which no remedy can assuage, and which end in death; the leaves are active vesicants. A European species (*L. urens*) derives its name from its blistering quality (Lindley). *L. cardinalis*, according to Dr. Burton, is used by the Indians for its antelmintic powers.

LOBO, JERONIMO, a Portuguese missionary, born in Lisbon in 1593, died there in 1678. He entered as a novice the order of Jesuits when only 16 years old, and in 1621 was made a professor in the Jesuit college at Coimbra. In 1622 he was commanded to proceed as a missionary to India. Arriving at Goa in the same year, he remained there till 1624, when he sailed for the African coast, with the intention of penetrating into Abyssinia. His first attempt to reach that country proved unsuccessful, but in 1625 he disembarked at a port of the Red

sea, and entering Abyssinia, took up his abode there as superintendent of Catholic missions. During the lifetime of the sovereign then reigning he enjoyed protection, but the next Abyssinian monarch persecuted the Catholics, who were compelled to leave the country in 1634. The exiles fell into the hands of the Turks at Massowah, and Lobo had to return to India in order to procure funds to effect their ransom. Having accomplished this object, he embarked for Portugal to submit their case to the Portuguese government, and endeavor to rouse it to undertake a crusade against Abyssinia. After undergoing shipwreck and captivity he arrived at Lisbon; but finding that he could not induce either Portugal or the other Catholic powers to assent to his views, he reëmbarked for India in 1640, and was subsequently rector and provincial of the Jesuits at Goa. In 1656 he sailed once more for Lisbon, and there passed the rest of his life chiefly in literary pursuits. He published an account of Abyssinia, and of the Catholic missions there, under the title of "A History of Ethiopia" (Lisbon, 1659). An English translation by Dr. Johnson from the French version, was published in London in 1735.

LOBOS (or SEAL) ISLANDS, three islands in the Pacific near the coast of Peru, and belonging to that country. The principal island, Lobos de Tierra, is in lat. $6^{\circ} 25' S.$ and long. $80^{\circ} 52' W.$, and is 5 m. long and 2 m. broad. The smaller islands are about 80 m. S. S. E. of Lobos de Tierra, and are separated from each other by a channel a few hundred feet wide. They are called together Lobos de Fuera, and are each from $1\frac{1}{2}$ m. to 2 m. long by less than 1 m. in breadth. There is good anchorage near the larger island, and two safe and capacious bays at the smaller islands. The sheltered parts of these islands are covered with guano, the product not only of birds, but of the seals which frequent them, and from which they are named. The quantity of the deposit on the whole group is estimated at 740,000 tons. In 1851 a controversy respecting the title to these islands sprang up between the government of Peru and that of the United States, the latter claiming them in consequence of their alleged discovery by an American vessel in the early part of this century. On investigation, however, the claim of Peru to them was established and admitted by the American and British governments.

LOBSTER, a well known marine crustacean, of the order *Decapoda* and genus *Homarus* (Milne-Edwards). The common lobster of the United States (*H. Americanus*, Milne-Edwards) has the general form of the crawfish, heretofore described, but may be distinguished by its larger size, marine habitat, narrow and spiny rostrum, and greatly developed anterior claws. The rostrum is sharp, turned up at the point, furnished with spines at the base, on the sides, and beneath, and with a slight furrow on the dorsal surface. The shell, which is olive or blackish green with darker spots and blotches, as is well known, becomes red by boiling, from

the action of the heat upon its pigmentary matter; acids and alcohol produce a similar effect, but all in a manner not perfectly understood, except by the further oxidation of the coloring matter. This horny, many-jointed, external skeleton, being non-extensible, is changed periodically as the animal grows; it splits in two on the head and body, the new one forming underneath in 2 equal halves, the tail being shed without splitting; in this condition of the shell, which is soft as paper, the animal is defenceless, hiding in crevices in the rocks to escape destruction by voracious fish and its own species. The eyes are placed on the end of 2 peduncles, movably inserted on the anterior border of the head; the external antennæ are very long and many-jointed, the seat of a delicate sense of touch, and at their base is a hollow process supposed to be the seat of the sense of hearing; there is also a pair of smaller median antennæ, in whose basal joint is generally placed the sense of smell. The first 3 segments of the thorax are changed into oral and tactile organs, forming foot jaws around the mouth; beneath a soft upper lip is a pair of strong mandibles moving laterally, the internal border hard, and having a tactile *palpus*; behind these mandibles are 2 pairs of lower jaws, weaker, and without tactile appendages; both mandibles and maxillæ are mere processes from the basal joint of thoracic legs; between these organs is a soft under lip, which is a fold of the skin. There is no distinction between head and thorax, the anterior part of the body being called cephalothorax, which contains 14 segments; the first 6 contain the eyes, antennæ, and jaws; the next 8 bear the maxillipeds or jaw feet; the 10th segment bears the great pincers, used as prehensile organs, ending in a two-fingered organ, the metatarsus being thickened and immovable and the tarsus capable of being applied to it like a finger; the 4 succeeding segments bear the ambulatory feet, consisting of 6 joints each, the anterior 2 pairs ending in weak pincers, and the posterior pairs with a single point, all more or less hairy. The abdomen consists of 7 segments, with 6 pairs of natatory appendages beneath, some concerned in the function of reproduction, and the terminal one divided into 5 hair-fringed plates, the external ones jointed. According to Siebold, the thorax is entirely abortive, the 5 pairs of legs being appendages of the abdominal segments. The principal organ of locomotion is the tail, which, by a sudden bending underneath, sends the animal backward with great velocity. The carapace is free at the side, and has a transverse suture on the back, the last segment being immovable; the abdomen is about as long as or longer than the thorax. The intestine is straight, and the anus at the end of the tail; the stomach has a firm cartilaginous support in the pyloric portion, consisting of 8 solid movable pieces, called the "lady" from a fancied resemblance to a female figure seated upon a sofa; it is composed of chitine, studded with bristles, and its parts

doubtless serve the purpose of teeth in an internal mastication; this cartilaginous framework is shed with the external skeleton. There is a greenish glandular organ surrounding the intestine, with a mixture of fat cells; this, popularly called "tomalley," is the liver. There is a distinct heart, with well developed arterial vessels, but the blood does not flow through capillaries into veins, being effused into the lacunæ which lie between the organs and appendages of the body; still the blood moves in a determinate direction, assisted by venous sinuses. Respiration is aquatic, effected by branchiæ, 19 in number on each side, covered by the carapace, and enclosed in a special cavity at the base of the thoracic limbs, communicating externally by two fissures; the water enters at the base of the feet near the edge of the cephalothorax, and passes out on the sides of the respiratory organs, which consist of clusters of minute cylinders set together in a brush-like manner; the foot jaws have also branchiæ. The sexes are distinct. The eggs or berries of the lobster are reddish or blackish, spherical, glued together by a viscid matter, and attached in clusters to the hairy feet of the posterior abdominal segments; they are thus borne about, protected under the body of the female, until the embryos are fully developed. The young differ but little from the adults, and take shelter under the mother's tail; they are often seen surrounded by the young 6 inches long, which retire to safe retreats when apprised of danger by the mother. One of the most curious peculiarities of the lobster is the ease and frequency with which the large claws are separated, either by accident or from injury received in their constant attacks upon each other; these and the other limbs are very soon replaced, and it is very common to catch these animals with one claw absent or smaller than its fellow; they are said frequently to lose them after a heavy clap of thunder, at which they are always much disturbed. As the teeth of one large claw are numerous and sharp, and those of the other few and blunt tubercles, the uses are probably different, the one for crushing and the other for retaining food or crippling an enemy; they are very quarrelsome, whether free or in captivity, and are dangerous to handle for those unacquainted with their habits and mode of attack. They vary in length, as caught for the market, from 1 to 2 feet, though specimens are seen considerably larger than this, and in weight from 2 to 15 lbs.; they are common in the markets, especially in spring and summer, and are considered a great delicacy, though the meat is rather indigestible. There is only one species in our waters, found from the coast of New York northward; the best are taken on the rocky shores of New England north of Cape Cod; our species is distinct from *H. gammarus* (Milne-Edwards) of Europe, and grows to a larger size. Their food is entirely animal. They are caught in baskets or traps, with a concave netting at each end having a hole in the centre, and bait-

ed with dead fish or any garbage; they can enter easily, but their expanded claws prevent egress, on the principle of the common wire rat trap. These traps, sunk to the bottom in deep water, and their places marked by wooden floats, are raised every day or two, and their contents removed; to prevent their injuring each other, a wooden plug is driven into the joint of the movable thumb, which keeps the claw shut, and they are then transferred to a floating large car, in which they will live many days, until they are wanted for market. In some places lobsters are largely used as bait for cod and other deep water fishes. It would be impossible to estimate the number consumed annually in the fresh state, but it must be counted by hundreds of thousands; as the price varies from 8 to 6 cents a pound, at the lowest, it will be seen that the lobster fishery is a source of a very great revenue to New England, which is their principal habitat and market. The shortest way of killing them is breaking off the rostrum. They are considered as good only for bait while undergoing the change of the shell; no part is poisonous, though the cartilaginous stomach or "lady" is so tough that no one would think of eating it; like other crustaceans and shell fish, they sometimes cause eruptions of the skin in hot weather and in susceptible constitutions; the unimpregnated eggs, of a fine red color, commonly called "coral," are considered a delicacy. The lobster is one of the highest of the macrouran or long-tailed decapod crustaceans, but is lower in its class than the brachyuran or short-tailed crabs of the same order.—The genus *palinurus* (Fabr.), or spiny lobster, of the European seas, grows to a weight of 15 or 20 lbs.; the shell is hard and spiny, the antennæ much longer than the body, and the claws very small; it is much esteemed as food, and was prized by the ancient Romans, who called it *locusta*.

LOCK, a metallic apparatus attached to doors, drawers, trunks, &c., by which they may be secured so as not to be opened without the instrument called a key or a knowledge of the peculiar device. Locks were employed by the ancient Egyptians for fastening doors, and they were furnished with iron keys, a specimen of which, described by Sir Gardner Wilkinson, had a shank 5 inches long looped at one end for a handle, and bent around at the other, where it was furnished with 3 teeth or prongs for fitting corresponding cavities, in which pins or tumblers held fast the bolt, until they were moved by this instrument. Other keys of various forms have been met with in the ruins of ancient Egypt, and it is remarkable that at that early period the principle of the best locks of modern times should have been adopted, which is that of tumblers for holding the bolt fast until they are first moved by the key. Rude locks with this contrivance have been used in different countries of Europe from time immemorial, and yet it was only taken up by regular lock makers within the last 100 years. The use of locks and keys is alluded to in some

of the oldest writings. In the *Odyssey* (xxi.) Penelope is spoken of as opening a wardrobe with a very crooked brass key having an ivory handle; and in Judges, iii. 23-25, they are also referred to as means of securing doors. In Herculaneum locks were found of complicated structure, and metallic keys as old as the occupation of Britain by the Romans have been discovered in that island. The Chinese have possessed considerable skill in lock making, and some of their wooden locks are constructed on the principle of the famous Bramah lock invented in England in 1784. These, with their sliders or tumblers of different lengths adapted to the exact length of the wards of the key, indicated a degree of ingenuity in this department not reached by the most civilized nations till near the close of the last century. Up to that time the locks in general use were of the most simple construction, like the common door locks of the present day. They consist of a box or case (essential to all locks) in which is a sliding bolt, that may be thrust partially out and turned back again by the key. When the lock is attached to a door, the bolt is the part that enters the fixed casement and prevents the door from being opened. The keyhole is the only aperture for reaching the bolt. The key is a lever acting upon a pivot, around which it is turned by the long handle or shank; and the extreme edge of the portion that enters the lock furthest from the pivot is the part that engages in the bolt and moves it. The bolt itself is notched, so that this part of the key as it turns may take hold of it. In order to add to the complexity of the lock, so that only a key of peculiar form can turn in it, bits of metal are secured to the inner surface of the plate, which obstruct the movement of the key unless this is provided with open spaces corresponding to these obstructions. Hence the so called wards, which give the different patterns to common keys. They may be removed from the key without injury, leaving only a strip of metal to connect the extreme edge with the shank. It would then be what is called a skeleton or master key, and might fit many locks of similar size. The insecurity of such locks is readily perceived. Even a crooked wire may often be successfully applied to reach the bolt and move it back; or a false key may be made by introducing a blank key (that is, one not cut into wards), its side coated with burglars' wax, and causing this to press against the obstructions, so as to leave the mark where the openings may afterward be made by filing. Though as little ingenuity appears to have been practised in the picking as in the construction of these locks, still their insecurity was evident, and others were invented in the latter part of the last century of more complicated plan, the key acting upon several bolts. But with the greater ingenuity in construction that of picking locks increased in the same ratio; and in the history of locks, from the invention of Bramah to the present time, it is a singular fact that each new one, regarded by its

inventor and others as impregnable, was sooner or later picked by the exercise of ingenuity as great as or greater than that employed in its invention. To construct a lock that shall set at defiance all attempts to open it without the possession of the true key would seem to be no very difficult task; but when the requisites of locks are considered, their construction is soon perceived to involve mechanical ingenuity of the highest order. The problem, it must be remembered, is not to make a single lock, with some device peculiar to itself, with secret contrivances to be understood by one or more particularly instructed in its mysteries; but it is to devise a plan upon which for economy's sake an unlimited number of locks can be made, each differing from every other one only in some slight modification, which is still so distinctive that the key which is made to open one is useless for another. The keys also, while resembling each other in size and general form, must possess each one some distinctive and essential feature which cannot be imitated without having the original key to copy, nor be accidentally hit upon. The lock also must be so constructed, that its inner portion cannot be reached through the keyhole by any other instruments designed either for moving the bolt, or for obtaining an impress of the forms and position of its parts, or for the introduction of gunpowder for the purpose of blowing it open. Locks with keyholes concealed under knobs, mouldings, and architectural devices, and reached by some secret spring, the position of which is known only to the owner, may in many cases prove a satisfactory and effectual security; but they may also prove a serious inconvenience, and do not answer the requirements of perfect locks for general purposes. The so called letter or dial locks are of similar character in this respect. They require no key, and the movement of the bolt is effected only when the indices upon a dial are so arranged as to point to certain letters, usually those of some word, which the owner must always bear in mind. The lock may be arranged on a new word as desired, and this the owner must be careful to remember. These locks have not proved a safe protection against picking. One invented by Mr. Brown in Liverpool, and the most celebrated of this class, was picked while on the safe of Messrs. Brown, Shipley, and co., by Mr. Hobbs; and another of Mr. Lillie's, equally celebrated in this country, was picked in 1856 by Mr. Linus Yale, jr., of Philadelphia.—The great feature in the best modern locks is the tumbler, which is introduced in a great variety of forms. Barron in 1774 improved them greatly by causing them to hold the bolt unless they were lifted to the exact height required to free it and no more. This he effected by inserting a little pin in the tumbler, but as afterward improved by others in the bolt, and making a notched slit in the tumbler for it to play in. When the key lifted the tumbler too high or not high enough, the pin, designated the stump, caught in the notches;

but when at the right height, the bolt could slide along, carrying the stump through the open slit or "gateing" past the notches. One or a number of tumblers may be used, each having its own gateing, to which a distinct notch in the extreme edge of the key is exactly adapted. The more tumblers the greater is the complexity of the lock and the improbability of constructing an instrument to pick it. For a long time it was generally regarded as perfectly safe, though the method of picking it, called the tentative process, since made known by American lock makers, was described in the 7th edition of the "Encyclopædia Britannica," published 80 years ago, but entirely overlooked. The most improved form of this lock, manufactured by Mr. Chubb of London, was repeatedly picked by Mr. Hobbs of Boston by this very method. It consists in carefully moving with some instrument, which serves as a key, one tumbler at a time, and judging by the feeling when the stump is opposite the gateing. This can be ascertained by an expert operator very quickly, and retaining each tumbler in its proper place as this is found, the bolt at last is free to move. Bramah's lock, invented in 1784 (see *BRAMAH'S LOCK*), is a very ingenious modification of the tumbler system; and in his pamphlet, in which he exposes the insecurity of ordinary locks, he states that it is "not within the range of art to produce a key or other instrument by which a lock on this principle can be opened." It was however by the method just referred to that Mr. Hobbs in 1851 proved the insecurity of this famous lock, and obtained the prize of 200 guineas that had long been a standing offer in the shop window of the Messrs. Bramah to any one who could make an instrument that would pick or open it. The lock to which this notice was attached was a very complicated one of 18 sliders, corresponding to the tumblers of Barron's lock. Like most other locks, it is defective in this respect, that its parts which come in contact with the key are affected by pressure applied to the bolt; and all such locks, according to Mr. Hobbs, can be picked. This is the weak point in the dial or letter locks. But the Bramah locks when in actual use are not exposed to this method of operating, and they are still properly regarded as among the most secure of locks, and the small size of their key is a great recommendation to them. But it should be remembered that, the patent having long since expired, there are many cheap imitations sold as genuine, which can be opened as easily by a goose quill or any small metallic tube as by their own key. The next invention in lock making worthy of note was that called the "detector," a contrivance of Mr. Jeremiah Chubb made in 1818. It is a lever so arranged that any tumbler lifted too high by a false key, or in picking, turns it so as to catch in the bolt and effectually prevent its moving until by a backward motion of the key the detector and tumbler are restored to their places. An operator aware of this contrivance being in the lock

can make use of it, as was shown by Mr. Hobbs, to indicate just the necessary height to which each tumbler must be raised. It hence proves to be worse than useless.—In 1831 Mr. Rutherford of Scotland invented a lock, the bolt of which being barred could be freed by clock-work connected with it, and set for any particular time. This ingenious contrivance was obviously open to serious objections. In 1833 a method of affording additional security to locks was patented by Mr. Parsons in England, which consisted in arranging the tumblers so that they could be taken out and transposed, and then returned to the lock, the key being at the same time changed in a corresponding manner. The principle, it is believed, was understood long before that time; and it is the same that was subsequently fully developed in the celebrated locks constructed in the United States and known as the "permutation" locks. The changes of which some of these locks are capable are almost infinite in number, and being readily made merely by adjusting rings attached to the key and then turning the bolt, which cannot afterward be turned back except by the same combination of rings upon the key, the contrivance would seem to be perfect, particularly as the key is conveniently small. By means of these changes the lock may even possess the advantage of a new one of different construction as often as the owner pleases. But unfortunately it has not been found proof against the very ingenious methods of picking which have kept pace with the improvements in locks. Dr. Andrews of Perth Amboy first produced locks on this principle that attained any celebrity. This was in the year 1841; and for some years after his lock was in high repute and much employed by bankers and others. Upon the barrel of the key he placed steel rings as blanks in the place of some of the "bits" of the key, and however arranged the key would lock the bolt, but unlock it only with the same arrangement. Mr. Robert Newell of New York invented in the same year a more complicated lock than that of Dr. Andrews upon this permutating principle, which he afterward developed to the highest degree of perfection. Making of lock picking a science for careful study, he showed the insecurity of Dr. Andrews's lock by picking it on the tentative or pressure principle, and then performed the same feat on his own lock, which he frankly acknowledged. His improvement was the introduction of the primary and secondary system of tumblers, thus doubling the capacity of the permutation key. To this he added the intermediate or detached tumbler principle as a perfect safeguard, and again offered his lock as unpickable. Its imperfection, however, was soon after shown by Mr. William Hall of Boston, who opened it by the so called "smoke" process. A smoky flame introduced into the lock leaves a fine deposit of lampblack on the edges or "bellies" of the tumblers, which is removed by the key when next introduced from those parts rubbed by its bits. After this the opera-

tor by means of a small mirror reflects a strong light into the lock, and brings the key marks to view. Means are thus afforded for obtaining the exact dimensions for a false key. The next step was to conceal the tumblers. This Mr. H. C. Jones of Newark accomplished by a concentric ring and curtain, and Mr. Pyes still more effectually by an eccentric ring and curtain. Thus completed, this was the famous parautoptic (concealed from view) lock, with one of which Mr. A. O. Hobbs defied the best English operators, and established the superiority of American locks in the great exhibition of 1851. This lock came into general use in the United States, but, though introduced into the bank of England and some other banks in Great Britain, has never become popular there. The perfect security it afforded remained unquestioned until 1855, when even this lock was picked by Mr. Linus Yale, jr., of Philadelphia, making use of what he called his impression process. Mr. Yale affirms that by this feat he has proved that all these locks may be picked, if the key be of the "winged" form, and if in its use it rubs an impression on the edges of the tumblers. The father of this inventor, Mr. Linus Yale, senior, also a lockmaker of great ingenuity, obtained a patent in 1843 for a lock called the "pin" lock, and after this for another known as the duplex lock, for which two keys were required; one being introduced, it was necessary to unscrew and remove its handle and close the keyhole entirely with a hardened plate before the other keyhole could open. This was regarded as absolutely secure until it was picked by his son. The latter, convinced that any plan for excluding picking tools is useless so long as the shape of the key prevents the keyhole from being entirely closed, and that the method just given of doing this is ineffectual, unless the lock be so constructed that the tumblers cannot be moved into their true position when the keyhole is open, contrived in 1851 a lock of most ingenious construction, which he called the magic lock. In this the bits of the key are attached upon its shaft and appear as of the same piece; but when the key is introduced into the lock they are taken up by a pin, which enters through them into the centre of the key shaft, and this being turned in the usual manner, a train of gear wheels is set in motion, which first separates the bits of the key from the shaft, and then carries them away from the keyhole into the interior of the lock. They there arrange the tumblers to their proper positions out of sight and beyond the reach of any picking tools; for the same motion which detaches and carries away the bits at the same time closes up the keyhole with a solid hardened blocking. When the bolt is shot the keyhole reopens, the bits come back and join the handle again, and all are taken out as they went in. The bits if desirable may be taken off and carried in the pocket, leaving the shaft or handle with the lock. In this lock neither the smoke nor impression process can be applied for picking, for the key bits

leave no trace of their action, and the movements are too concealed to be reached by any observation. This lock as well as Newell's is highly praised both for its security and the perfection of its workmanship by Mr. E. B. Denison, the famous clockmaker of London. He remarks "that the casting of both these American locks (which have all their heavy parts of cast iron) is vastly superior to any iron casting we have ever seen made in England; and on the whole the United States are evidently far ahead of us in the manufacture of both good and cheap locks." He observes the same peculiar feature of the application of machinery by American mechanics to the production of duplicates of the parts of locks, which he had praised in their construction of clocks; and noticing the extent to which Mr. Hobbs had carried the stamping and machine finishing system, he adds: "It is hardly exaggerating to say that he has abolished the use of the file, and left nothing to hand labor except the mere fitting of the pieces together and putting the tumblers in the right position to have the gating cut according to the key." As a proof that the United States still retains the lead in this art, the fact may be mentioned that the permutation lock is here in general use, while in England it is hardly known. Mr. Denison himself invented in 1852 a lock pronounced by Mr. Hobbs the only one of English invention secure against any known method of picking. In this the works are large and strong, while the keyhole is so narrow that no instrument strong enough to injure the lock can be introduced, nor a reflector to observe the bellies of the tumblers. The bolt is shot by a handle independently of the key, by which alone it can be withdrawn; but the construction of the lock does not allow the key to remain in it; and except when the key is in the hole, it is quite closed by a steel curtain within, which springs across it.—A common device against the employment of strong tools for forcing locks apart, and of gunpowder to blow them up, is a strong slider of cast steel, made, as in the lock just named, to close the keyhole. Sometimes a piece of the back plate of the lock is cut out, and screwed on again with a few small screws. When force is applied, this part gives way, saving the rest.

LOCK, MATTHEW, an English composer, born in Exeter about 1685, died in 1677. At the restoration he was appointed to prepare the music for the public entry of Charles II. He is considered as the father of the English opera. He wrote the music for "Macbeth," the "Tempest," and Shadwell's "Psyche."

LOCKE, JOHN, an English philosopher, born in Wrington, Somersetshire, Aug. 29, 1632, died at Oates, a country seat in Essex, Oct. 28, 1704. The moderate inheritance of his family was considerably reduced during the civil wars, in which his father was a parliamentary captain. Under the brief political ascendancy of the Puritans he imbibed the religious principle and spirit of liberty which actuated that body of men. His

education began at Westminster school, from which he was elected in 1651 to Christchurch college, Oxford, where he was graduated bachelor of arts in 1655 and master in 1658, continuing to reside in that city till 1664. In after life he regretted that he had spent so much of his time in the university, chiefly from his contempt of the scholastic philosophy and methods which were there upheld; yet he applied himself diligently to the classics, read in private the works of Bacon and Descartes, and enjoyed the friendship of persons whose society and conversation first suggested the idea of his greatest work. His companions were chosen rather from among the lively and agreeable than the studious and learned, and his early correspondence often displays wit and irony. The precise and scientific method of Descartes seems to have given the first impulse to his speculations, but Bacon exerted a more permanent and congenial influence, and he may be called the metaphysician of the Baconian philosophy. After receiving his degrees he devoted himself principally to medicine, which occupied much of his attention through life, and his eminent proficiency in which is attested by Dr. Sydenham, the greatest authority of his time. But though he was disciplined by the study of the complicated and fleeting phenomena of disease for the sagacious observation of the phenomena of the mind, yet his works, unlike those of Hartley, Darwin, or Cabanis, who were also both physicians and philosophers, contain no passages savoring of the chemical laboratory or the anatomical lecture room. In 1664 he accepted the post of secretary in a diplomatic mission to the court of Brandenburg, and, returning to Oxford within a year, was in doubt whether to begin the practice of medicine as a profession, to continue in diplomatic employments, offers of which both in Spain and Germany were made to him, or to enter the church, a considerable preferment in which was promised through the duke of Ormond, lord lieutenant of Ireland. He was engaged in studies in experimental philosophy, when in 1666 he became acquainted with Lord Ashley, afterward earl of Shaftesbury, who was then suffering from an abscess in the chest. Locke divined the nature of the disorder, which no one else had been able to discover; the life of the nobleman was believed to have been saved by a surgical operation which the philosopher advised; and the result was a close and permanent friendship between them. Locke accompanied him to London, and in his house enjoyed the society of the duke of Buckingham, the earl of Northumberland, Lord Halifax, and others of the most distinguished characters of the time. Shaftesbury united engaging manners with distinguished ability, and was an admirable talker; and Locke, whose esteem for conversational capacity led him to assign it a first place in the formation of a man's mind, was probably attached in this instance very much by this quality. While residing with him he superintended the education of his son, and subsequently of his grandson the

third earl of Shaftesbury, the elegant philosophical writer of Queen Anne's reign. In 1668 he accompanied the earl and countess of Northumberland on a tour in France, and after his return (1672) was employed by Shaftesbury to draw up the fundamental laws of Carolina, which province had just been granted to him and 7 others. The scheme of government which was prepared, aristocratic and conformed to monarchy, yet tolerant of all religions, indicates the cautious and practical tendencies of his mind, since, though a lover of freedom, he proposed to establish it in a new country only in so far as it had been realized in England. In 1670 he made the first sketch of his "Essay on the Human Understanding," which was finished in 1687 and published in 1690. In a discussion with five or six friends at his chambers in Oxford, he suggested that the dispute and perplexity could only be solved by a preliminary examination of our own abilities, and of what subjects our understandings are or are not fitted to deal with. He set down several thoughts on the subject previous to their next meeting, and the work thus begun was often resumed and often neglected during his various avocations, and was ultimately completed in retirement and leisure. While Shaftesbury was lord chancellor, Locke held the appointment of secretary for the presentation of benefices, and afterward of secretary to the board of trade. In 1675 he went to France for the benefit of his health, residing in Montpellier, where he became acquainted with Mr. Herbert (afterward earl of Pembroke), to whom his "Essay" is dedicated, and in Paris, where his conversation was welcomed by the most eminent literary and scientific men. He was recalled to England when Shaftesbury regained power for a brief season in 1679, and followed that nobleman when, charged with high treason, he took refuge in Holland in 1682. He continued to reside there after the death of Shaftesbury, having incurred the hostility of the court by his connection with him. At Amsterdam he kept aloof from the British exiles who were plotting the rebellion of Monmouth, auguring their ill success, and joined with Limborch, Le Clerc, and others, in the formation of a philosophical society for the weekly discussion of important questions. Spies were set about him to suggest irritating topics, and to report his words to his ruin, but they were foiled by his steady silence concerning the politics of the day. The court therefore resolved to punish him in the only point where he was vulnerable, and ejected him from his studentship in Christchurch college. Still he refused to take part in the schemes of invasion, and concealed himself at Utrecht, where he was employed in writing his letter "On Toleration." In the *Bibliothèque* of Le Clerc he published in French in 1686 a "New Method of a Common-place Book," in 1687 an abridgment of his "Essay on the Human Understanding," and in 1688 his letter "On Toleration," which was published in England in the same year, and in Latin

at Gouda in 1689. Its liberal views were attacked by an Oxford theologian, and were defended by Locke in two additional letters. Adopting the theory of a compact, he maintained that the state relates only to civil interests, has nothing to do with matters of the world to come, and should therefore tolerate all modes of worship not immoral in their nature or involving doctrines inimical to good government. Conscious of no crime, he refused to accept a pardon which William Penn promised to obtain for him from James II., but returned to England after the revolution of 1688 in the same fleet which brought the princess of Orange, and obtained through Lord Mordaunt the office of commissioner of appeals. In 1690 appeared his "Essay on the Human Understanding," the first work which attracted attention in England to metaphysical speculations, except on the part of merely studious men, and one of the greatest contributions in modern times to the philosophy of the human mind. The celebrity of the author as a friend of civil and religious liberty, the attacks upon it, and the attempts made at Oxford to prevent the students from reading it, were among the secondary causes of its success. Six editions appeared within 14 years, and through translations into Latin and French the fame of the author was made European. He published in 1690 two "Treatises on Civil Government," written to support the principles of the revolution by establishing the title of King William upon the consent of the people as the only title of lawful government; in 1693 his "Thoughts concerning Education," in which his object is to fashion a gentleman rather than a scholar, and therefore he lays less stress on learning than on virtue, breeding, and practical wisdom; and in 1695 the "Reasonableness of Christianity," the object of which was to determine what points of belief were common to all the Christian sects, in order to facilitate a plan of the king for the reconciliation and union of them all. He published a vindication of this work against the charge of Socinianism, and conducted a controversy with Stillingfleet, who in his work on the Trinity denounced some of the principles of the "Essay" as opposed to fundamental Christian doctrines. In 1700 he resigned his commissionership in consequence of his failing health, and, declining a pension offered him by the king in a personal interview, retired to the mansion of his friend Sir Francis Masham at Oates, in Essex, where he devoted the remainder of his life to the study of the Scriptures. Among the fruits of his later labors were a "Discourse on the Miracles," "Paraphrases, with Notes, of the Epistles of St. Paul," and an "Examination of Father Malebranche's Opinion of Seeing All Things in God," which were published posthumously. His excellent treatise on the "Conduct of the Understanding," which may be regarded as the ethical application of his "Essay," being a scheme of the education which an adult person should give himself, also appeared after his death. He received during his

last years, while suffering under an incurable asthma, the affectionate attentions of Lady Masham, a daughter of Ralph Cudworth, and died ultimately in his chair, from the natural decay of a constitution originally weak, while she was reading the Psalms to him.—The course and circumstances of Locke's life were in every respect favorable to the production of such a work as the "Essay on the Human Understanding." Early imbued with a zeal for liberty and with the principles of a severe morality, his whole life was a warfare against the enemies of freedom in speculation, freedom in worship, and freedom from every unnecessary political restraint. Acquainted by his studies both with scholastic subtleties and the physical sciences, he was in mature age admitted to the society of wits and politicians, and became a man of business and of the world. The "Essay" was the product of meditation continued through many years, was composed at intervals, and is in a studied colloquial and rather racy style, which, however attractive to the reader, is too figurative, ambiguous, various, and even contradictory, for the purposes of philosophy. The essential character and tendency of his system has therefore always been a matter of dispute between metaphysicians of different schools, and different passages suggest very opposite conclusions. His object was to inquire into the origin, certainty, and extent of human knowledge, and his method was purely psychological, by the patient and tentative observation of the phenomena of consciousness. In the 1st book he confutes the Cartesian doctrine of innate principles or axioms, which would conflict with his whole theory of the empirical origin of our ideas. This theory is fully developed in the 2d book, in which he shows that our natural faculties are capable of forming every notion that we possess, that the action of these faculties takes its rise from experience, and that the mind may therefore be compared to a sheet of white paper void of all characters till the events of time inscribe them. Having thus stated the principle that all the materials of our knowledge come from experience, he explains it more particularly by making a distinction between sensation and reflection as sources of ideas. The former is observation of the external world, the latter of our own mental operations. Though he uses the term reflection in a wavering and indefinite sense, it does not plainly appear that he ascribed to it any other power than that of a mere formal and logical mechanism, to act upon, to combine and compare, and to extensively modify the materials primarily afforded by the senses. In long and acute processes of reasoning he aims to bring the ideas of space, time, infinity, causality, personal identity, substance, and good and evil within the limits of experience. The 3d book is a treatise on the nature, use, and abuse of language. In the 4th book he passes from ideas to knowledge, from psychology to ontology, treating the question as to the adequacy of our ideas and the reality of

our knowledge. He held a representative theory of perception, maintaining that the mind does not know things immediately, but by the intervention of ideas; that knowledge is real only in so far as there is conformity between our ideas and the reality of things; and that ideas may be entirely inadequate, however distinct they are, thus rejecting the criterion of Descartes. This theory contains the germ of utter scepticism, and was the ground on which Berkeley denied the existence of the material world, and Hume involved all human knowledge in doubt. The distinction established by Kant between the cause and the occasion of our conceptions, making the former to exist in the original constitution of the mind, and the latter in the circumstances of experience, would have removed the fundamental error involved, perhaps without design, in the system of Locke. There are indications in many passages of his work that he was not satisfied with that tendency to sensationalism, which when rigidly developed bore fruits of utilitarianism in morals, materialism in metaphysics, and scepticism in religion.—A biography of Locke was published in 1829 by Lord King, a lineal descendant of his sister, and added to Bohn's "Standard Library" in 1858. The best complete edition of his works is in 10 vols. (London, 1801 and 1812). His philosophical works have been published with a preliminary essay and notes by J. A. St. John (2 vols., London, 1854).

LOCKED JAW. See **TETANUS**

LOOKHART, JOHN GIBSON, a Scottish author, born in Glasgow in 1792, died at Abbotsford, Nov. 25, 1854. He was educated at the university of Glasgow, and having obtained an exhibition in Balliol college, Oxford, was graduated at the latter place as a bachelor of civil law. After a tour on the continent he settled in Edinburgh, and in 1816 was called to the bar of that city. Although favorably known in the circles of the Scottish metropolis by his accomplishments, he failed to make an impression as an advocate, and upon the establishment of "Blackwood's Magazine" in 1817 became a contributor to its columns. Sharing in the strong Tory prejudices of the conductors, he wielded in their behalf a pen unsurpassed in invective and sarcasm, and which not unfrequently lent itself to coarse personal abuse of political opponents. On subjects other than political he wrote with scholarly grace and vigor, and occasionally contributed original verses or metrical translations from the Spanish and German of genuine merit. In 1819 appeared "Peter's Letters to his Kinsfolk," the joint production of Professor Wilson and himself, containing lively though exaggerated descriptions of Scottish society and manners, with portraits of Jeffrey, Wilson, Scott, Chalmers, and many other notabilities, including himself. A considerable portion of "Christopher in the Tent," published in "Blackwood" in the same year, and several of the earlier "Noctes Ambrosianæ," were also written by him. In the previous year he had met Sir Walter

Scott in Edinburgh, and the intimacy which sprung up between them resulted in Lockhart's marriage, in April, 1820, to Sophia Charlotte, the eldest daughter of Sir Walter. He soon after removed with his wife to Chiefswood, a cottage within 2 miles of Abbotsford, whither his father-in-law was in the habit of going daily for relaxation from his literary labors, or to escape his numerous visitors. He remained, however, a regular contributor to "Blackwood," and at the same time became an industrious writer of fiction. In 1821 appeared his "Valerius, a Roman Story," said to have been written in 3 weeks; in 1822, "Adam Blair," a Scottish tale of a deep and almost tragic interest; and in 1823, "Reginald Dalton," a tale of English university life. In 1822 he edited an edition of "Don Quixote," with copious notes, and in the succeeding year collected and published his translations of "Ancient Spanish Ballads," which had previously appeared in "Blackwood" and elsewhere. This work, which has been repeatedly reprinted in Great Britain and America, is one of his most popular publications, and the splendid illustrated edition of Murray (London, 1841) has circulated by many thousands of copies. In 1824 appeared his last novel, entitled the "History of Matthew Wald." In the latter part of 1825 Sir John T. Coleridge, who had conducted the "Quarterly Review" since the retirement of Gifford, was compelled by professional engagements to resign the editorship, and Lockhart, although only in his 34th year, was invited to supply his place. He accepted the offer, removed to London with his family early in 1826, and filled the responsible position of editor until 1858. Under his charge the "Quarterly" maintained and increased its reputation. He did not entirely relinquish his connection with "Blackwood," however, but contributed occasionally to the "Noctes Ambrosianæ" and to other departments of the magazine. His remaining works are: a "Life of Burns," published in 1828 in "Constable's Miscellany;" a "Life of Napoleon Bonaparte" (London, 1829), which formed the commencement of "Murray's Family Library;" and the "Life of Sir Walter Scott" (London, 1836-'8), originally published in 7 volumes. In relating Scott's business transactions, he allowed his prejudices to get the better of his judgment, and his strictures upon the Ballantynes, the publishers of the Waverley novels, provoked a bitter controversy. The large emoluments which Lockhart received from his literary labors, and a sinecure given him by Sir R. Peel, placed him pecuniarily in easy circumstances, but his latter years were clouded by domestic sorrows. His wife and two sons died before him, and of all the happy circle which used to assemble at Abbotsford, he and his daughter remained the sole survivors. In the infant daughter, Monica, of this lady, whose husband Robert Hope assumed the name of Scott, the pedigrees of Scott and Lockhart are now centred. Lockhart left the "Quarterly Review" in 1858 in shattered health, and

retiring to Abbotsford, now the seat of his daughter, ended his life there. His personal qualities were not of a kind to make him generally popular, although he possessed warm friends. His bearing was aristocratic, and his manner chilling and even supercilious to strangers; and he frequently broke through his reserve only to utter witty sarcasms, in which he was unsurpassed. Those whom he admitted to his friendship, however, claim that beneath his cold exterior he concealed truly generous impulses.

LOOKPORT, a township and village, capital of Niagara co., N. Y., on the Erie canal, and on the Rochester, Lockport, and Niagara Falls railroad, which here crosses the canal by a viaduct 500 feet long and 60 feet above the water; pop. of the township in 1855, 13,886; of the village in 1855, 8,989—in 1860, 12,500. It has large quarries of very fine limestone and of sandstone flagging, which give employment to several hundred men. The surplus water of the Erie canal, which is here raised 60 feet by 5 double combined locks, is distributed by means of a hydraulic canal $\frac{1}{4}$ of a mile long to various manufactories, furnishing an immense water power, and constituting one of the chief sources of prosperity. The village is lighted with gas, and contains 5 flouring mills, 7 saw mills, 5 stave and shingle factories, 2 tanneries, 4 machine shops and foundries, a general manufacturing establishment for steam engines, sewing machines, and farming implements, employing more than 200 men, and a glass factory employing over 100 men. There are 4 banks of issue and 2 savings banks, 5 printing offices, and 2 daily and 3 weekly newspapers. There are 18 churches (1 Baptist, 2 Episcopal, 1 Friends', 2 Lutheran, 2 Methodist, 2 Presbyterian, 2 Roman Catholic, and 1 Universalist), and a union school, a flourishing public institution which provides instruction in all the branches of a liberal education to 600 or 700 pupils. In 1855 there were 5,011 children attending public schools.

LOCOMOTIVE ENGINE. See **STEAM CARRIAGE.**

LOCRI, or **LOCRI EPIZEPHYRII** ("Western Locri"), an ancient city of southern Italy, situated on the S. E. coast of the Bruttian peninsula. It was founded by a colony from Locris, in Greece, in the 1st quarter of the 7th century B. C., and became celebrated by the laws of Zaleucus. In later times Locri was generally an ally of Syracuse, whose tyrant, the elder Dionysius, married a Locrian woman. On the expulsion of his son and successor from the former city, it was in Locri that he sought refuge; but he is said to have abused the confidence of the Locrians, and, seizing on their acropolis, established a despotism over them which endured for 6 years. When Pyrrhus of Epirus invaded Italy, 280 B. C., Locri was garrisoned by a Roman force. On the approach of that monarch, however, the Locrians drove out the Romans, and declared for the Epirote; but having risen against

the mercenaries whom Pyrrhus had stationed in their citadel, during his absence in Sicily, he on his return levied heavy contributions upon them, and carried off a great part of the treasure deposited in the temple of Proserpine. After the departure of Pyrrhus from Italy Locri again submitted to Rome, and remained in this condition till 216 B. C., when, on receiving intelligence of Hannibal's great victory at Cannæ, she went over to the Carthaginians. In 205 B. C. the treachery of the aristocracy enabled the Romans to recover possession of the city, in which a Roman legate with a powerful garrison was now stationed. From this period we hear little of Locri. It existed however as late as the 6th century A. D., and probably owed its destruction to the Saracens. Modern travellers have discovered its ruins near the Neapolitan town of Gerace, where are still visible the fragments of a Doric temple, supposed to have been that of Proserpine.

LOCRI, a country of ancient Greece, occupied by the Locrians, who were said to have been descended from the Leleges. Their territory, in the opinion of Niebuhr, originally extended across the continent from the Corinthian gulf to the Eubœan sea; but the encroachments of the Phocians and Dorians deprived them in time of the central portions, and confined them to the maritime districts. The Opuntii and Epicnemidii, whose territories lay toward the east, became comparatively polished and civilized; but the western tribe, who were distinguished by the contemptuous epithet of Ozolian, remained to the last in a semi-barbarous state. The territories of the Locri Epicnemidii (so called from their proximity to Mount Cnemis) and Locri Opuntii (named from their chief city Opus) stretched along the Eubœan sea and Mælian gulf from the mouth of the river Cephissus to the pass of Thermopylæ, save where a strip of Phocis intervened and severed them. The Locrians are mentioned by Homer, who represents them as following Ajax, the son of Oileus, to the Trojan war, with 40 ships. In the Persian war the Opuntii sent a contingent under Leonidas to Thermopylæ, and a squadron of 7 ships to aid the confederate fleet. During the Peloponnesian war the eastern Locrians sided with Sparta.—The territory of the Ozolian or western Locrians was bounded N. E. by Doria, E. by Phocis, S. by the Corinthian gulf, and W. and N. W. by Ætolia. It is a mountainous and barren district. The chief towns were Amphissa, Naupactus, and Eupalium. The Ozolian Locrians first appear in history during the Peloponnesian war, and are classed by Thucydides with the half-savage Ætoliæ and Acarnanians, whom they resembled in their customs, arms, and manner of fighting. In 426 B. C. they promised to aid the Athenian general Demosthenes against the Ætoliæ, but after the defeat of that officer they submitted without opposition to Eurylochus, the Spartan commander. In the latter days of Grecian independence they were members of the Ætolian confederacy. After

the Roman conquest of Greece, all Locris was absorbed in the province of Achaia.

LOCUST, a saltatory orthopterous insect, of the family *locustida*, and the genera *acridium* (Geoffr.), *locusta* (Linn.), and *tetrix* (Latr.), characterized by roofed wing covers, short antennæ not tapering at the end, 8-jointed feet, and absence of projecting ovipositor. The name locust is derived from Lat. *locus*, place, and *ustus*, burned, from the resemblance of districts ravaged by them to a region desolated by fire. In the locust family the extremity of the body in the female is provided with 4 short wedge-shaped pieces, arranged in pairs, and moving up and down like double nippers; these are forced into the ground, enlarging the hole as they are opened and withdrawn until it is deep and large enough to receive the eggs. The males make a loud noise by rubbing their hind legs across the projecting veins of the wing covers, like playing upon a violin, the sound being intensified by a sonorous cavity in the 1st abdominal segment. The hind legs are very powerful, enabling them to leap much better than the grasshoppers; their strong and narrow wings give them the power of rapid and long continued flight, accompanied by a loud whizzing noise, compared in their immense swarms to the rushing of a whirlwind, the rattling of chariots, and the crackling of burning stubble. In the genus *acridium* there is a projecting spine or tubercle on the breast between the fore legs; three species, *A. alutaceum*, *flavo-vittatum*, and *femur-rubrum*, are described by Dr. Harris in his report on "Insects Injurious to Vegetation." In the genus *locusta*, differing from the preceding by the absence of the spine on the breast, and including the famous migratory locust of the East, Dr. Harris describes 15 American species. The Carolina locust, about 1½ inches long with an expanse of wings of about 8 inches, is pale yellowish brown, with dusky spots, black wings broadly margined with yellow; this species, well known for its sharp noise during the hottest days of summer, is found abundantly by the roadside, flying before the traveller to a considerable distance; it prefers warm and dry places, but is sometimes seen near salt marshes in company with the red-legged species; the eggs, deposited in the ground in autumn, are hatched in the following spring. In the genus *tetrix*, or grouse-locusts, Dr. Harris describes 7 species; they are found in the hottest places, and leap to an astonishing distance; they may be known by their small size, and their keeled thorax resembling a reversed boat.—The celebrated locust of the East (*locusta migratoria*, Linn.; placed in the genus *acridium* by Latreille) is about 2½ inches long, of a greenish color obscurely spotted, with pale brown wing covers marked with black. Its special habitat is western Asia, northern Africa, and southern Europe, whence it has spread even to England and northern Europe. It is destructive in all its forms, in the larval, nymph, and perfect conditions, feeding voraciously on plants. It will be sufficient here to allude to the devastations committed by locusts, as most books of eastern travel describe the steady and irresistible progress of their vast swarms, destroying every trace of vegetation in the districts visited by them. Their numbers are so incredible that rivers have been blocked and many square miles covered by them, the stench of their decaying bodies infecting the air for hundreds of miles. Messrs. Kirby and Spence mention an army of locusts which ravaged the Mahratta country, extending in a column 500 miles long, and so compact that it obscured the sun like an eclipse; this, however, was another species, of a red color, which produced an additional bloody hue as they stripped the trees of their foliage. Many are the allusions in the Old Testament to the flight of these insects, and the prophet Joel (ch. ii.) gives a magnificent description of their appearance. The locusts were considered by the Jews and eastern nations, and still are by the Arabs, as the avenging armies of the Deity; the latter assert that a statement to this effect exists in good Arabic on the wings of the insect; they do not occur in large swarms every year, but only every 4th or 5th season, and generally toward the end of May. Locusts are used as food in the countries where they abound; the legs and wings being pulled off, the bodies are fried in oil, and are considered a delicacy; they are sometimes dried in the sun, pounded up, and used as a flour for making bread. In many towns in Arabia there are shops where locusts are sold by measure. Other species are common in Africa, where they are also used as food. Gordon Cumming describes these insects in Africa as coming on like a snow storm, flying slowly and steadily about 100 yards from the ground; the air was darkened by their masses, and the plain upon which he stood became densely covered with them; as far as the eye could reach in every direction, they stretched in one unbroken cloud, and more than an hour elapsed before their devastating legions swept by; they form in Africa food for man, cattle, carnivora, and birds. Locusts have also committed considerable ravages in America; most of the devastation popularly attributed to grasshoppers really belongs to locusts, and most often to the red-legged species (*A. femur-rubrum*, De Geer); they have proved specially destructive to the grass of salt meadows, clover, corn, and vegetables, until arrested by the early frosts; the hay crop is sometimes so much tainted by their decaying bodies that cattle refuse to eat it; toward the middle of the 18th century these insects were so abundant in northern New England that days of fasting and prayer were appointed on account of the wide-spread calamity.—Various methods have been resorted to to check the ravages of locusts. A bounty has been given for the collection of their eggs, which may easily be turned out of the ground; the adults are taken by means of cloths and nets swept over the fields; destroyed by boil-

ciously on plants. It will be sufficient here to allude to the devastations committed by locusts, as most books of eastern travel describe the steady and irresistible progress of their vast swarms, destroying every trace of vegetation in the districts visited by them. Their numbers are so incredible that rivers have been blocked and many square miles covered by them, the stench of their decaying bodies infecting the air for hundreds of miles. Messrs. Kirby and Spence mention an army of locusts which ravaged the Mahratta country, extending in a column 500 miles long, and so compact that it obscured the sun like an eclipse; this, however, was another species, of a red color, which produced an additional bloody hue as they stripped the trees of their foliage. Many are the allusions in the Old Testament to the flight of these insects, and the prophet Joel (ch. ii.) gives a magnificent description of their appearance. The locusts were considered by the Jews and eastern nations, and still are by the Arabs, as the avenging armies of the Deity; the latter assert that a statement to this effect exists in good Arabic on the wings of the insect; they do not occur in large swarms every year, but only every 4th or 5th season, and generally toward the end of May. Locusts are used as food in the countries where they abound; the legs and wings being pulled off, the bodies are fried in oil, and are considered a delicacy; they are sometimes dried in the sun, pounded up, and used as a flour for making bread. In many towns in Arabia there are shops where locusts are sold by measure. Other species are common in Africa, where they are also used as food. Gordon Cumming describes these insects in Africa as coming on like a snow storm, flying slowly and steadily about 100 yards from the ground; the air was darkened by their masses, and the plain upon which he stood became densely covered with them; as far as the eye could reach in every direction, they stretched in one unbroken cloud, and more than an hour elapsed before their devastating legions swept by; they form in Africa food for man, cattle, carnivora, and birds. Locusts have also committed considerable ravages in America; most of the devastation popularly attributed to grasshoppers really belongs to locusts, and most often to the red-legged species (*A. femur-rubrum*, De Geer); they have proved specially destructive to the grass of salt meadows, clover, corn, and vegetables, until arrested by the early frosts; the hay crop is sometimes so much tainted by their decaying bodies that cattle refuse to eat it; toward the middle of the 18th century these insects were so abundant in northern New England that days of fasting and prayer were appointed on account of the wide-spread calamity.—Various methods have been resorted to to check the ravages of locusts. A bounty has been given for the collection of their eggs, which may easily be turned out of the ground; the adults are taken by means of cloths and nets swept over the fields; destroyed by boil-

ing water, they are greatly relished by hogs. They are devoured by insectivorous mammals and birds, especially domestic fowls; the sand wasp preys upon them; intestinal worms (*gordius*) and red mites (*oecypete*) feed upon their juices and finally kill them; winds sweep them into the sea, and immense numbers are drowned by the high tides which inundate the marshes. The natural causes of destruction, after all, are more to be relied on than the occasional and isolated attempts of the farmer, who here rarely suffers in comparison with those of eastern nations.—The harvest fly and some species of grasshoppers are often erroneously called locusts in the United States. (See GRASSHOPPER, and HARVEST FLY.)

LOCUST (*Robinia*, Linn.), a North American genus of trees and shrubs, bearing stipular spines, flat seeds in many-seeded, compressed, nearly sessile pods (legumes), preceded by showy white or rose-colored flowers, in simple, usually pendent, axillary racemes. The common locust tree (*R. pseudacacia*, Linn.) grows in some districts to a great size, with a straight, lofty stem, covered with a thick, deeply and irregularly furrowed bark, and with strong, rude branches, ending in slender, virgate spray, which is clothed in summer with a soft velvety foliage, consisting of unequally pinnate leaves, often seen bright and clean by the dusty roadsides in the heat of the season, and then refreshingly beautiful; or earlier, with a profusion of fragrant, clustered, pendent blossoms. The locust tree loves the fertile soils westward of the Alleghany mountains, and extends thence as far as Arkansas; but it is not indigenous north of Pennsylvania, nor to be found near the sea coast in the southern states. When growing upon thin soils, it is observed that it greatly improves them if unmolested, probably by the rapidity with which its small leaflets decay and form a natural compost or surface soil, bringing in a grassy sod. It has even been deemed advisable by some agriculturists to use it for artificial plantings upon thin and poor lands, employing the suckers, which spring up plentifully around the older trees, or even by planting out pieces of the roots. It readily grows from the seeds, which, ripening in October, should be sown immediately, and will come up in the following summer. Close coppices, woods, or thick belts of locust trees succeed better than single plantings, it having been discovered that exposure to the free air and sunlight is favorable to the habits of destructive insects, especially to the locust tree borer (*elytus pictus*, Drury), which causes premature death. It would appear that this species of insect must have increased rapidly within comparatively a few years, and subsequent to the lofty growth and gigantic proportions of fine old specimens yet to be seen in various parts of the country, and not wanting even in Massachusetts, where the tree is not indigenous. The usual appearance of individuals that have sprung up from chance seeds or from suckers is that of straggling bushes rather than

of thrifty trees, and as such better fitted for hedge rows than for forest planting. No remedy against the borer has promised so much as thick planting. The free and unrestrained growth of the locust tree is very rapid, and its stem increases in magnitude to such a degree as to make valuable timber. It is not uncommon for young plants to attain a growth of 8 or 10 feet in a single summer, and one sprout from a young stump of a yellow locust tree grew 16½ feet. For certain uses in ship building the wood of the locust is preferable to any other timber. Where strength or durability in the material is required, its value is acknowledged. It makes excellent posts for gates or sleepers for foundations; and mill cogs and similar articles in constant wear are constructed of it. A tree so beautiful, so rapid in increase, so valuable in economic uses, recommends itself for artificial cultivation upon acres of land otherwise almost valueless and to be found on every extensive farm. The locust tree was carried into Europe in the time of Henry IV. of France, and was named *Robinia* in honor of Robin, father and son, who first introduced and cultivated it. A southern species, known as the glutinous locust (*R. viscosa*, Ventenat), occurs upon the mountains of Georgia and Carolina; it is from 20 to 40 feet high, with leaves unequally pinnate, of 5 to 7 pairs of leaflets, the petioles, peduncles, and young wood covered with a viscid pubescence. The flowers are white tinged with pink; the seed pod is obliquely lanceolate, mucronate, when young pubescent, 3 to 4 seeded. This species is cultivated at the North for its ornamental properties, the flowers being considered very beautiful. One other species (*R. hispida*) is only a straggling shrub from 3 to 5 feet high, but its flowers are very large and of a deep rosy color. The branches, stalks, and pods are bristly; but there is a variety (*R. h. rosea*) having nearly smooth branches and petioles, which, according to Pursh, grows in the high mountains of Virginia and Carolina; and still another (*R. h. nana*), growing in the pine barrens of South Carolina, so dwarf as to be scarcely a foot high. The hispid locust is sometimes called rose acacia, and is much cultivated under this name. As it has a disposition to throw up from its roots numerous suckers, it is the much better way to graft it into the common locust; and when thus set on a tall young stock of that species, the effect is exceedingly beautiful. The hispid locust may be trained to a trellis with good success.—The term locust tree is applied to another genus, the *Gleditschia*, of which the one-seeded water locust (*G. monoesperma*) is an instance; a small tree, with broadly oval, oblique, flat legumes, destitute of pulp; the wood is of little value; this tree is found in swamps of South Carolina, Florida, Louisiana, and Texas. The sweet or honey locust (*G. triacanthos*, Linn.) is, on the contrary, a large tree, with a trunk sometimes of a diameter of 3 to 4 feet; but its wood, though hard, is not very valuable. The foliage of the *Gleditschia* is beautiful, con-

sisting of numerous finely pinnate dark green leaves; its flowers are very small and almost inconspicuous, its pods are very long and somewhat twisted, containing many hard, polished seeds, invested in a sweetish pulp, which, fermented, is made into a sort of beer in some of the southern states, where the tree is found growing wild. The species has been employed in making hedges, and with very good success; the long, irregular, but flexile branches, and sharp spines or thorns with which they are clothed, are found effectual in keeping off such animals as would intrude. A variety is frequently raised from seed, which is unarmed or thornless, and equally beautiful as a shade tree. Usually the honey locust is prolific in seed pods, but sometimes large trees have proved entirely barren, a fact accounted for by the polygamous character of the flowers. The Chinese honey locust (*G. Sinensis*, De Lamarck) is a tree very distinct, according to Desfontaines, from the American species, having very strong, branching thorns, and these frequently occurring in bundles upon the trunk; its legumes, too, are rarely more than 6 inches long; as a tree it is better suited to the climate of Paris than is the 3-thorned honey locust. There is a variety with large, robust, much compressed, trifid thorns besetting its trunk, which rises to the height of 80 to 50 feet, and is called *G. S. ferox* (Desfontaines). The Caspian honey locust (*G. Caspica*, Desf.) has slender, trifid, compressed prickles, is a native of Persia, and was introduced into cultivation in 1822.

LODGE, THOMAS, an English author and physician, born in Lincolnshire about 1555, died in London in Sept. 1625. He was educated at Trinity college, Oxford, and became an actor and dramatist. In 1584 he was entered as a law student at Lincoln's Inn; next turned soldier, and accompanied the expeditions of Clarke and Cavendish; and then, abandoning the profession of arms, went to Avignon and applied himself to the study of medicine. Having obtained his degree of M.D., he proceeded once more to London, and there began to practise as a physician, in which capacity he achieved great success owing to his intimate relations with the Roman Catholic party. He is said to have fallen a victim to the plague. The most important of his works are: "Rosalynde: Euphues Golden Legacie" (1590), a novel, chiefly interesting as the basis of Shakspeare's "As You Like It," and reprinted in Collier's "Shakspeare's Library;" "The Wounds of Civill War lively set forth in the True Tragedies of Marius and Scilla," a drama (1594, reprinted in Dodsley's "Old Plays"); and "A Margarite of America" (1596), a tale, said to have been written during his voyage with Cavendish. Lodge also wrote a "Defence of Stage Plays" (1580), a "Treatise of the Plague" (1603), and translations of Josephus and Seneca (1602-'14).

LODI, or LODI-K-CREMA, a province of Lombardy, bounded N. by Bergamo, E. by Cremona, S. by the duchy of Parma, from which it is sep-

arated by the Po, and W. by Milan; area, 459 sq. m.; pop. 218,844. The surface is a vast plain watered by the Adda, Serio, Lambro, and other affluents of the Po. The soil is extremely fertile, and produces corn, wine, flax, pulse, and the mulberry. A large proportion of the land is occupied by pastures, and cattle are extensively reared for dairy purposes. The celebrated Parmesan cheese, so named from Parma, whence it was first exported, is now made chiefly in this province, and employs the milk of 30,000 cows. There are few manufactures except of linen and cordage.—LODI, the capital, is an episcopal town, situated on the right bank of the Adda, here crossed by a bridge, 18 m. S. E. from Milan; pop. about 18,000. It is built on a small hill and surrounded by a wall with 4 gates, beyond which lie extensive suburbs. It is generally well built, having a number of handsome streets and a public square lined with arcades. Its cathedral is an interesting structure of the 12th century. Several of the other public edifices are beautiful models of architecture, and the town has 2 or 3 palaces, a theatre, lyceum, gymnasium, diocesan seminary, an English female institute, a public library, 2 hospitals, and a number of schools. The most important article of trade is cheese. Bonaparte gained a victory over the Austrians at the bridge of Lodi, May 10, 1796.

LODOMERIA, the Latin name of the principality of Vladimir in Volhynia in the middle ages. On the 1st division of Poland, in 1772, Austria gave the name of Galicia and Lodomeria to its share. (See GALICIA.)

LOFFODEN, LOFODEN, or LOFOTEN, a group of islands off the N. W. coast of Norway, between lat. 67° 30' and 69° 30' N., long. 12° and 16° E.; pop. about 4,000. The largest are Andöen, Langöen, Hindöen, E. and W. Vaagen, and Flagstadöe. The coasts are extremely rugged and deeply indented, and the interiors are mountainous and sterile. During the season they are visited by about 4,000 boats with 20,000 fishermen. The average produce of the cod fishery is about 9,000 tons of dried fish, 22,000 barrels of oil, and 6,000 barrels of roe. The cod fishery ends in April, but the herring fishery continues, and furnishes an important branch of national revenue. Near the S. end of the group is the famous whirlpool called the Maelström.

LOFTUS, WILLIAM KENNETT, an English archaeologist, born in Rye, Sussex, about 1830, died on the passage from India to England in Nov. 1858. He was educated at Cambridge, where he attracted the attention of Professor Sedgwick, who proposed him as a fellow of the geological society, and subsequently of Sir Henry de la Beche. The influence of the latter procured him an appointment on the Turco-Persian commission for the settlement of the frontier between Turkey and Persia, and for 4 years (1849-'52) he was a resident of Asia Minor and the regions on the Tigris and Euphrates, where he successfully explored the mounds under which the ancient cities of the East are buried. In 1858 he revisited the same ground under the

auspices of the Assyrian society, and upon his return to England the results of his researches were given in a handsome volume embellished with engravings of the sculptures and cuneiform inscriptions of Babylonia, Chaldæa, and Susiana. Subsequently he received an appointment on the staff of the geological survey of India, the operations of which were interrupted by the mutiny of 1857-'8. He died from the effects of a *coup de soleil* and of repeated attacks of fever caught on the banks of the Tigris and Euphrates. The specimens of ancient sculpture which he sent to the British museum are hardly inferior in interest to those excavated by Layard, and he was the reputed discoverer of the city or cemetery of Warka, supposed to be the biblical Erech.

LOG, and Log LINE, an apparatus used in connection with the half minute glass for obtaining the approximate rate of the movement of a vessel through the water. The log is a triangular or quadrangular piece of board, one side of which has a circular edge, and is weighted with lead, so as to cause the piece to sit upright when thrown into the water. It is attached by cords from its corners to the log line, which is a stout cord about 150 fathoms long, divided by knots or slips of leather into spaces called knots, and wound on a reel which revolves with freedom. Its use is called "heaving the log," and consists in dropping the wood over the stern of the vessel, with a quantity of the line sufficient to reach from the vessel to the log, at the instant the half minute glass is turned up. The reel is held up so that the line may run off freely as the vessel moves away from the log; and as the last sands run through the glass, the reel is instantly stopped. The number of knots run off in the half minute indicates the rate of motion of the vessel. This method of measurement is very inaccurate, a heavy sea sometimes throwing the log after the ship, while a head sea may carry it in the opposite direction. The glass also measures the half minute differently in damp and dry weather, and the line is liable to change its length. Various empirical allowances are made, which add but little to the correctness of the apparatus. It is not known when or by whom this contrivance was invented. Humboldt says, that in all writings on the subject, including the "Encyclopædia Britannica," he found the erroneous opinion expressed that the log was not introduced before the end of the 16th or the beginning of the 17th century, while it is certain that Pigafetta, the companion of Magellan, in the beginning of the 16th century, speaks of the log (*la catena a popa*) as of a well known means of measuring the course passed over. Purchas makes mention of it in 1607; but the length of a degree of the meridian not being then determined, its divisions were necessarily inaccurate. They were corrected in 1687 by Norwood. The length of a sea mile is now estimated at about 6,086.7 feet; and as the length of the knot is intended to bear the same proportion to this that half a minute bears to an hour, the measurement of the knot

is properly 51 feet. Each one is divided into 10 parts called fathoms. For glasses which run out in 28 seconds, the length of the knot should be 47.6 feet.—Numerous substitutes for the log have been contrived. The best of these is that of Massey. A box shaped like a wedge is provided with a spindle to which 4 wings are fixed spirally. With this are connected registering wheels somewhat on the plan of those of the gas meter, their object being to record the number of revolutions of the spindle. This is carried round by the motion against the water as the box is towed astern by a stout line 60 fathoms long. The box is hauled in, and the record noted whenever the course is changed; but while the ship runs full 8 knots the register is not reset except once every 24 hours. At a less rate than 8 knots its indications are uncertain from not towing horizontally.

LOGAN. I. A W. co. of Va., bordering on Ky., drained by the Guyandotte and the Tug fork of Sandy river; area, 750 sq. m.; pop. in 1850, 3,620, of whom 87 were slaves. The surface is uneven and the soil generally good. Iron and coal are abundant in the highlands of the county. In 1850 it produced 1,588 bushels of wheat, 154,943 of Indian corn, 8,353 lbs. of tobacco, and 8,202 of wool. There were 6 churches, and 175 pupils attending public schools. Named from the celebrated Indian chief Logan. Capital, Arracoma. II. A S. W. co. of Ky., bordering on Tenn., and drained by branches of the Green and Cumberland rivers; area, 478 sq. m.; pop. in 1850, 16,581, of whom 5,467 were slaves. The surface, resting on cavernous limestone, is finely diversified and well timbered, and the soil fertile. It contains a number of ancient artificial mounds. The productions in 1850 were 1,103,186 bushels of Indian corn, 242,840 of oats, 2,684,767 lbs. of tobacco, and 38,001 of wool. There were 15 grist mills, 8 saw mills, 4 tanneries, 39 churches, and 740 pupils attending public schools. Named in honor of Gen. Benjamin Logan, a pioneer of Kentucky. Capital, Russellville. III. A central co. of Ohio, drained by the Miami river and its branches; area, 425 sq. m.; pop. in 1850, 19,162. The surface is moderately rolling or level, and the soil fertile. In 1850 the productions were 168,811 bushels of wheat, 665,606 of Indian corn, 97,562 of oats, 25,150 of potatoes, and 88,258 lbs. of wool. There were 18 grist mills, 80 saw mills, 2 iron foundries, 7 tanneries, 27 churches, and 7,965 pupils attending public schools. It is intersected by the Mad river and Lake Erie and the Bellefontaine and Indiana railroads. Capital, Bellefontaine. IV. A central co. of Ill., intersected by Salt creek and drained by Kickapoo and Sugar creeks; area, 529 sq. m.; pop. in 1855, 8,324. The land is level and fertile. In 1850 the productions were 839,638 bushels of Indian corn, 26,598 of wheat, 35,728 of oats, and 23,527 lbs. of wool. There were 6 grist mills and 6 saw mills. The county is intersected by the Chicago and Mississippi railroad. Capital, Mount Pulaski.

LOGAN, the English name of the Indian chief Tah-gah-jute, celebrated in American revolutionary and colonial history, born about 1725, killed on the southern shore of Lake Erie in the summer of 1780. He was the son of Shikellamy, a celebrated chief of the Cayugas, who lived at Shamokin on the Susquehanna, and was called Logan from James Logan, the secretary of Pennsylvania and a firm friend of the Indians. In his early manhood he was known throughout the frontier of Virginia and Pennsylvania for his fine personal appearance, his engaging qualities, and his friendship to the whites. About 1770 he removed with his family to the banks of the Ohio, where he gave way in a measure to intemperance. In the spring of 1774 his family were massacred, it was alleged, by a party of whites led by Capt. Michael Cresap, under the pretext of retaliation for Indian murders; but it is exceedingly doubtful whether Cresap had any connection with the transaction. Logan at once instigated a war against the scattered settlers of the far West, and for several months fearful barbarities were perpetrated upon men, women, and children. He himself took 80 scalps in the course of the war, which terminated after a severe defeat of the Indians at the mouth of the Great Kanawha. He disdained to appear among the chiefs who subsequently sued for peace, but sent by an interpreter to Lord Dunmore, the governor of Virginia, the following speech explaining his conduct, which was first published in Jefferson's "Notes on Virginia:—" "I appeal to any white man to say if ever he entered Logan's cabin hungry, and he gave him not meat; if ever he came cold and naked, and he clothed him not. During the course of the last long and bloody war Logan remained idle in his cabin, an advocate for peace. Such was my love for the whites that my countrymen pointed as they passed, and said, Logan is the friend of the white men. I had even thought to have lived with you, but for the injuries of one man. Colonel Cresap, the last spring, in cold blood and unprovoked, murdered all the relations of Logan, not even sparing my women and children. There runs not a drop of my blood in the veins of any living creature. This called on me for revenge. I have sought it; I have killed many; I have fully glutted my vengeance. For my country I rejoice at the beams of peace. But do not harbor a thought that mine is the joy of fear. Logan never felt fear. He will not turn on his heel to save his life. Who is there to mourn for Logan? Not one." His habits of intemperance grew upon him after this, and while frenzied with liquor he felled his wife by a sudden blow, so that she lay to all appearance dead. He fled, and while traversing the wilderness between Detroit and Sandusky was overtaken by a party of Indians. Supposing his avengers at hand, he prepared to attack them, and was killed by his relative Tod-hah-dohs in self-defence.

LOGAN, JAMES, an American colonial statesman and author, born in Lurgan, Ireland, Oct.

20, 1674, died at Stenton, near Philadelphia, Penn., Oct. 31, 1751. By his own efforts he acquired a knowledge of the chief ancient and modern languages, and was well informed in mathematics and various branches of natural science. In 1699, being then established in trade in Bristol, England, he accepted an invitation from William Penn to accompany him to America in the capacity of secretary. In 1701, upon the return of Penn to England, he was appointed provincial secretary, and he subsequently filled the offices of commissioner of property, chief justice, and president of the council, discharging in the last capacity the duties of governor of the province for two years after the demise of Gov. Gordon in 1736. The latter years of his life were passed at his seat called Stenton, near Philadelphia, in the pursuit of literature and science. His chief work, *Experimenta et Meletemata de Plantarum Generatione* (Leyden, 1739; London, translated from the Latin by Dr. Fothergill, 1747), an expansion of a paper on the growth of maize published in the "Philosophical Transactions" for 1735, was considered an important contribution to the science of botany. He was the author of two other Latin treatises of a scientific character published in Holland, of an English translation of Cicero's *De Senectute*, published in 1744 by Benjamin Franklin, and of Cato's "Disticha," the latter in verse; and he left a variety of papers on ethics and philology. The translation of Cicero was the first original one of a classical author printed in America, and has been called the best previous to Melmoth's. His library, numbering about 2,000 volumes, was, in conformity with his desire, presented to the city of Philadelphia, and is deposited in a separate department of the Philadelphia library under the name of the Loganian library. He was a member of the society of Friends.—GEORGE, an American statesman and philanthropist, grandson of the preceding, born at Stenton, Sept. 9, 1753, died there, April 9, 1821. He was educated in England, subsequently studied medicine in Edinburgh, where he took the degree of M.D., and after an extended tour on the continent returned in 1779 to America. For many years he devoted himself to agricultural pursuits, which he was one of the first in America to prosecute successfully in a scientific manner. He also served several terms in the Pennsylvania legislature. At the outbreak of the French revolution he embraced with enthusiasm the democratic doctrines which it inaugurated, and joined Jefferson and the republican party in opposition to the federalists. In 1793, the United States being then on the brink of a rupture with the French republic, he departed for France, principally at his own suggestion, under the idea that he might contribute to the preservation of peace. He was well received by Talleyrand and Merlin, then chief of the directory, and returned to America with the assurance of the desire of the French government to renew amicable relations with the United States.

But as he had taken with him letters of introduction from Jefferson instead of passports from the state department, he was denounced by the federalists on his return as the treasonable envoy of a faction who had undertaken to institute a correspondence with a foreign and hostile power. He was coldly received by Washington and President Adams, and in the latter part of 1798 an act, known as the "Logan act," was passed by congress, making it a high misdemeanor for a private citizen to interfere in a controversy between the United States and a foreign country in the manner he had done. He was subsequently elected to the U. S. senate, of which body he remained a member from 1801 to 1807; and in 1810, urged by the same philanthropic motives which had induced him to visit France 12 years before, he went to England in the hope of preserving peace. In 1797 he published "Experiments on Gypsum" and "Rotation of Crops."

LOGAN, JOHN, a Scottish clergyman and author, born in Fala, Edinburghshire, in 1748, died in London, Dec. 28, 1788. He completed his education at the university of Edinburgh. In 1768, on the recommendation of Dr. Blair, he was appointed tutor to the afterward celebrated Sir John Sinclair. He soon returned to Edinburgh, and, having obtained a license as preacher in the established church of Scotland, he was nominated a minister of the town of Leith in 1773. In 1779 he delivered in Edinburgh a course of lectures on the philosophy of history, and in the following year was an unsuccessful candidate for the professorship of history in the university. Being charged with drunkenness by his parishioners in 1785, he was under the necessity of retiring from the ministry on a small pension. He now repaired to London and devoted himself to literary composition. He was not only an eloquent orator and lecturer, but also a gifted poet. His "Ode to the Cuckoo" (1770), and his "Hymns," which have been incorporated into the psalmody of the church of Scotland, entitle him to high rank as a lyricist. A volume of his poems was published in 1781, a new edition of which in 1805 contains a life of the author. The most important of his other works are "Runnamede," a tragedy produced on the Edinburgh stage in 1783; "View of Ancient History," &c. (London, 1788); "Review of the Principal Charges against Mr. Hastings" (1788), a defence of the ex-governor-general esteemed so formidable by his enemies that they arraigned its publisher, Stockdale, for a breach of the privileges of the house of commons; and two volumes of sermons edited by Dr. Robertson in 1790-'91.

LOGAN, SIR WILLIAM EDMOND, a Canadian geologist, born in Montreal in 1798. He was educated at the high school and university of Edinburgh, and in 1818 entered the mercantile office of his uncle, Mr. Hart Logan, of London, and after a time became a partner in the firm. In 1829 he went to Swansea as manager of copper smelting and coal mining operations in which his uncle was interested, but left it soon

after the death of the latter in 1838. During his 7 years' residence in South Wales, Mr. Logan devoted himself to the study of the coal field of that region; and his minute and accurate maps and sections were adopted by the ordnance geological survey, and published by the government. He was the first to demonstrate that the stratum of under clay, as it is called, which always underlies coal beds, was the soil in which the coal vegetation grew. In 1841 Sir William visited the coal fields of Pennsylvania and Nova Scotia, and communicated several valuable memoirs on the subject to the geological society of London. At this time he began an examination of the older palæozoic rocks of Canada, and a geological survey of Canada having been commenced, he was placed and still continues at its head, having refused for it a very advantageous offer of a similar position in India. In the course of his investigations upon the rocks of the eastern townships, which are the continuation of those of New England, Sir William has shown that so far from being, as had been supposed, primitive azoic rocks, they are altered and crystallized palæozoic strata; a fact which, although suspected, had not hitherto been demonstrated, and which is the key to the geology of north-eastern America. He found the rocks which form the Laurentide and Adirondac mountains, previously regarded as unstratified, to be disturbed and altered sedimentary deposits of vast thickness, equal perhaps to all the hitherto known stratified rocks of the earth's crust. In 1851 he represented Canada at the great exhibition in London, and was also a commissioner from Canada at the industrial exhibition at Paris in 1855, when he received from the imperial commission the grand gold medal of honor, and from the emperor the decoration of the legion of honor. He was knighted in 1856, and in the same year was awarded by the geological society, of which he has long been a member, the Wollaston palladium medal, for his eminent services to geology.

LOGANSPOUT, a city and the capital of Cass co., Ind., on the Wabash river at its junction with Eel river; pop. in 1859, about 4,500. It is situated in a fertile region, for which it is an active centre of trade. In 1850 it contained 6 churches (1 Baptist, 1 Episcopal, 1 Methodist, 2 Presbyterian, and 1 Roman Catholic), 3 banks, and an academy. Two bridges cross the Wabash and one the Eel river at this place.

LOGARITHMS (Gr. *λογος*, reason, and *ἀριθμός*, number), numbers so related to the natural numbers that the multiplication and division of the latter may be performed by addition and subtraction, and the raising to powers and the extraction of roots by very simple multiplication and division. The labor of these operations by the ordinary processes of arithmetic, when the numbers are composed of many figures, is enormous. By the use of logarithms, for the invention of which the world is indebted to John Napier of Merchiston, Scotland, this labor is greatly diminished.—The general theory of

logarithms is very simple. All numbers whatever may be regarded as the powers of some other number taken as a base. Thus, taking as a base the number 8, its successive integral powers give the series of numbers 8, 64, 512, 4,096, &c.; for $8^1 = 8$, $8^2 = 64$, $8^3 = 512$, $8^4 = 4,096$, &c. But it is not necessary to limit the series to the integral powers. The cube root of $8 = \sqrt[3]{8} = 8^{\frac{1}{3}} = 2$; the square of the cube root of $8 = \sqrt[3]{8}^2 = 8^{\frac{2}{3}} = 4$. The first power of 8 multiplied by the cube root $= 8 \times 8^{\frac{1}{3}} = 8^{\frac{4}{3}} = 16$; $8 \times 8^{\frac{2}{3}} = 8^{\frac{5}{3}} = 32$, &c. Other fractional powers would give the numbers omitted in this series; so that a power of 8 could be found which would be equal to any number whatever. By taking negative powers, fractions would come into the series. In a system of logarithms of which 8 is the base, the logarithms are the exponents of the powers to which 8 must be raised to produce the number. Thus, as above, $\frac{1}{3} = \log. \text{ of } 2$, $\frac{2}{3} = \log. \text{ of } 4$, $1 = \log. \text{ of } 8$, $1\frac{1}{3} = \log. \text{ of } 16$, $1\frac{2}{3} = \log. \text{ of } 32$, $2 = \log. \text{ of } 64$, $2\frac{1}{3} = \log. \text{ of } 128$, &c. It is obvious that the base of the system may be taken to be any positive number except unity. To demonstrate the general principles of logarithms, let a represent the base of the system, m any number, and x its logarithm; then the relation between the number m and its logarithm is expressed by the equation $a^x = m$. That is, the logarithm of a number is the exponent of the power to which the base must be raised to produce the number. Let m and n be two numbers, x and y their logarithms, and a the base; then $a^x = m$; $a^y = n$. Multiply the first members of these equations together, and we have $a^x \times a^y = a^{x+y} = mn$. That is, $x + y = \log. mn$; or the logarithm of the product of two numbers equals the sum of the logarithms of the numbers themselves. Dividing the first of the equations above by the

second, we have $\frac{a^x}{a^y} = \frac{m}{n}$, or $a^{x-y} = \frac{m}{n}$; that

is, $x - y = \log. \frac{m}{n}$, or the logarithm of the quotient of one quantity divided by another is equal to the logarithm of the dividend, less the logarithm of the divisor. In the equation $a^{x+y} = mn$, if we make $m = n$, then $x = y$, and we have $a^{2x} = m^2$; $2x$ is then the logarithm of m^2 , or the logarithm of the square of a number equals twice the logarithm of the number itself. By similar reasoning it is shown that the logarithm of the cube of a number equals 3 times the logarithm of the number, &c. If we take $m^2 = p$, then $m = \sqrt{p} = p^{\frac{1}{2}}$; but $\log. m^2 = 2 \log. m = \log. p$. Substituting in the last equation $\sqrt{p}$ for m , it becomes $2 \log. \sqrt{p} = \log. p$, or $\log. \sqrt{p} = \frac{1}{2} \log. p$; i. e., the logarithm of the square root of a number equals half the logarithm of the number itself. In the same way it may be shown that the logarithm of the cube root of a number equals $\frac{1}{3}$ the logarithm of the number, and the logarithm of any root of a number equals the logarithm of the number divided by the exponent of the root.—The system of logarithms in

common use is that proposed by Henry Briggs, professor of geometry at Oxford, soon after the publication of Napier's invention in 1614. Briggs used as the base of his system the number 10, and it was soon universally accepted, being so well adapted to the decimal notation. The logarithm of any number in this system is the exponent of the power to which the number 10 must be raised to produce the number. Thus, since $(10)^0 = 1$, $(10)^1 = 10$, $(10)^2 = 100$, $(10)^3 = 1,000$, $(10)^4 = 10,000$, &c., 0, 1, 2, 3, 4, &c., are the logarithms respectively of 1, 10, 100, 1,000, 10,000, &c. A number between 1 and 10 will have for its logarithm a fraction between 0 and 1. Thus the $\log. \text{ of } 2 = 0.30103$, for $(10)^{0.30103} = 2$. A number between 10 and 100 will have for logarithm a number between 1 and 2; thus the logarithm of 50 $= 1.69897$, for $(10)^{1.69897} = 50$. Numbers between 100 and 1,000 will have for logarithms numbers greater than 2 and less than 3, or 2 plus a fraction; thus the $\log. 250 = 2.39794$, for $(10)^{2.39794} = 250$, &c.—In order to make logarithms available for purposes of calculation, the logarithms of all numbers between convenient limits are computed and arranged in tables, the natural numbers occupying the leading or argument column, the logarithm being placed opposite in adjoining columns. Sometimes tables are arranged with the logarithms in the leading or argument column; these are called tables of anti-logarithms. For certain purposes logarithms constructed substantially according to the system originally proposed by Napier are used, and are known as Napierian, natural, or hyperbolic logarithms. In this system the base is the number 2.7182818+. These logarithms are of great use in the higher mathematics, and in the investigation of many problems in physics. The Napierian logarithm of a number is equal to the common or Briggs logarithm multiplied by 2.3025851, or divided by 0.4342945.—The early computers of logarithms carried them to 10 places of decimals; but it was soon found that 7 places were sufficient for most of the uses of astronomy, navigation, surveying, &c. In fact, 5-place logarithms are often sufficient, and, being much more convenient and portable, should be used except when very great accuracy is required. The theory and use of logarithms is now taught as a part of liberal education, and it would be well if the compilers of text books would introduce into them only 5-place decimal logarithms. They, however, often use 6-place logarithms, and make the tables of the size common to 5-place logarithms. This very much increases the labor required in using the tables, and so prevents students from acquiring the necessary facility.—An excellent collection of 5-place logarithms is that attached to "Bowditch's Navigator," and also published separately under the title of "Bowditch's Useful Tables." This contains, beside the tables of logarithms for numbers, $\log. \text{ sines, tangents, \&c.}$, also many auxiliary tables useful in navigation and surveying. A good collection of 5-place tables by J. Hoüel (8vo., Paris, 1858) contains

also Gauss logarithms for addition and subtraction. Among tables of logarithms to 7 places of decimals may be mentioned Babbage's, which are very accurate. Taylor's tables (large 4to., London) are very valuable, but difficult to obtain. Shortrede's tables (large 8vo., Edinburgh) contain nearly all the tables required in computing; they are especially designed for military and civil engineers. The tables of Callet (8vo., Paris) are very good; they contain the logarithms of all numbers from 1 to 108,000, with log. sines, tangents, &c., beside tables of Napierian logarithms to 20 places of decimals, and short tables of common logarithms to 20 and to 61 places. For log. sines, tangents, &c., Bagay's tables (4to., Paris) are very convenient; they contain the log. sines and tangents for every second of the quadrant. A new edition of Vega's tables (8vo., Berlin, 1856), edited by Dr. Bremiker, is very convenient, and may be obtained at a very moderate price.

LOGIC (Gr. *λογος*, reason), the science of reasoning. More strictly and properly, it is the science of deducing ideas or conceptions one from another, and of constructing them into propositions, arguments, and systems. A wide range and great diversity of topics have, however, been included in the various treatises written under its name. Some have understood by it an account of the whole mental activity, and defined it as the art of thinking. Others have made it comprise only a knowledge of the first principles, or axioms, from which we reason. Others appear to have held it responsible for the truthfulness of all professedly logical reasoners and processes. Others again have regarded it as chiefly or exclusively an instrument of invention and discovery, and worthless except for the attainment of some new truth. It is now generally held that logic assumes certain first principles or axioms, from which as premises to reason; that it is concerned with the form only of reasoning or argument, and not at all with the subject matter; that it is and of necessity must be a purely *a priori* science, and moreover a hypothetical science, since it neither assumes nor proves as such the reality of any thing, does not assert that any objects corresponding to our conceptions do really exist, but only gives results and conclusions, based on premises, and true provided the premises be true. Logic is thus limited to the method of reasoning. Though commonly regarded as consisting of two parts, analytics and method, it is essentially a constructive science; it explains the way in which theories and systems are constructed from our primary ideas of objects, and it proves and tests, not their truth, but their legitimacy as deductions. In this view, it presupposes psychology, which is a sort of natural history of thought, and it is preliminary and prerequisite to ontology, the science of being.—Logic begins with ideas. Our ideas of objects are complex wholes, and may be analyzed into conceptions of the known properties of objects. Thus, snow is represented by its properties of

whiteness, coldness, &c., and an orange by its color, shape, &c. These properties, or rather the terms describing them, become predicates which we may affirm of the object. Thus, having analyzed our idea of an orange, we obtain the properties of roundness, &c., and hence may say: "The orange is round." Or, forming a generic conception, we may say: "An orange is a fruit;" "Men are animals." We may thus predicate M of P, and S of M, and then, dropping the common or middle term M, may predicate S of P, a proposition derived by induction from the two premises or primary judgments. The formula, "M is P, S is M, therefore S is P," is called a syllogism, a term which includes any possible combination of two propositions from which is deduced a third, which is hence called a conclusion. The conclusions of preceding syllogisms may become the premises of others *ad infinitum*. The premises may be negative as well as affirmative—S is not P, as well as S is P; they may also include only a part of the subject, as some S is P, some S is not P. Hence there are 4 cardinal propositions:

Universal affirmative: All S is P.
 " negative: No S is P.
 Particular affirmative: Some S is P.
 " negative: Some S is not P.

For convenience these propositions are designated by the 4 first vowels; thus: A, universal affirmative; E, universal negative; I, particular affirmative; O, particular negative. Combining these 4 propositions in all possible ways of 3 in a set, we obtain 64 sets, which are called moods. Of these moods, however, only 11 are found to give valid conclusions, viz.: AAA, AAI, AEE, AEO, AII, AOO, EAE, EAO, EIO, IAI, and OAO. It is found also that the position of the middle term is of essential importance, for let the mood AAA be written thus: "All M is P; all S is M; therefore all S is P;" and it is evident at once that if M is included in the class P, and S is included in the class M, then S must be included in P also. But if the same mood be written: "All P is M; all S is M," then it does not follow that S is included in P; for men are animals, and horses are animals, but men are not therefore horses. Every mood of the syllogism thus has what are termed figures, of which there are four. In the 1st figure, the middle term is the subject of the major premise and the predicate of the minor; in the 2d, the middle term is the predicate of both premises; in the 3d, it is the subject of both premises; and in the 4th, it is the predicate of the major premise and the subject of the minor. The 11 moods each having 4 figures would give 44 syllogisms, of which, however, only 19 are found by examination to be distinct and valid. These are designated by the capital vowels in the following mnemonic hexameters:

BARBARA, CELARENT, DARII, FERIOQUE, priores:
 CESARE, CAMESRE, FESAPRO, BAROCO, secundae:
 TERTIA DARAPTI, DISAMIS, DAFISI, FERAPTON.
 BOKARDO, FERISON, habet: quarta inaequalis addit.
 BRAMANTIP, CAMENES, DIMARIS, FESAPO, FERESON.

When one of the premises is understood, but

not expressed, in the statement, the syllogism is called an *enthymeme*. When several premises are employed for the same conclusion, several syllogisms are in fact abridged into one formula, which is called a *societas*. When one premise is assumed as hypothetically true, and the conclusion is stated as depending upon the truth of the other alone, we have what is called a conditional judgment; and if the conclusion is stated as depending upon the falsity of the other, we have a disjunctive judgment. A conditional or disjunctive proposition may be made the major premise, and then the syllogism be completed as follows: "If A is B, C is D; but A is B; therefore C is D." "Either A is B or C is D; but A is not B; therefore C is D." The major premise may affirm only a comparison or relation between the terms, as: "Where the boy is, there the father is; but the boy is at home; therefore, the father is at home."—Beside the fulfilment of all the conditions of the formulas in syllogisms, there are found to be also certain conditions and laws in regard to the use of words, which are necessary to the validity of the reasoning. The violation of these laws gives rise to fallacies, of which there are reckoned 18, 6 in *dictione* and 7 *extra dictionem*. 1. Equivocation is when a word is used in the same formula in two different senses. 2. Amphibology is when a word is so used as to leave it doubtful whether it be a subject or predicate, or when the reference of a pronoun is ambiguous. 3 and 4. Composition and division are caused by using the same term both collectively and distributively in the same formula, thus: "3 and 2 are two numbers; but 5 is 3 and 2; therefore, 5 is two numbers." Here 5 and 2 are used distributively in the major and collectively in the minor premise. The reverse is true of the word Romans in the following: "The Romans conquered Carthage; Brutus and Cæsar were Romans; therefore Brutus and Cæsar conquered Carthage." 5. Accent may occasion a fallacy by varying the meaning of a proposition. Thus the purport of the question: "Do you ride to town to-day?" may be changed 5 times by changing the accented word. 6. The form of the expression (*figura dictionis*) may lead to a fallacy, as when we infer from the fact that one word ending in *a*, as *mensa*, is of the feminine gender, that therefore another word with a like termination, as *poeta*, is feminine also. 7. The fallacy of accidents arises when we affirm of something described by some accidental property or circumstance what is true only of its substance, as: "We buy raw meat in the market; what we buy in the market, we eat; therefore, we eat raw meat." Here we do not buy meat because it is raw, but because it is meat, for its essence and not for its accidents, and only its essential quality is common to the different members of the argument. 8. Mistaken application consists in giving to a statement a universal application when it was intended for only a limited one. 9. The *ignoratio elenchi* is when

we either fail to give for any particular conclusion the premises required, or draw from given premises a conclusion not legitimately following from them, or employ a legitimate syllogism which does not give the conclusion that the occasion demanded. 10. The *a non causa, pro causa*, is when we reason from a premise that is not true. 11. The fallacy of consequences consists in employing a conclusion not derived from the premises. 12. The *petitio principii*, or begging the question, assumes as true that which should be proved. 13. The fallacy of many questions is when several interrogatories are either expressly or implicitly so combined into one that they must all receive the same answer, though truth requires that some be answered affirmatively and others negatively.—Aristotle was the creator of the science of logic (though he says that Zeno the Eleatic was the founder of dialectics), and his writings have been the basis of most of the treatises on logic that have since appeared. Six separate works constitute his *Organon*. In his "*Categories*" he treats of the highest generic ideas, which he reduces to 10, and of the nature of terms. In his "*Prior Analytics*" he examines the nature of propositions and the theory of conclusions; in his "*Posterior Analytics*," of demonstrable knowledge and the methods of reasoning. His "*Topics*" embrace dialectics and the discussion of first principles; his *Sophistica* are devoted to fallacies; and he also wrote a work on the art of expression. The whole system of Aristotle is crude and perplexed, as is usually the case with the first draft or statement of any thing that lies far beyond the ordinary thought of men. There has, however, until a late period been little done in the department of logic more than to simplify and rearrange the materials furnished by the Stagirite. He recognized and discussed only the 3 first figures, and the discovery of the 4th is ascribed to Galen. Moreover, he scarcely regards the hypothetical syllogisms or modes as reasoning at all; the discovery of these is ascribed to Theophrastus. It was clearly seen by Aristotle that reasoning depends in some way on the relations of the logical wholes—individual, species, and genus—to one another. Porphyry in his "Introduction to Aristotle" explained more fully and clearly than his master had done the predicables, as they were called, namely, genus, species, differentia, property, and accident. Logic was extensively studied during the middle ages, though no important advance was made in its development. Its use gave rise to the scholastic method, which consists in applying the formulas of reasoning to terms, or to general principles deduced by definition or otherwise from terms. This method is of course legitimate, and the only one that is at all legitimate, in mathematics, and in all *a priori* or demonstrative sciences. But in the natural sciences the first principles or topics are the facts of nature; and a careful observation, analysis, and classification of them, together with an induction from them, must

precedes any useful deduction. The discovery of this great principle led to a disregard of the proper sphere and use of formal logic, and brought the whole subject into neglect and contempt; and the inductive was generally proclaimed of vastly more use than the scholastic method. Induction, however, had not wholly escaped the attention of Aristotle, who defined it as "the method from which we pass from particular instances to general truths." The natural sciences all begin with induction. The philosophy of the method has not, however, been explained to universal satisfaction. The *Novum Organum* of Bacon was designed to show its necessity and practical application, rather than the philosophic grounds on which its validity rests. During the general neglect of logic, one of the most important works produced in its interest was *La logique, ou l'art de penser* (1662), usually called the Port-Royal logic, by several authors, among whom Arnauld, Nicole, and Sacy were most prominent. It was really in the interest of the scholastic method, though intended otherwise, and though the scholastic rules and formulas were illustrated by new and well chosen examples, which constitute the great merit of the work. It was widely read, and gave a new impulse to the study. At the beginning of the next century Wolf published his great treatise on logic, in which he attempted to incorporate the peculiarities of the Leibnitzian philosophy, and which gave the direction to speculations on this subject in Germany, leading the German writers to regard the fundamental laws of thought which underlie and give validity to logical formulas, rather than their practical value or application. In 1816 Hegel completed the publication of his "Logic," in which the term is used with a breadth of meaning peculiar to his philosophical system. The Hegelian logic is the law of absolute being, the scientific exposition of the pure conceptions of reason, of the absolute idea; its domain is the absolute truth as it is in itself, apart from its manifestations; it represents God as he is in his eternal being, before the creation of the world or of a finite mind; it is the analysis of the successive grades of history in their abstract form. It thus constitutes the first and highest part of the Hegelian scheme of absolute idealism. Archbishop Whately published his "Elements of Logic" in 1825, when this branch of study was at its lowest ebb in the English universities. This work has had probably a wider circulation and more extensive use than any other ever written on the subject, and had the effect of recalling public attention to its importance. He maintained that induction as well as deduction should be regarded as a branch of logic, and consequently attempted to explain the philosophy of induction and to show its accordance with the deductive formulas; and while the writers of the German schools treated logic as chiefly or exclusively concerned with thought, Whately regarded it as chiefly concerned with words. His work gave rise to many other

efforts in the same department, prominent among which was the "System of Logic, Ratiocination, and Induction," by J. Stuart Mill (1843), in which the author treats the grounds and fundamental principles rather than the formulas of reasoning. Being an eminent thinker of the sensational school, he does not make logic an *a priori* science, but aims to systematize the inductive method and reduce it to strict rules. The work abounds in valuable practical hints and reflections, and the concluding portion aims to solve the question whether from moral and social phenomena the instrument of logic may not derive a body of truths irrevocably acquired and universally assented to, like many of the laws of the physical world. In 1847 Prof. De Morgan published his treatise on "Formal Logic," an attempt to construct the science on a new basis. A mathematician of high repute, his work is difficult of comprehension to all except scholars in his own department. The peculiarity of its fundamental principle is that it ignores the distinction between a unit and an individual. Units, however, are not, and individuals are distinguishable from one another. Six men, for example, are not distinguished as mere units from any other 6 objects of thought; but it is obvious that we may predicate of 6 men what would not be true of 6 individuals in any other species; and logic does not deal with its objects as mere units, but as individuals making up species and genera. If the subject in any affirmative proposition denote an individual, the predicate will denote the species in which it is comprehended; and if the subject denote a species, the predicate will denote the comprehending genus; but the argument neither establishes nor affirms any numerical relation between them. Sir William Hamilton dissented from the views of Whately and his followers, who considered logic as chiefly concerned with language and as including the department of dialectics. He maintained that it is exclusively occupied with the forms of reasoning, that it takes no notice of the subject matter, and has no connection with psychological processes. The peculiarity of his system results from what he calls the quantification of the predicate, a fact which in his view had hitherto been overlooked. Beside the 4 kinds of propositions designated by A, E, I, and O, he distinguishes 4 others. It had previously been held that affirmative propositions as such and of necessity distributed the subject, and negative propositions the predicate. Thus in the universal affirmative: "All men are animals," the subject only is taken into the scope of the proposition as a logical whole. We here speak of "all men" as a class, but not of "all animals," and we say or imply nothing concerning the latter except that some of them are men. The universal negative distributes both terms, and in like manner it has been held that the particular affirmative takes neither of its terms as a whole, and that the particular negative distributes the predicate only.

But Sir William Hamilton holds that we may have affirmative propositions with or without the subject distributed, and negatives with or without the predicate distributed; and he proposes to designate the 8 propositions which result as A, U, I, Y, ϵ , η , o, ω . The scheme, presenting the quantity of the predicate, is as follows:

- U. Toto-total: All S is all P.
- A. Toto-partial: All S is some P.
- Y. Parti-total: Some S is all P.
- I. Parti-partial: Some S is some P.
- ϵ . Toto-total: All S is not all P.
- η . Toto-partial: All S is not some P.
- o. Parti-total: Some S is not all P.
- ω . Parti-partial: Some S is not some P.

This view, if it be accepted, revolutionizes the theory of the syllogism, and the whole system of logic as commenced by Aristotle and elaborated by his followers down to the time of Hamilton. De Morgan claimed that this theory of quantification was substantially the same as his own. An elementary treatise on logic by Dr. Wilson, professor in Geneva college, N. Y., was published in 1856. He differs from Hamilton by holding that in order even to construct logical formulas it is necessary to take some note of the quality of the conceptions, and that we can only do this by referring to the processes of the mind, and to the objects of these processes, which are the subject matter of reasoning. Any other view leads to the theory of De Morgan, who regards all objects as mere units without individuality. He attained by analysis to 5 distinct principles of reasoning: 1, by the subsumption of species under genera, and individuals under species; 2, by the comparison of continuous quantity, which includes comparison of time and place; 3, by calculation, dealing with units alone; 4, by condition or hypothesis; and 5, by disjunction. Other important works produced in this country on the subject are: the "Elements of Logic," by Prof. Levi Hedge (1816), founded on the Scotch philosophy, and therefore omitting all metaphysical discussions of formulas and *a priori* conditions of thought; the "Elements of Logic," by Prof. Henry P. Tappan (1844), founded on the philosophy of Kant, and occupied rather with the conditions and laws of thought than with the application of logical formulas; and the "Science of Logic," by Prof. A. Mahan (1857).—See Blakey's "Historical Sketch of Logic from the Earliest Times to the Present Day" (London and New York, 1851).

LOGWOOD, a dye wood obtained from the logwood tree (*hæmatoxylon Campechianum*) of Central America. The tree belongs to the sub-order *casalpinææ* of the natural order *leguminosææ*. It grows in very favorable situations 40 or 50 feet high, but more commonly not more than 25 feet. Its trunk is generally less than 20 inches in diameter, and is crooked and covered with a rough bark. The branches are also crooked and furnished with thorns. The flowers in axillary spikes at the end of the branches have a purplish calyx and light yellow petals. The outer sap wood is yellow, but the inner

portion, which alone is exported, is deep red. It is a close-grained wood, very hard, and so heavy that it sinks in water. Its decoction assumes various colors, according to the time it has been prepared and the substances with which it is treated. It is first deep red, but becomes paler by absorbing oxygen, and at the same time it acquires the property of precipitating gelatine. Acids brighten the color, while they also make it paler; alkalies render it of a purplish or violet hue, and the salts of iron dark violet blue. The wood is principally useful for furnishing red and blue, but more particularly black dyes. By the use of iron and alum bases they are obtained of various degrees of intensity, and with proper mordants are rendered permanent. The coloring principle of logwood was separated about the year 1811 by Chevreul, and this is now known by the name of hæmatoxyline. He obtained it from the watery extract in transparent brownish yellow crystals, the composition of which when anhydrous is represented by the formula $C_{10}H_{17}O_{11}$. Erdmann also procured 4 oz. of the crystals from 2 lbs. of the pulverized extract by digesting it in 2 lbs. of ether, with a portion of sand intermixed to prevent agglutination, and afterward expelling the ether by evaporation. Hæmatoxyline resembles liquorice root in taste, is soluble in boiling water, and with alcohol and ether produces reddish yellow solutions. Beside this substance, the wood contains a great variety of salts of lime, alumina, iron, and manganese, together with a fatty or resinous substance, a volatile oil, tannin, acetic acid, &c. Logwood is used in medicine as well as in dyeing, being a mild astringent without irritating properties. It is given in extract or decoction in cases of chronic diarrhœa, chronic dysentery, and in the relaxed state of the bowels succeeding cholera infantum.—To prepare the wood for use, the imported logs were formerly cut by machinery into chips by means of steel cutters upon a horizontal drum, against which they were moved endwise; but the practice is now to grind the wood to powder, in which state the infusion is more readily obtained than from the chips.—Logwood was taken to Europe for a dyeing material soon after the discovery of America. Its introduction into England was violently opposed in the time of Queen Elizabeth, and an act was passed prohibiting its use. This was repealed in 1661, when the demand for logwood rapidly increased. It was obtained only in the Spanish possessions; and in order to procure it the New Englanders made settlements in Yucatan, and sent thence large quantities to the north and to Jamaica. The opposition of the Spaniards led at last to a special treaty between England and Spain, by which British subjects were permitted to cut and ship the wood in the bay of Campeachy; whence the name it has received of Campeachy wood. In 1715 the tree was introduced into Jamaica; by means of planting the seed and from being cultivated in plantations it spread all over the

island. Thus Jamaica also has furnished large quantities to commerce.

LOIR (anc. *Lidericus*), a river of France, which rises in the department of Eure-et-Loir, in a range of hills dividing its basin from that of the Seine, and joins the Sarthe a little above the junction of the latter with the Mayenne. Its length is 150 m., and it is navigable for 80 m. Its principal tributaries are the Ozane, Bray, Conie, Long, and Meaulne.

LOIR-ET-CHER, a central department of France, in the old province of Orléanais, bounded by Eure-et-Loir, Loiret, Cher, Indre, Indre-et-Loire, and Sarthe; area, 2,389 sq. m.; pop. in 1856, 264,043. The surface presents a number of elevated and extensive plains, and is nearly equally divided by the Loire, the district N. of which is traversed by the Loir and its affluents the Ozane and the Bray, and that S. by the Cher, Sauldre, Beuvron, and Cosson. There are numerous ponds along the left bank of the Loire, and the S. E. of the department presents a vast marshy plain which contains many hundreds of ponds. The soil is of various qualities: in the N. E. it is a dark rich loam, in the S. E. clay and sand, along the Cher calcareous, and the N. W. part is arid and covered with heath. The chalk formation occupies a large portion of the department. The chief crops are grain, wine, fruits, vegetables, beet root, and hemp. Vendôme is noted for its draught horses, and the Sologne district for its sheep. The cattle are of an inferior breed. Poultry and game are plentiful. The principal minerals are iron, marl, potters' clay, and building stone. The climate is in general mild and salubrious. The manufactures consist of coarse woollens, cotton cloth, hosiery, gloves, sugar, leather, glass, and earthenware. Capital, Blois.

LOIRE, an E. department of France, in the old province of Lyonnais, bounded N. by Saône-et-Loire, E. by Rhone and the river of the same name, S. by Ardèche and Haute-Loire, W. by Puy-de-Dôme, and N. W. by Allier; area, 1,805 sq. m.; pop. in 1856, 505,260. It belongs almost entirely to the basin of the Loire. The surface consists chiefly of extensive plains broken by the mountains of the Cévennes and Forez, and by several isolated volcanic hills of black basalt. The chief rivers are the Loire, Rhone, Ondène, Furens, Coize, Lignon, and Sornim. The heights separating the valleys of the Loire and the Allier are chiefly composed of granite rocks or of the older limestones and sandstones. Part of the higher ground between the Loire and the Rhone is occupied by coal measures, and the valley of the Loire by strata of the supra-cretaceous group. This department indeed contains one of the richest coal fields of France. Lead, iron, building stone, granite, and potters' clay are the other most important minerals. The soil is not of superior quality, but produces hemp, fruit, wine, oil seeds, grain, and excellent pasturage, on which feed great numbers of cattle and sheep. In the valley of the Rhone mulberry trees are exten-

sively grown for the production of silk. Pine, fir, oak, and beech grow on the mountains, and large quantities of pine are converted into charcoal. Chestnuts form a staple in the common diet of the people, and are also largely exported to Paris. The manufactures are important, and include firearms, cutlery, ironware, machinery, cotton, woollen, silk, and linen goods, glass, bricks, canvas, earthenware, lime, &c. The chief manufacturing town is St. Etienne. Capital, Montbrison.

LOIRE (anc. *Liger*), a river of France, running in a W. N. W. direction across the S. W. and central parts of the country, and dividing it into two nearly equal parts. It rises on the slope of the Cévennes, and passing by the towns of Orleans, Blois, Amboise, Tours, Saumur, and Nantes, flows into the bay of Biscay 86 m. below Nantes. Its principal affluents are the Arroux, Bèbre, Allier, Cher, Vienne, Mayenne, Indre, and Sèvre-Nantaise. Below Nantes, where it first feels the influence of the tide, it is studded with small islands. Its length is about 600 m.; it is navigable from its mouth to Roanne, a distance of 450 m.; and between this point and Noire, 45 m. higher, it is navigable downward only. In the lower part of its course it is obstructed by shifting sands, but these impediments are obviated by a canal. The river is also subject to floods, to guard against which extensive works have been constructed. In its upper course the river is a romantic mountain torrent; as it descends, its valley widens and embraces extensive plains, so richly covered with orchards, vineyards, and corn fields, that they have justly received the name of the "garden of France." The basin of the Loire is estimated at one fourth part of the whole of France.

LOIRE, HAUTE. See HAUTE-LOIRE.

LOIRE-INFÉRIEURE (Lower Loire), a W. maritime department of France, in the old province of Brittany, bounded N. by Morbihan and Ille-et-Vilaine, E. by Mayenne and Maine-et-Loire, S. by Vendée, and W. by the bay of Biscay; area, 2,595 sq. m.; pop. in 1856, 555,996. The coast line is about 55 m. long, and broken by the bays of Pennebé, Pembron, Croisic, and Bourgneuf. The interior is level, with the exception of a line of low hills in the N. The department is watered by the Loire and its tributaries the Sèvre-Nantaise, Acheneau, and Erdre. The Vilaine touches the department on the N. W., and there are several less considerable streams. Grand-Lieu, the largest lake in France, is situated near the left bank of the Loire, with which it communicates by the Acheneau. The chief minerals are coal, iron, lead, tin, slate, granite, quartz, mica, kaolin, and feldspar. The soil is generally fertile. The chief crops are wheat, rye, buckwheat, mixed grain, and barley. The pastures are excellent, and cattle of good breed and horses are numerous. The district S. E. of Lake Grand-Lieu is somewhat lilly and well wooded. The vineyards supply annually about 82,000,000 gallons of wine. The principal manufactures are linen,

cotton, and woollen goods, which are produced chiefly at Nantes, Clisson, Châteaubriant, and Guérande; ship building is extensively carried on at Nantes, Painbœuf, and Pellerin. On the coast there are large fisheries. The commerce of the department is very important, and the principal articles of trade are wine, brandy, fruits, salt, oil, hardware, provisions, soap, and wool. Capital, Nantes.

LOIRET, a central department of France, in the old province of Orléanaise, bounded N. by Seine-et-Oise and Seine-et-Marne, E. by Yonne, S. by Nièvre, Cher, and Loir-et-Cher, and W. by Loir-et-Cher and Eure-et-Loir; area, 2,551 sq. m.; pop. in 1856, 345,115. The surface is level or gently undulating, and is traversed by the Loire, Loiret, Loing, Ouanne, and a number of smaller streams. Water communication is much extended by the canals of Briare, Orleans, and Loing. There are several extensive forests, including those of Orleans, Montargis, and Gien, the first having an extent of 50 m. by 15, but including many open tracts with villages and hamlets. The soil is generally fertile, especially to the N. of the Loire. The chief products are grain, wood, wine, and saffron. Bees are largely reared, and sheep and cattle are numerous. There are mineral springs at Ferrières, Segrais, St. Gondon, Noyers, Beaugency, and other places. Capital, Orleans.

LOJA, or LOXA, a town of Spain, in the province of Granada, near the left bank of the Genil, here crossed by a bridge, 81 m. W. from Granada, 22 m. E. from Antequera, and 41 m. N. from the port of Malaga; pop. 15,968. It is beautifully situated on the slope of a hill, has 21 woollen factories, 3 paper mills, 8 churches, 3 suppressed monasteries, a nunnery, a town house, and 2 hospitals. On the summit of the hill above the town are the ruins of an ancient Moorish castle, which was taken by Ferdinand III. in 1226. From coins and other antiquities found in it, Loja appears to have been an important Roman station.

LOKMAN, an Arabian philosopher and fabulist, represented in the Koran as a contemporary of David and Solomon, with whom he is said to have frequently conversed. He was prince or sheik of the primitive tribe of Ad, and when that tribe perished by the *Seil-ol-Arim*, he alone was preserved because of his piety and wisdom. He was as remarkable for his personal deformity and ugliness as for his wit and sagacity. Fables attributed to Lokman are still extant. A Latin-Arabic version of them appeared at Leyden in 1615, and they have since been translated into Dutch, French, and German. The best editions are those of Oausin (Paris, 1818), Freytag (Bonn, 1823), and Rödiger (Halle, 1830). Among the more recent is that of Derenburg (Berlin, 1850). The talents and deformities of Lokman bear such a resemblance to those of *Æsop*, that they are supposed to have been the same person.

LOLA MONTEZ (MARIA DOLORES PORRIS Y MONTEZ), countess of Landsfeld, a woman cele-

brated for her remarkable adventures, born in Limerick, Ireland, in 1824. Her mother, a creole of great beauty, was married in succession to a Spanish and an Irish officer, from which several contradictory reports have arisen as to her parentage and place of birth. She was brought up in her infancy in England, at first in her mother's house and later at a school in Bath. While very young she married an officer named James, who took her to India, but treated her cruelly, for which reason she left him and returned to England, where her singular talents and remarkable disposition made her well known. In 1840 she appeared as a dancer at the Porte St. Martin, in Paris. Her wit and accomplishments drew around her a circle of the literary men and artists of the French capital, with one of whom, Dujarrier, an editor of the *Presse*, her relations were intimate. His death in a duel was the cause of Lola's appearance as witness in the celebrated trial which ensued. Shortly after she found her way through a series of extraordinary adventures to Munich, where she appeared as a *danseuse* and fascinated the king Louis. Here her restless and daring mind found itself in a position to influence political events, and she exerted her abilities with such zeal as to become the cause of a revolution. The king wished to give her the title of countess of Landsfeld, but his ministry, led by Karl von Abel, refused to sanction the honor. The ministry was dissolved (1846), and Lola Montez received the title. At this time she lived in state, having a large pension and a splendidly furnished house, due to the liberality of the king, while her portrait was placed in the gallery of court beauties. A second ministry, that of Wallerstein, which she herself had formed or at least approved, became hostile to her, and this was in turn dissolved by her influence. The deposed ministers stirred up the people against her, and the imprudent acts into which she was easily provoked were repeated with every exaggeration. Having made friends with a corps of students of the more aristocratic class, these young men were assailed by the mob and by other students, and the king and Lola, who were present, were only saved from personal violence by a charge of cuirassiers. The next day a royal decree closed the university. The result was a terrible tumult in Feb. 1848, which compelled her to fly from Munich. After the abdication of the king in the following month, in consequence of the general movement in Europe, she went to England, where her reputation again drew around her numbers of wealthy and influential friends. A young English officer named Heald offered her his hand and was accepted; the result was a prosecution for bigamy, James, her first husband, being yet alive. Mr. and Mrs. Heald fled to Spain. The death of James in 1850, followed by that of Heald, soon freed her from both husbands. In 1852 she came to the United States, where she appeared with great success in autobiographical dramas, setting forth her various adventures.

From New Orleans she went to California, where it is said she was married to and divorced from a third husband named Hull. In 1855 she went to Australia, where she played at Melbourne with great success for the benefit of the wounded at Sebastopol. Returning to the United States, she delivered lectures on a variety of topics. She afterward visited and lectured in England, but returned in the autumn of 1859 to New York. The minor adventures of her wild career in the principal cities of Europe are probably without parallel. Her accomplishments as a linguist are remarkable. She has published a volume of her lectures, with an autobiography, "Arts of Beauty, or Secrets of a Lady's Toilet," and "Anecdotes of Love."

LOLLARDS, a name given to several religious associations in the middle ages. Its etymology was formerly explained in different ways, but more recently its derivation from the verb to lull (German *lullen*) has been generally adopted. It signified persons speaking at religious services with a low, suppressed voice. The name first appears in the Netherlands about 1800, and was sometimes given to a religious congregation of men who devoted themselves to nursing the sick and burying the dead, and who called themselves Alexians; sometimes to the societies of the Beguins. The name always implied at least a suspicion of heresy. In England it was applied to the adherents of Wycliffe as early as 1382, and in 1387 and 1389 it was used in episcopal documents. It remained a common appellation of the adherents of Wycliffe until the beginning of the reformation of the 16th century. They maintained all the principal doctrines of Wycliffe, especially that of the Scriptures being the only rule of faith. At the time of Wycliffe's death their number in England seems to have been very great. A chronicler of that time remarks, that it was difficult to meet two people in the street without one being a Wycliffite. John Hereford, doctor of theology in Oxford, John Ayshton, magistrate in Oxford, and John Purney, a friend of Wycliffe, were their leading men. In 1394 they petitioned the parliament for a reformation of the church. In 1400 an act of parliament *de comburendo hæretico* made death the penalty of heresy, and a great many suffered this punishment; among them, in 1417, Sir John Oldcastle, Baron Cobham. The last executions took place in 1430 and 1431. After that time they ceased to be numerous, and were found almost exclusively among the lower classes. But toward the middle of the 15th century a bishop of Chichester, Reginald Pecock, still mentions them in his principal work, "The Repressor," as "erring persoones of the lay people whiche ben clepid lollards." He calls them in another part of his work "Biblemen," and mentions expressly that they possessed the New Testament in the native language, that they learned it by heart, and that they preferred the reading of the Bible to the instruction given by priests and scholars. In 1494 several Lollards, men and women, were

prosecuted in the western district of Scotland; and in 1506, 80 persons of Amersham, a principal seat of the Lollards, were punished for heresy. After the introduction of the reformation in the 16th century, the Lollards gradually united with the reformed churches.

LOLLI, or LOLLY, ANTONIO, an Italian violinist, born in Bergamo in 1728, died in Sicily in 1802. Little is known of his youth; but from 1762 to 1773 he occupied the position of concert master to the duke of Württemberg, residing chiefly at Stuttgart. Upon his arrival in that city he found that a resident artist, Nardini, was his superior on the violin. Having obtained from the duke leave of absence to travel, Lolli retired to a secluded village, and applied himself so assiduously to the mastery of his instrument that on his return to Stuttgart he utterly eclipsed his rival, who returned in despair to Italy. Between 1775 and 1778 Lolli was attached to the court of the empress Catharine II. of Russia, who loaded him with honors. Subsequently he performed in London, Paris, and other large continental cities. He was most celebrated for playing quick movements, and attained a wonderful rapidity and facility of execution. His compositions are of little value.

LOMAX, JOHN TAYLOR, LL.D., an American jurist, born at Port Tobago, Caroline co., Va., in Jan. 1781. He was graduated at St. John's college, Annapolis, in 1797, in 1799 began the study of law, and in 1802 commenced practice at Port Royal on the Rappahannock. On the death of his brother in 1805 he removed to Fredericksburg, where he remained until 1809. He spent the following 9 years at Menokin in Richmond co., Va., and in 1818 resumed his place at the Fredericksburg bar, where he practised very successfully until his appointment in 1826 as professor of the school of law in the university of Virginia. He was also for some time chairman of the faculty. He resigned this position in 1830 in order to accept a seat on the bench of the general court of Virginia, to which he was unanimously elected by the legislature under the constitution of 1776. Soon after entering upon this office a new constitution was framed, and he was reelected. Under the constitution of 1851 he was retained on the bench for a term of 8 years by vote of the people of the circuit. The convention which framed this constitution had adopted a clause which disqualified any person over 70 years of age from holding the office of judge; but at the request of a number of members of the bar, this provision was cancelled in order not to exclude Judge Lomax. He continued to preside on the bench until 1857, when he retired to private life. He is the author of a "Digest of the Law of Real Property" (1839), and "Law of Executors and Administrators" (1841).

LOMBARD, PETER, or PETRUS LOMBARDEUS, surnamed "Master of Sentences," an Italian theologian, born near Novara about the beginning of the 12th century, died in Paris in 1164. He removed in his youth to France, and St. Ber-

nard placed him at the seminary of Rheims. He afterward entered the university of Paris, where he became a pupil of Abelard, and was so distinguished by his attainments that he was appointed tutor to Philip, son of Louis the Fat, made professor of theology in the university, and in 1159 bishop of Paris. The most remarkable of his works is his *Sententiarum Libri IV.*, a collection of passages from the fathers bearing on controverted points in theology. It acquired a great reputation, being employed in the schools as a manual, and made the text of innumerable commentaries. It was from this work that he derived his surname. It is still in repute, and was reprinted in Paris (2 vols. 8vo.) in 1841.

LOMBARDY, a state of northern Italy, lying between lat 44° 54' and 46° 37' N., and long. 8° 32' and 10° 42' E., and bounded N. by the Alps, which separate it from Switzerland, E. by Venetia, S. by Parma and Modena, and W. by Piedmont; area, 6,270 sq. m.; pop. in 1856, 3,009,505, or 480 to the square mile, a much denser average than that of any other country in Europe. It is divided into the delegations or provinces of Bergamo, Brescia, Como, Cremona, Crema-e-Lodi, Mantua, Milan, Pavia, and Sondrio. These are subdivided into 102 districts and 2,109 communes. The chief cities are Milan, Brescia, Cremona, Mantua, Pavia, Lodi, and Como. The greater part of the country is a plain sloping southward from the Alps toward the river Po, and which, being profusely watered and highly cultivated under a genial climate, is one of the richest and most productive districts in the world. Sondrio and the greater part of the delegations of Como and Bergamo are mountainous, lying on the southern slope of the Alps. The highest summits within the limits of Lombardy are the Splügen, 8,180 feet high; the Legnone, 8,120 feet; the Godena, 7,549 feet; and the Tremezzo, 5,106 feet. Immediately S. of this mountain region is a sub-alpine or hilly region, beyond which spreads the great plain. The principal rivers are the Po and its tributaries, the Ticino, the Olona, the Adda, the Oglio, and the Mincio. The lakes are large and important, and renowned for their picturesque beauty. The most remarkable are the Lago Maggiore, which is partly in Switzerland and is 50 m. long, with a breadth varying from 5 to 8 m.; Lake Lugano, which is also partly in Switzerland, and is 24 m. in length by 6 m. in greatest breadth; the lake of Como, 33 m. long, with a breadth of 3 m.; the lake of Iseo, 18 m. long and 5 broad; and the lake of Garda, the largest and one of the most beautiful of Italian lakes, which is 33 m. long and 11 m. in its greatest breadth, and separates Lombardy from Venetia on the E. The climate is healthy except in the marshy districts, and mild except among the mountains of the north. The winter lasts about two months, and on the plains snow scarcely ever remains on the ground. In the mountain region are forests of fir, oak, larch, birch, and chestnut. The southern de-

clivities of the mountains produce the vine, the mulberry, and a variety of fruit trees common to the temperate zone. The sub-alpine region and the great plain produce silk, wine, maize, millet, chestnuts, fruits, and vegetables. The mineral products of Lombardy are confined to a small quantity of iron from some of the alpine valleys.—The Lombards have a high reputation for intelligence and nobleness of character. M. Galiffe, a Swiss traveller, in his "Italy and its Inhabitants," says: "There is no nation so like the English as the Lombards. Their features have that general uniformity of style which characterizes a peculiar race of men. The nose is straight; the under lip retired, or smaller than the upper one; the complexion fair; the eyes and eyebrows strongly marked and expressive; the forehead high and noble, and divided exactly in the middle by a vein which becomes distended and visible on every strong emotion; the hair of a light brown; the general expression of the countenance gentle, mild, and open. I have travelled a great deal, and have not merely visited but have resided in many countries; but nowhere have I met with a more amiable people than the Milanese. They have all that vivacity of imagination, all that liveliness in their exterior appearance, which one expects to find in Italians, without the least mixture of that low cunning with which the Italian nation is so universally reproached. The character of the Milanese is frank and open; they are more cordial than complaisant, and their civility is blunt and hearty, yet graceful." Of the people of Brescia the same traveller remarks: "It is impossible to imagine a more beautiful race than the population of that city and its neighborhood. Raphael's most sublime conceptions of ideal beauty fall short of the living specimens which engaged our admiration in Brescia and on the road to Verona. I am persuaded that I saw a greater number of handsome women in that space than I had seen in all Europe beside; and many of them were more exquisitely beautiful than any individuals I had ever met with. What peculiarly characterizes their style of beauty is the commanding nobleness of their countenances, mingled with a degree of mildness and candor."—More than two thirds of the population of Lombardy are employed in agriculture. The country is better cultivated than any other in Europe. Irrigation, for which the streams flowing from the Alps afford ample facilities, is universally and skilfully employed. The water of the rivers is so distributed by canals that there are few farms without a copious supply. The purchase and sale of water for irrigation forms a business of much importance, and is conducted with great strictness, the volume of water being accurately measured and paid for at a high rate. Great attention is bestowed upon meadows, and upon the maintenance of live stock in the best possible condition. The chief labor of ploughing is performed by oxen, of which,

by the census of 1854, there were in the country 137,219, and of cows, bulls, and young cattle 311,831. At the same period the number of sheep and goats was 186,390, and of pigs 106,839. The live stock is fed entirely in stalls on grass, which can be cut from the meadows all the year round. Pigs are fattened on Indian corn. Horses, mules, and asses are employed for draught. Of horses in 1854 there were 68,738, of mules 12,054, and of asses 15,557. The dairies of Lombardy are extensive, and are managed with great care and with the most scrupulous cleanliness. They produce immense quantities of excellent cheese, known throughout Europe as Parmesan; the amount annually produced is computed at 52,000,000 lbs., worth in the country itself about \$7,000,000. The farms in Lombardy are generally small, most of them varying in size from 7 to 25 acres. The most numerous class of cultivators, called *coloni* or colonists, occupy cottages with less than 3 acres of land. Silk is the chief commodity furnished to commerce by the agriculture of Lombardy, and the value of the annual product is estimated at \$15,000,000. Rice was introduced from the East as early as the 10th century; its cultivation is restricted by the government on account of its insalubrity, but the annual product is about 5,000,000 lbs. Maize is the grain most extensively cultivated, more than one third of the arable land of Lombardy being devoted to its production. The average product per acre is said to be 25 bushels, and on the richest lands from 50 to 78 bushels. Wheat is chiefly raised in the alpine region; in 1854 the product was about 300,000 bushels. The grape vines of Lombardy are trained upon trees, and extend in elegant festoons from one tree to another. The wine is generally of poor quality; its annual product previous to 1851 averaged about 33,000,000 gallons, but since that year it has much decreased, the vines having been attacked by disease. Potatoes are little cultivated, and their production is almost exclusively confined to the alpine region; they are disliked by the people, and all attempts to extend their cultivation have failed. The chief branch of manufacture is that of silk, but cotton, woollen, and flax manufactures are on the increase. Milan has been long famous for its fabrication of arms, and there are extensive iron works in various parts of the country. The principal smaller manufactures are those of paper, glass, gold and silver articles.—The religion of Lombardy is the Roman Catholic. Milan is the seat of an archbishop, who has jurisdiction over 8 episcopal sees. The number of Jews is about 3,000, and of native Protestants about 600. Education is very generally diffused. In 1854 the number of schools of all kinds, public and private, was 5,488, attended by 275,000 pupils. For the higher branches of education there are lyceums at Bergamo, Brescia, Como, Cremona, and Mantua, a university at Pavia, and medical and surgical colleges at Milan. There

are beside seminaries attached to every episcopal see. In 1855 there were 12 newspapers and 47 scientific and literary journals. In 1853, 1,444 works were issued from the press.—Lombardy was anciently a part of *Gallia Cisalpina*, or Cisalpine Gaul. It owes its present name to the Lombards, Longobardi, or Langobardi, an ancient German people of Suevic race, whose name is derived in some of their national writings from their habit of wearing long beards, while some modern critics derive it from Germ. *lang*, long, and *Barte*, in Old German a battle club, or from *lang* and *Börde*, in Low German a bank of a river. The last refers to the banks of the Elbe, where they first appear in history in the time of the emperor Augustus. Having figured for some time in the history of Arminius and Marbodius, they soon after disappeared, and in the 5th century emerged in Hungary on the northern bank of the Danube, which they crossed in the following century after a successful war of extermination against their former masters, the Heruli. South of the Danube, in Pannonia, they carried on a protracted war against the Gepidæ; and after the final annihilation of their enemies, they crossed the Julian Alps under their victorious king Alboin, and in northern Italy founded, in 568, a powerful state, with feudal institutions. Their kingdom lasted for more than 200 years, their most remarkable monarchs being Autharis, who embraced Christianity; Rotharis, who promulgated a code of written laws in 643; Grimoald, who reformed the laws of the preceding; Luitprand, who conquered Ravenna in 728; Astolphus, who attempted the conquest of Rome; and Desiderius, with whom the kingdom ended, being conquered by Charlemagne in 774. Under the successors of the latter the Lombard cities, with Milan at their head, grew prosperous and powerful, and adopted republican institutions. After a long struggle with the emperors, these cities became independent by the treaty of Constance in 1183. The family of the Visconti soon afterward became powerful in Milan, of which city Giovanni Galeazzo Visconti became duke in 1395, with an extensive territory. His daughter Valentina married Louis, duke of Orleans, whence arose in the early part of the 16th century a claim on the part of France to the duchy, which was then in possession of the house of Sforza. The emperor Charles V. supported Francesco Sforza against the French, and in 1540, after Francesco's death, bestowed Milan as a vacant fief of the empire on his son Philip II.; and it continued to be a possession of the Spanish crown till 1706, when it was annexed by Austria. In 1796 the French conquered Lombardy, and it became successively a part of the Cisalpine republic, of the Italian republic (1801), and of the kingdom of Italy (1805). It was restored to Austria after the downfall of Napoleon in 1815, and was united with Venice to form the Lombardo-Venetian kingdom. (For its subsequent history, see ITALY, and SARDINIA.) By

the peace of Villafranca, July 11, 1859, the whole of Lombardy, with the exception of the fortresses of Mantua and Peschiera, was added to Sardinia.

LOMÉNIE, LOUIS LÉONARD DE, a French writer, born in St. Yrieix, Haute-Vienne, in 1818. He has published a series of political and literary biographies known as the *Galerie des contemporains illustres*, with portraits (10 vols. 18mo., Paris, 1840-47). In 1845 he was selected as the substitute of M. Ampère in the chair of French literature at the college of France, and in 1849 became tutor in the same department in the polytechnic school. He has also published in various periodicals another biographical series not yet completed, entitled *Les hommes de 89*. His most valuable work, which originally appeared serially in the *Revue des deux mondes*, is *Beaumarchais et son temps, études sur la société Française* (2 vols. 8vo., 1855; 2d ed., 1858). This was translated into English in 1857 (4 vols.), and abridged in New York. He is preparing a work on the Mirabeau family.

LOMÈNE DE BRIENNE. See **BRIENNE**.

LOMOND, LOCH, the largest lake in Scotland, about 20 m. from Glasgow, lying between the counties of Dumbarton and Stirling. It is 24 m. long, and has its greatest width, from 6 to 8 m., at the S. end, from which it contracts until at the N. extremity it is sometimes less than 1 m. wide. Its depth also varies greatly, seldom exceeding 60 feet in the S. portion, while toward the N. it increases to nearly 400 feet. Its area is 45 sq. m.; its surface 22 feet above the level of the sea. It contains about 30 islands, receives the Endrick and a large number of rivulets, and discharges its surplus waters into the frith of Clyde by the river Leven. Loch Lomond is celebrated for its grand scenery, being surrounded by high and rugged mountains toward the N., the most conspicuous of which is Ben Lomond, and toward the S. by an elevated and diversified country dotted with villas. Steamers ply on the lake.

LOMONOSOFF, MIHAIL, a Russian scholar, naturalist, and poet, born near Kholmogor, in the government of Archangel, in 1711, died in St. Petersburg, April 16, 1765. He was the son of a fisherman, who was a serf of the crown. With the aid of a priest he learned so much from a few books to which he had access, and among which was a poetical translation of the Psalms, that he conceived the plan of devoting himself to literature, especially poetry, and clandestinely repaired to Moscow. He soon found ample protection, and was enabled to complete his studies at that city, Kiev, St. Petersburg, Marburg, and Freiberg. After his return to St. Petersburg he was made an associate of the academy, professor of chemistry, and in 1760 rector of the university. Other marks of distinction were amply lavished on him. His works, which have passed through various editions, contain contributions to history, grammar, rhetoric, poetry, astronomy, chemistry, and other branches of science; but his fame

rests chiefly on his poetical writings, especially his odes, and on his grammar of the Russian language, of which he is regarded as the principal legislator. His biography has been written by Polevoi (2 vols., 1836).

LONDON, the capital of Middlesex co., Canada West, situated at the junction of the two branches of the Thames, and on the great western railway, 76 m. S. W. from Hamilton, and 114 m. from Toronto; pop. about 16,000. It is the westernmost city in Canada, was laid out in 1825, and has been twice nearly destroyed by fire; but its growth has been more rapid than that of any other place in the province. It is the centre of a rich agricultural district, and has an active trade in wheat and other produce. The city is well built, regularly laid out with wide streets, and is lighted with gas. It is connected by railway with Port Stanley and St. Mary's, and lines are projected to Sarnia and Port Frank on Lake Huron. It contains a number of fine public buildings and churches, among which the English church, a handsome Gothic structure, is noted.

LONDON, the metropolis of the British empire, situated on both sides of the river Thames, about 60 m. W. from the sea by the course of the river to the Nore light, or 40 m. in a straight line, in lat. 51° 30' 48" N., long. 0° 5' 48" W., measured from St. Paul's cathedral, comprising, according to the metropolis local management act of 1855, the cities and liberties of London and Westminster, the borough of Southwark, and various parishes, precincts, townships, and places. It includes, among others, the extreme points of Hampstead, Islington, Stoke-Newington, and Hackney to the N.; Stratford-le-Bow, Limehouse, Deptford, Greenwich, Woolwich, Charlton, and Plumstead to the E.; Camberwell and Streatham to the S.; and Kensington, Fulham, Hammersmith, and Putney to the W. Many of these districts were formerly distinct, but are now combined or combining into one almost continuous and constantly increasing line of houses, the vacant spaces between distant lines of road rapidly filling up. The whole metropolitan district comprises 186 parishes and an area of 122 sq. m., 51 m. of which are in the county of Middlesex, of which London is the capital, 36 m. in Surrey, and 35 m. in the county of Kent; the extreme length of the metropolis proper may be set down at 10 m., and its breadth at 6 m. The districts on the N. side of the Thames are as follows: 1, western districts: Kensington, Chelsea, St. George (Hanover square), Westminster, St. Martin's-in-the-Fields, and St. James's, Westminster; 2, northern districts: Marylebone, Hampstead, Pancras, Islington, and Hackney; 3, central districts: St. Giles's, Strand, Holborn, Clerkenwell, St. Luke, East London, West London, and City of London; 4, eastern districts: Shoreditch, Bethnal Green, Whitechapel, St. George-in-the-East, Stepney, and Poplar. The districts on the S. side of the Thames are: St. Saviour (Southwark), St. Olave (Southwark),

Bermondsey, St. George (Southwark), Newington, Lambeth, Wandsworth, Camberwell, Rotherhithe, Greenwich, Lewisham, and Woolwich. These districts are contained within that portion of the valley of the Thames which may be considered to commence where the high land approaches the river at Brentford on the N. side, and at Richmond on the S. side. The range of hills which bound the valley on the N. side passes between Hanwell and Ealing, and then, turning eastward to Hampstead and Highgate, divides the valley of the Thames from that of the Brent. From Highgate the range continues in an easterly direction, separating the London basin from the tributaries of the river Lea, and is terminated abruptly at Stamford hill by the valley of the Lea. On the S. side the range of hills which bounds the main valley may be considered to pass from Richmond, by Wimbledon park, to Tooting; then southward, by Streatham, Norwood, the crystal palace at Sydenham, and Forest hill, to Deptford, and to be terminated by the high land which passes S. of Greenwich, and abuts on the river at Woolwich. But this main range of hills is intersected by three subsidiary valleys. First, on the E. side of Richmond park, it is intersected by the valley of the Baveley brook; secondly, between Wimbledon park and Tooting, by the valley of the river Wandle; and thirdly, the valley of the river Ravensbourne, at Deptford, separates the main range from the high land which lies at the back of Greenwich and Woolwich. The metropolitan district terminates in the marshes a little below Woolwich. The following table from the report of the metropolitan board of works, presented to the house of commons in 1857, in regard to the amount of sewerage for which provision should be made, contains a full statement of the prospective population in 1861, compared with that of 1851:

Districts.	Pop. in 1851.	Prospective pop. in 1861.
<i>Metropolitan Districts.</i>		
N. side of the Thames.....	1,745,601	3,578,069
S. " " "	616,685—2,362,286	
<i>Prospective and Subsidiary Districts.</i>		
N. side—Chiswick, Brentford, Hanwell, &c.	22,244	401,000
S. side—Richmond, &c.	15,253	
Valley of the Baveley brook and Wandle.....	18,477	
Valley of the Ravensbourne	31,458	
Wimbledon, &c.	2,698	
Valley of the Lea.....	59,483	
East Ham and Barking	6,490	
Willesden, &c.	2,989—154,076	
Total.....	2,516,312	3,979,069

—The parliamentary division of the metropolis consists of the city of London (pop. 127,869), the city of Westminster (241,611), and the 5 boroughs of Tower Hamlets (589,111), Finsbury (323,772), Marylebone (370,957), Lambeth (251,345), and Southwark (172,868). The city of London proper has for its base the N. bank of the Thames, with its W. line extending to Middle Temple lane, where, crossing Fleet

street at Temple Bar and Holborn at Southampton buildings, it afterward skirts Smithfield, Barbican, and Finsbury circus on the N.; traversing the end of Bishopsgate street Without, and pursuing its way southward down Petticoat lane across the end of Aldgate street and along the Minories, it finally reaches the Thames at the tower of London. Of its 108 parishes, 97 are "without" (the walls of the city) and 11 "within." The city of Westminster is bounded N., from its end at Tottenham court road to its suburban limit at Kensington gardens, by Oxford street; while on its extreme W. side, crossing the centre of the Serpentine in Hyde park, it reaches the river at Chelsea hospital. The metropolitan borough of Westminster, beside the city of Westminster, includes the district of the Savoy and the lordship of the duchy of Lancaster, which are situated between the Strand and the bank of the Thames. The borough of Tower Hamlets adjoins the city of London and the borough of Finsbury on the W.; and Finsbury adjoins Westminster and Marylebone on the W., and the W. part of the city of London on the S. The borough of Marylebone is chiefly in the Regent's park district in the West End, and the boroughs of Southwark and Lambeth are on the Surrey side of the river. The Thames runs through the centre of the city, and is spanned by 9 bridges, which we give in alphabetical order: Battersea, Blackfriars', Chelsea suspension, Hungerford suspension, London, Southwark, Vauxhall, Waterloo, Westminster. The new Westminster bridge is partly open for traffic and in course of completion. The Victoria railway bridge over the Thames will be open for traffic in 1860, and a new Charing Cross bridge upon the site of the present suspension bridge, for the purpose of extending the S. E. railway from London bridge to Charing Cross, was proposed in 1860.—The most northerly of the longitudinal streets parallel to the river enters the metropolis on the W. by the Bayswater road, and passes through Oxford street, Holborn, and Newgate street, till it reaches Cheapside; it next passes through the Poultry, having the bank of England and the royal exchange on the one hand, and the mansion house on the other, along Cornhill to Leadenhall street, and is thence continued by Whitechapel and the Mile End road, which leads to Essex and the eastern counties. The other great longitudinal street begins on the W. at Hyde Park corner, passing Kensington gardens, part of Hyde park, and the Green park. On the E. end of Piccadilly the continuous line of street diverges to the right through the Haymarket, whence it proceeds to the E. along E. Pall Mall, through Trafalgar square, and past St. Martin's church, till it reaches the Strand. The Strand terminates at Temple Bar. The great line of street is thence continued through Fleet street and Ludgate hill, till it arrives at St. Paul's cathedral. At the N. E. end of St. Paul's churchyard it joins in Cheapside the great northern street line which comes

from the Bayswater road; but another branch of the former line runs nearer the river through Watling street, Eastcheap, and Tower street to Tower hill, whence it may be followed either in a straight line through Radcliffe highway, N. of the London docks, or close by the river along Wapping and Shadwell, where the lines unite in a single street leading to the West India docks. Another line of street which unites with that last described begins at Vauxhall bridge, and runs through Abingdon street until it has Westminster abbey on the left and the houses of parliament and Westminster hall on the right. Leaving these and Westminster bridge on the right, it joins Parliament street and Whitehall, which separates it from St. James's park on the left. Beyond Whitehall is Charing Cross, where the line, bending E. with the river, unites with the Strand. Among the streets running from N. to S., the principal and most westerly is the Edgeware road with its continuations, Park lane, Grosvenor place, and Vauxhall bridge road, which for the most part form the western boundaries of the metropolis. The second line of street proceeding eastward is the thoroughfare formed of Portland place, Regent street, and Waterloo place, extending between Regent's and St. James's parks; a little north of Piccadilly it curves through the Quadrant, and continues northward to Oxford street, where it expands into a circus, and then, resuming its former dimensions, proceeds to Langham place, where by a slight curve westward it continues into Portland place, Park crescent, and Park square, leading to Regent's park. The third great line is a continuation southward of the road from Hampstead, passing through Tottenham Court road to the E. end of Oxford street, from which point it proceeds through narrow streets down St. Martin's lane to Charing Cross. The chief N. line which connects the city with its northern suburbs is composed of Gray's Inn lane, which runs from Holborn hill to the New road; Aldersgate street and Goswell street, leading in a direct line from the post office to the Angel at Islington; and the street commencing at the Regent's canal on the N., successively called Kingsland road, Shoreditch, Norton Falgate, Bishopsgate street, and Gracechurch street, connecting Kingsland and Hoxton with London bridge and Southwark, the street line passing at the S. end of Gracechurch street over London bridge, and being thence prolonged across the borough as far as Kennington church. Another line connects Finsbury circus through Moorgate with London bridge, and New Cannon street, opened in 1854, connects St. Paul's churchyard with the same bridge. A vast cycle of road encircles the greater part of London on the N., which, commencing in the Uxbridge road, proceeds eastward as far as King's Cross, St. Pancras, where it ascends Pentonville hill, and, entering the City road, terminates in Finsbury square, within half a mile of the bank of England, and under the names of New road and the City road extends like a

boulevard almost completely round the N. and E. of the metropolis. On the Southwark and Lambeth or Surrey side 6 great roads converge from the different bridges to the Elephant and Castle tavern and posting house. From this point the roads, the principal of which is the Blackfriars' road, again diverge, the Kent road leading to Greenwich, the Kennington and Newington roads to Brixton and Tulse hill, and the road southward to the crystal palace at Sydenham. A new route from the West End to the railway termini at London bridge is in course of erection.—On entering London from the W. side, the wealth and civilization, the social and political significance of Great Britain, and particularly of its metropolis, are indicated by the splendor of the mansions of the nobility and of the opulent commoners, by the capacious pleasure grounds of Hyde park, Regent's park, St. James's park, Green park, and Kensington gardens, by the stately squares and elegant streets, the brilliant equipages, the superb horses, the fashionable throng, especially during the session of parliament in the summer months, the sumptuous club houses, the opera houses, the museums and galleries of art, the public libraries and institutions for the promotion of science and letters, the royal palaces, houses of parliament, government buildings, and courts of justice, and by the most diversified manifestations of the national glories and idiosyncrasies, from Westminster abbey, where many of the great in thought or deed are buried, to Tattersall's, where congregate the chiefs of England's great pastime of the turf. This part of London is called the West End. On entering the metropolis from the water side on the east, its world-wide commercial importance is made palpable by the imposing array of shipping of all nations in the port, and by the docks, wharves, manufactories, and warehouses which occupy the N. bank of the river as far as Blackwall; on crossing over to the Surrey side, by the aspect of the sailors' headquarters in Rotherhithe, by the large breweries and industrial establishments in Southwark and Lambeth, and by the tanneries of Bermondsey; on advancing into the heart of the city proper, by the colossal display of business transacted in the offices clustering round the bank of England and the royal exchange, round Lombard street, the seat of banking *par excellence*, and the stock exchange in Capel court, and round the coal exchange in Thames street, the corn market in Mark lane, and the colonial produce market in Mincing lane; and in the more remote parts of the east by the silk weavers' district of Spitalfields and the cabinet makers of Bethnal Green, the sugar baking houses of Goodman's Fields, the watchmakers of Clerkenwell, the whole eastern part of London teeming with every species of activity, from the highest spheres of commerce and finance in the office of the Rothschilds in New court and of the Barings in Bishopsgate street, down to the fish stalls in Billingsgate and the Jewish clothes dealers in Houndsditch. This part of London

contains the most hard-working and under-paid classes of the population; but even its most troublesome inhabitants, as in some of the districts along the Thames, are far more turbulent than vicious; while the West End, which includes the most distinguished portion of metropolitan society, is at the same time invaded by some of its most criminal members, and comprises as well as the city a large number of shopkeepers and others employed in the lower walks of life. The great majority of those in better circumstances, however, engaged in the city during the day, return to their homes in the West End or in the suburbs in the evening, some of the handsomest houses there being inhabited by city merchants, ship owners, bankers, stock and commercial brokers, and lawyers; while bookkeepers, clerks, and all those who occupy a subordinate position in the mercantile hierarchy of London, as well as wealthier classes who prefer to live economically or unostentatiously and quietly, are now so widely scattered in all parts of the metropolitan districts, and even in remote country places, that the former absolute distinctions between the eastern and the western part of London, as indications of low or high social standing, would seem to require some modification. Temple Bar, however, retains its ancient attribute as the boundary line between the city and the West End, although the higher commercial life of the city ceases almost at the bank of England, and the genuine reign of fashion hardly begins before Charing Cross.—The principal E. and W. lines of streets run from Mile End road to Hyde Park corner, through the heart of the city (the great landmarks of which are the bank of England, the royal exchange, and the mansion house), through Cheapside, Fleet street, the Strand, and Charing Cross; or on the N. of Cheapside along Newgate street, Holborn, and Oxford street. N. of these lines sweep the New road (the longest road of London, measuring 5,000 yards, and leading to Regent's park), St. John's Wood, and the Edgeware road and the City road (1,700 yards), which runs from the Angel tavern at Islington to Finsbury square. City-bound people pass daily through these two roads or through the above line of streets, and swell the traffic to such an extent that Holborn, Ludgate hill, Fleet street, the Strand, and especially Cheapside, on account of its narrowness, are sometimes fairly blocked up by pedestrians, omnibuses, cabs, and other vehicles, particularly in the morning when the eastward movement begins, and in the afternoon when the tide rolls backward to the west. The steamboats disgorge an additional number of city-bound people. Another line of traffic passes over London bridge, a magnificent structure with 5 vast elliptical arches, which presents an aspect unequalled in any other part of London for interest and animation. Just below the bridge is the Pool, with its fleets of colliers moored in the stream; above it are the stairs of the penny steamboats with their thousands of West End or

Greenwich passengers. At the foot of the bridge is Fishmongers' hall. Passing up Fish street hill, one sees the most picturesque of all metropolitan monuments, erected in commemoration of the great fire; and at the entrance of King William and Cannon street is the statue of William IV. The bridge itself is constantly crowded with an ever-moving stream of people and vehicles bound to the city, and a counter stream hastening to the borough on the Surrey side. The streets of the city which reflect most steadily the activities diffused by so many different currents are Upper and Lower Thames street, with the custom house, Bishopsgate street Without and Within, Gracechurch street, Leadenhall street, Fenchurch street, Cornhill, and Cheapside. The by-streets of Cheapside are filled with Manchester wholesale houses, and the street itself as well as Cornhill displays a variety of jewellers', goldsmiths', watchmakers', saddlers', and other shops. In St. Paul's churchyard the shops present a world of show, and Ludgate hill and Fleet street are flanked on either side with hosiers, mercers, and various shops of the greatest pretensions. From the most distant parts in the East End almost every house contains shops, which increase in attractiveness in proportion as they advance toward the fashionable regions of the west.—Cheapside has long been famous for its traffic. Tournaments were formerly held there, and along it proceeded all the city pageants. One of its cross streets, King street, leads to the Guildhall, and Queen street to Southwark bridge. The mansion house stands at the E. end of the Poultry, which is a continuation of Cheapside, and on lord mayor's day the street is still made the scene of a quaint and antiquated procession. Not far from Cheapside are the general post office and Newgate prison. Newgate street, a little to the N. of which lie Bartholomew's hospital and Smithfield, communicates through Skinner street, a new street built on the site of the steep place formerly known as Snow hill, with Holborn, which runs E. and W. between Drury lane and Farringdon street. Holborn was the old road from Newgate and the tower to the gallows at Tyburn. From Drury lane to Brook street it is called High Holborn, from thence to Fetter lane Holborn, and from Fetter lane to Farringdon street Holborn hill. The descent of the latter is so steep that it is in contemplation to make a viaduct from Newgate street to the top of the hill. Holborn communicates with curious little lanes, as Shoe lane and Leather lane, the names of which indicate the former industry of the locality, and with Gray's Inn lane, Chancery lane, and other head-quarters of lawyers. Many of the courts and alleys between Holborn and the Strand are still inhabited by the lowest order of the population; and especially at early dawn the street presents an odd appearance, many of the poor people creeping from their haunts and thronging round the stalls where coffee and other refreshments are

sold. In the vicinity of Smithfield and Barbican the street is still unsafe during the night; and although the rookeries of St. Giles's have been mostly broken up and the watchfulness of the police has much increased, cries of disorder continue not the less to be heard in the by-streets and lanes of Holborn. Holborn leads into Oxford street, which runs between St. Giles's pound and the site of old Tyburn turnpike, and was formerly known as Tyburn road. New Oxford street, opened in 1847, occupies the site of the worst part of St. Giles's, which was a notorious place of resort for the most audacious sharpers of the metropolis. All that remained in 1850 of this ruffian horde was crowded into about 100 miserable hovels in Church lane and Carrier street. Oxford and New Oxford streets abound with splendid shops, although less fashionable than those of Bond and Regent streets. —The journey from the East to the West End through Holborn is far less agreeable than that through the Strand. On leaving Cheapside for the Strand, St. Paul's, the chief religious edifice of London, first presents itself; a line of small streets or lanes lead from the hill on which the cathedral stands toward Blackfriars bridge. In Water lane, Blackfriars, is Printing House square, containing the offices of the "Times" newspaper. Near St. Paul's churchyard is Paternoster row, the great publishing market. At the end of Ludgate hill formerly ran the river Fleet, now a sewer. West of the Fleet is Fleet street, at the end of which, marking the city boundaries, is Temple Bar, where on state occasions the lord mayor of London meets the sovereign. The Strand extends from Essex street (a little beyond Temple Bar) to Charing Cross. On its S. side curious and narrow lanes extend downward to the river. On the same side are the sites of Essex and Arundel house and of Maypole; Adam street, leading to Adelphi terrace; Wellington, leading to Waterloo bridge; and Northumberland house, near Charing Cross. On the N. side is Wych street, communicating with Drury lane amid a labyrinth of alleys, courts, and lanes, teeming with poor Irish; and Holywell street, full of second-hand book stalls and clothes dealers. Somerset house and Exeter hall are also in the Strand. A communication was completed in 1859 between Tavistock street and the Strand. Charing Cross and Trafalgar square (called by the late Sir Robert Peel the finest site of Europe, but the latter rather deformed than adorned by the want of proportion in the Nelson and other monuments) are the great turning points from Westminster bridge and various parts of the West End and N. W. to the city, and, from their proximity to the club houses and the houses of parliament and galleries of art, are among the most busy localities in the metropolis, especially during the season, when cabs start thence in all directions in such numbers that Charing Cross has often been called the centre of cabs. Pall Mall, where most of the clubs are situated, extends from the

foot of St. James's street to the foot of the Haymarket, and was as favorite a resort of the wits of Queen Anne's time as it is of the fashionable gentlemen and politicians of the present day. Between Charing Cross and Regent street it is called Pall Mall east, and thence to St. James's street simply Pall Mall. It is pronounced Pell Mell, and was so written by Pepys, who says in 1660: "We went to Wood's at the Pell Mell (our old house for clubbing), and there we spent till ten at night." In Pall Mall are the British institution, the new society of painters in water colors, Marlborough house, the principal clubs, and at the end of the Mall is St. James's palace. St. James's street, also celebrated for its club houses, commences at St. James's palace and extends to Piccadilly. Not far away from it are Willis's rooms, where the once highly fashionable balls of Almack's are held. Some excellent hotels are in St. James's street, as well as in the adjoining Jermyn street. Haymarket, with the Haymarket theatre and Her Majesty's theatre or Italian opera house, is chiefly occupied on its W. side by restaurants and oyster shops. At night the Haymarket is the resort of what Charles Dickens calls "the worst company in London, male and female," particularly adjoining Coventry and Regent street. Drury lane, not far distant from Great Russell street, where the British museum is, communicates through Long Acre, much occupied by carriage builders, with Leicester square, which is the principal resort in London for foreigners from the continent. Little Russell street leads from Drury lane to Covent Garden and to Drury Lane theatre. Notorious in the neighborhood of Drury lane is Charles street, alias Lewknor's lane. The queen of Bohemia died in Craven house (now Craven buildings), and Nell Gwynn was born in Coal yard. Further westward there are 8 great thoroughfares to Piccadilly: the Haymarket, the fine opening of Waterloo place and Regent street, and St. James's street; and a new street, in course of erection, will afford a direct link between Covent Garden market and Piccadilly. —Piccadilly, one of the most brilliant streets of the metropolis, particularly at its W. entrance from Hyde Park corner, with Apsley house on the one hand and the arch surmounted by an equestrian statue of the duke of Wellington on the other, near Constitution hill and the Green park, is mentioned for the first time in the latter part of the 16th century by Gerard, who remarks that "the small wild bugloss grows upon the dry ditch banks about Piccadilly." It continues to be one of the great points of egress from London, although the White Horse cellar, whence the mail coaches started for the west of England, which made Hazlitt say "that the finest sight of the metropolis is that of the mail coaches setting off from Piccadilly," has lost much of its bustle since the introduction of railways. Piccadilly communicates with the bachelor chambers in the Albany, and through Park lane, one of the most beautiful and select streets of the

West End, with Oxford street. Bond street, on the right of Piccadilly, is celebrated for its fashionable shops and hotels, the Clarendon being there, and Mivart's, the most aristocratic hotel of London, being in the vicinity. Through Burlington arcade it communicates with Burlington street and Saville row, the latter much inhabited by physicians. Regent street, the handsomest street of London, commences at St. Alban's street, crosses Piccadilly and Castle street, where it forms a quadrant, and then crosses Oxford street to Langham place, where it opens into Portland place. It contains the most elegant shops of the metropolis. That part which intersects with Portland place contains the polytechnic institution and the national institute of fine arts. The Edgware road, one of the principal thoroughfares of the West End, leads from the W. end of Oxford street, and proceeds due N. to St. John's Wood, the latter a very agreeable retreat, most of the houses being provided with gardens and almost entwined in flowers and evergreens. In Bayswater, Maida hill, and many streets clustering round Kensington gardens and in Kensington proper, are also many delightful cottages and elegant mansions; and no greater contrast can exist than that between the almost dreamy repose and beauty of this neighborhood and the excitement in Regent street and Charing Cross, and the turmoil in the city. The Harrow road, diverging from the Edgware road, leads to the famous village and school of that name, as well as to Kensal Green cemetery. New lines of streets have arisen in that neighborhood within the last 20 years, as Westbourne terrace, the place of residence of Mr. Cobden and of many wealthy merchants and stockbrokers, Westbourne Park villas, and other pleasant new streets, the number of which is constantly increasing, owing to the rural and at the same time convenient situation of this region, being within a short distance of the Bayswater and Paddington line of omnibuses, and of the Great Western railway station in Paddington. Mayfair, including Curzon street, Hill street, Chesterfield house, Berkeley square, and a large portion of the streets and squares between Piccadilly and Grosvenor square, built mostly on ground belonging to the marquis of Westminster, was for nearly 100 years, until the rise of Belgravia, the great fashionable centre of the West End. Sydney Smith used to say that the parallelogram between Piccadilly, Bond street, Park lane, and Oxford street, includes more of beauty, wealth, wit, and fashion than any other part of the world. The two new districts which have sprung up within the last few years are Tyburnia and the above mentioned Belgravia. The former, the northern wing of the West End, is bounded N. by Maida hill, E. by the Edgware road, S. by Hyde park and Kensington gardens, and W. by Bayswater, and is principally inhabited by professional men and rich city people, or by aspirants to fashion. Belgravia, the southern wing of the West End, was built be-

tween 1826 and 1852. It is bounded N. by Knightsbridge, E. by Grosvenor place, S. E. by Ebury street, and W. by Sloane street. It includes Belgrave and Eaton squares, and is now considered the most fashionable, as it is the most stately neighborhood in the West End. Near Belgravia lie Brompton and Chelsea. Brompton is, on account of its warm and moist air, a resort for consumptive persons, and is also a favorite place of residence for artists and members of the theatrical profession. Chelsea is chiefly inhabited by the poorer classes. N. E. of Tyburnia is the Regent's park district, extending from the N. side of the New road to Camden Town and Somers Town. A distinct communication between the districts lying N. and S. of Hyde park was proposed in 1860. The most princely private residences in the West End are those of the duke of Sutherland, Sutherland house, overlooking Green park; the duke of Devonshire, Devonshire house, walled in and overlooking Piccadilly; the marquis of Lansdowne, walled in and overlooking Berkeley square; the duke of Northumberland, Northumberland house, overlooking the river; the marquis of Westminster, Grosvenor street; and the marquis of Hertford, Hertford house, overlooking Hyde park.—The squares contribute greatly to the salubrity and beauty of London. The most fashionable of them are: Grosvenor square (654 feet square), with the mansions of the earls of Shaftesbury, Wilton, Fortescue, and Harrow, marquises of Aylesbury and Exeter, Viscount Canning, dowager duchess of Cleveland, countess of Mornington, &c.; Belgrave square (684 feet by 637), with the mansions of the Rt. Hon. Sidney Herbert, duke of Bedford, earl of Sefton, Lord Taunton, Viscount Combermere, duke of Montrose, archbishop of York, Sir Roderic Murchison, Lord Panmure, &c.; Portman square (500 by 400), with the mansions of the dukes of Newcastle and Hamilton, earl of Cardigan, &c.; St. James's square, the residence of the earl of Derby, of the duke of Cleveland, earl of Eglinton, marquis of Bristol, and the bishops of London and Winchester, and the seat of the Norfolk house and of the Wyndham club. Among the largest squares are Eaton (also one of the most fashionable in Belgravia), 1,637 by 371 feet; Cadogan, 1,450 by 870; Bryanston, 814 by 198; Montague, 820 by 156. All the squares W. of Regent street, among the more prominent of which may be mentioned Berkeley and Cavendish squares, may, on the whole, be called fashionable. Two other divisions of squares are situated between Regent street on the W. and Gray's Inn lane and Chancery lane on the E.; Holborn and Oxford street form the boundary line between them. South of that line are the squares which, having once been the seats of rank and elegance, and still bearing marks of faded splendor, have become rather unfashionable. North of it are the squares inhabited by the aristocracy of the legal profession, among whom mingle merchants and literary men; such are Russell and Bedford squares. To

the E. of Bedford square, passing along Guildford street, are Queen square and Brunswick and Mecklenburg squares, with the founding hospital and grounds between them. To the N. of this range is a group consisting of Regent, Torrington, Woburn, Gordon, Tavistock, and Euston squares, together with the semi-square, Burton crescent, all new and not very remarkable, while Fitzroy square is considered a failure. Eastward of Gray's Inn and Chancery lanes are the obsolete city squares. There are however anomalies in their division. Red Lion, Bloomsbury, and Queen squares are not much superior to the city squares, while Finsbury square in the city is almost as handsome as those in the West End. Lincoln's Inn fields and Covent garden are both squares. Soho square, near Oxford street, was one of the gayest in London about the time of the accession of George III., and witnessed the orgies of George IV. when prince of Wales, but has lost all its importance, and is only interesting as the seat of the Linnæan society in the house formerly inhabited by Sir Joseph Banks. Golden square partakes of the character of Leicester square in the large number of foreigners who frequent it. Squares now exist in all the suburbs of London. Hoxton and Kensington squares are the oldest of these. Crossing the Regent's park to the S. W. is the genteel Dorset square. On the Surrey side there are some fine places, as Kennington common and Camberwell green, and few squares except Kennington oval, which however partakes more of the character of a circus than a square. In the new town springing up to the N. of the terraces and gardens which line the Oxford road as it skirts Hyde park, there are Hyde Park and Gloucester squares, and two squares and two crescents, forming a whole though separated by roads, namely, Oxford and Cambridge squares and Southwick and Norfolk crescents, which are built in the Belgrave style. Squares are very abundant in the suburb west of Belgrave square. Next upon Kensington square follow the squares and places in Hans Town, so called after Sir Hans Sloane, between Chelsea and Brompton. Hans place, a hexagon, is so quiet that Mrs. Hall says in one of her novels: "The very cats which come to reside there unlearn the art of mewing." Brompton has Trevor, Montpelier, Brompton, Alexander, and Thurloe squares. One of the most beautiful squares of Kensington is Edwardes square, laid out by a Frenchman at the back of the range of houses that front toward Holland house. The fashion of squares is now spreading fast over all new districts of the metropolis.—There are 7 parks in the metropolis. Hyde park (area about 400 acres) is entered from Piccadilly by a screen of triumphal gates, and from Oxford street by a marble arch removed thither from Buckingham palace in 1851. It connects the Green park with Kensington gardens, and extends from Whitehall to Kensington. It is well wooded, intersected by well kept foot paths and carriage roads, and ornamented by a sheet of water

called the Serpentine. Hyde park is a favorite resort of the working classes on Sundays, and is visited by crowds of people, on foot and on horseback, during the week days. During the season, however, it presents the most brilliant appearance, especially in the afternoon, when the long ride called Rotten row (from Apsey house to Kensington gardens) is thronged with equipages and equestrians of both sexes. The carriage drive along the upper side of the Serpentine is called "the Lady's mile." On the S. side of the park, opposite Rutland and Prince's gates, stood the crystal palace of 1851, which has since been taken down and removed to Sydenham. From an early period to the present time this park has been a favorite locality for military reviews. Regent's park (450 acres) is situated at the S. foot of Primrose hill, which is connected by a ridge with the N. part of Hampstead. The S. side is parallel to the New road, which is S. of it; the E. side extends northward to Gloucester gate; the W. side extends to Hanover gate. The N. terminations of the E. and W. sides are connected by an irregular curve nearly coinciding with the sweep of Regent's canal, which passes along and within the N. boundary of the park. Through the centre of the park, on a line with Portland place, and along the E. side of the zoological gardens, runs a broad avenue lined with trees, from which foot paths ramify across the sward in all directions, interspersed with shrubbery. Around the park runs a drive nearly 2 m. in length. The park is nearly circular and surrounded by mansions of the larger class built in uniform terraces, which produce a favorable effect. The zoological and botanical gardens, which are in this park, are among its principal attractions. On its E. margin stands the Colosseum, a 16-faced polygon surmounted by a dome 120 feet in diameter, and used for the exhibition of panoramas. St. James's park (90 acres) resembles in its shape a boy's kite; the head is bordered by the horse guards in the centre, the admiralty on its right, and the treasury on its left; the tail is occupied by Buckingham palace; its N. side by the Green park, Stafford house, St. James's palace, &c.; and the right or S. side by Queen square and the Wellington barracks. It was a favorite lounge of Charles II., during whose reign St. Evremond was honorary keeper of the ducks. The gravelled space in front of the horse guards is called the parade; the N. side is called the Mall, and the S. the Bird-cage walk. The road connecting this park with Hyde park and skirting the garden wall of Buckingham palace is called Constitution hill, where Sir Robert Peel was thrown from his horse, in consequence of which he died. Green park (60 acres), next to Hyde park, is entered from Piccadilly by a triumphal arch, with an equestrian statue of Wellington, and situated between that street and St. James's park, Constitution hill, and the houses of Arlington street and St. James's place. The available space of this park was extended in 1856 by the removal of the reservoir of

the Chelsea water works. It is one of the smallest, but the prettiest park of London. Victoria park (about 800 acres), laid out in the reign of Queen Victoria, serves as a lung for the crowded districts of Bethnal Green and Spitalfields in the N. E. part of London. It is bounded S. by Lea Union canal, W. by Regent's canal, E. by Old Ford lane, leading from Old Ford to Hackney Wick, and N. by an irregular line of fields. A new main line of thoroughfare from Victoria park to the East India docks was commenced in 1860. Kennington park, formerly Kennington common, on the Surrey side of the Thames, laid out in 1852, contains about 20 acres, and is still in its infancy. Battersea park, also on the Surrey side, opposite Chelsea hospital, &c., is in course of formation. Its extent will be about 200 acres. The grounds have been laid out, and an esplanade leading to the park was opened in 1857. Beside these parks in the metropolis, there is Greenwich park with the Greenwich observatory, and with its extensive pleasure grounds, and Richmond park, with the residence of Lord John Russell in Pembroke lodge, 9 m. from London, containing over 2,200 acres, and distinguished for its beautiful scenery; also Bushy park near Kingston and Hampton Wick, within a short distance of Richmond, celebrated for its chestnut avenue.—The principal public gardens of London are Kensington gardens, E. of Kensington palace, with a charming variety of surface in wood and water and extensive ground. An exquisite walk of flowers and shrubs extends from the central avenue along the S. boundary of the garden. The numerous plants are distinguished by inscriptions. The lawn in the W. park, near the palace, darkened by cedars of Lebanon, is a lovely and romantic spot, and the general beauty of the gardens is perhaps unequalled in any part of the world. They are separated from Hyde park by a bridge over the Serpentine. The Kew botanic gardens are 5 m. from Hyde Park corner, on the road to Richmond. Their principal attractions are the palm house and the new museum. The pleasure grounds adjoining, and partly surrounding the gardens, comprise 170 acres, laid out in half garden, half park style. The Chiswick gardens are to horticulture what those of Kew are to botany. The other principal gardens are the royal botanic and zoological in Regent's park. The Royal Surrey gardens, in Camberwell, and the Oremorne gardens, Chelsea, have extensive grounds, but are interesting only as places of popular amusements. Vauxhall gardens were closed as a place of amusement in 1859, the site to be covered with lines of streets and terraces. Beside these parks and gardens, there are many fine places in almost all directions from London, to which the people resort on Sundays and holidays. Among these are Hampstead Heath, Greenwich, Blackwall, Gravesend, Richmond, Hampton Court, Blackheath, &c.—Religion is represented in the whole metropolitan district, according to the census of 1851, by

about 1,100 places of worship. The London directory of 1857 enumerates in the metropolis proper 822 churches and chapels, viz.: Baptist, 95; Calvinist, 7; Church of England, 417; Church of Scotland, 5; Friends', 7; German Catholic, 1; Greek (one for the modern Greeks, and the other for the Russians in London), 2; Independent, 117; Irvingite or Catholic Apostolic, 6; Jewish synagogues, 10; Lutheran, 5; Methodist, Calvinistic, 4; do., New Connection, 4; do., Primitive, 7; Moravian, 1; Mormon, 3; Presbyterian (including 2 English and 1 Free church Presbyterian), 9; Roman Catholic (including Bavarian, French, Sardinian, and Spanish churches or chapels), 28; Swedish, French, and Swiss Protestant, 8; Unitarian, 7; various Protestant denominations, 12; Wesleyan, 68; Wesleyan dissenting, 9. In the directory of 1860 the number of churches and chapels is 852. The most remarkable of the oldest minor churches are St. Saviour's, Southwark, with a Lady chapel and tomb of Gower, and the remains of Fletcher and Massinger; the Temple church, in the Inner Temple, restored in 1842, with its central portion modelled from the Holy Sepulchre, and with the tombs of Selden and Goldsmith; Savoy church, or St. Mary-le-Savoy, near the Strand, on the site of Savoy palace, with many ancient and quaint monuments; Whitehall chapel, one of the chapels royal, opposite the horse guards, the famous banqueting house built by Inigo Jones, the ceiling painted by Rubens, and the only remaining relic of Whitehall palace—Charles I. walked to the scaffold through one of its windows; and St. Margaret's, Westminster, the resort for public worship of the house of commons on great occasions. The churches of a date later than 1666 are chiefly works of Wren and his imitators. Among the principal churches built by that celebrated architect are: St. Stephen's, Walbrook, considered as his masterpiece; Bow church, Cheapside; St. Bride's, Fleet street; St. Andrew's, Holborn hill; St. Clement Danes; and St. Magnus, London bridge. Among other noteworthy places of worship may be mentioned St. Martin's-in-the-Fields; St. Mary-le-Strand, by Gibbs; St. Pancras new church, by Mr. Inwood; Marylebone new church, by Hardwicke; St. Luke's, Chelsea; and St. Stephen's, Westminster, a fine specimen of modern Gothic, built at the expense of Miss Countess. Among the most popular are St. James's, Piccadilly, by Wren, and St. George's, Hanover square, by James, the latter the most fashionable for marriages. All these places of worship belong to the established church. The most noteworthy of other denominations are the cathedral-like Apostolic church (Irvingite), in Gordon square, and the Wesleyan chapel in the City road, with the tomb of Wesley. The foundation stone of a tabernacle for Mr. Spurgeon was laid on a site near the Elephant and Castle, Newington, Surrey, Aug. 16, 1859, the building to accommodate about 5,000 people, and the cost, including the site, amounting to about £30,000.

Among the principal new churches are St. Matthew's, Oakley square, accommodating about 1,000 persons, and All Saints' church, Margaret street, the *chef d'œuvre* of modern mediævalism, of which the foundation stone was laid by Dr. Pusey in 1850, and which was opened in 1859. The principal Roman Catholic edifice is St. George's cathedral, in the Roman Catholic diocese of Southwark, at the corner of the St. George's and Westminster roads, the largest Roman Catholic church in England since the reformation, accommodating 3,000 persons. It was built in 1840-'48 by Mr. A. W. Pugin. The principal synagogue is in Great St. Helens, St. Mary Axe, Leadenhall street.—The most imposing religious edifices of London are St. Paul's cathedral and Westminster abbey. The former stands at the head of Ludgate hill, on the site of old St. Paul's, the origin of which is traced back to the beginning of the 7th century, and which was destroyed by the great fire of 1666. The present cathedral was completed in 1711. (See CATHEDRAL.) Among its monuments are those of Nelson, John Howard, and Dr. Johnson, to which that of Sir Charles Napier was added in 1860. In the crypt are the tombs of Nelson and Wellington. In the interior of the dome is the "whispering gallery," communicating with the stone gallery on the outside of the dome, whence the outer golden gallery at the apex is reached, which affords a noble view of the metropolis and its vicinity. The whole ascent is by 616 steps, of which the first 260 are comparatively easy and well lighted. In the S. W. tower are the clock room and the great bell, the diameter of which is about 10 feet. The charity children of London assemble once a year in the cathedral. St. Paul's is the cathedral church of the see of London. Its administration is under the charge of a dean and chapter, consisting of 4 resident canons, 4 prebendaries, and various minor officers.—Westminster abbey, in the West End, existed before the end of the 8th, and is traced back to the early part of the 7th century. The larger portion of it in its present condition was completed in 1245. It is in the form of a somewhat irregular cross. Its length, exclusive of Henry VII.'s chapel, is 511 feet; extreme breadth at the transept, 268; height of the nave 102, and of the towers 225 feet. Soon after the revolution, the abbey, which had suffered much during the civil wars, was repaired, and the western towers were added by Wren, but in a mixed Grecian and Gothic style which occasioned much criticism. On approaching Victoria street from Parliament street, the buttresses and pinnacles and the whole expanse of the abbey gradually open to view. The British sovereigns, from Edward the Confessor to Queen Victoria, have been crowned in Westminster abbey, and many of them are buried there, some with, others without monuments. Surrounding the E. end in a semicircle are 9 chapels, the most interesting of which are those of Edward the Confessor, beyond the altar, and of Henry VII., which forms the east-

ern extremity of the abbey. The centre of the former chapel is occupied by the shrine of Edward the Confessor, formerly richly inlaid with mosaic work. Henry VII.'s chapel is a fine specimen of the architecture of the time of that monarch, who founded it. The monuments of Queen Elizabeth and the queen of Scotland are in the N. and S. aisles of the chapel respectively. In the south transept, in and near Poets' corner, are monuments to most of the great poets of the country; and here, as well as in both aisles of the nave and choir, are monuments to other distinguished persons, including notabilities in all departments of life. Among those buried there most recently are Stephenson and Brunel the engineers, and Macaulay the historian. The new Westminster memorial, by Mr. Scott, in honor of Lord Raglan and other old Westminster scholars who died in the Crimea, is to be erected at Dean's yard, opposite the W. end of Westminster abbey. Religious service is performed daily in the abbey, and the services on Sunday are numerously attended, though the voice of the preacher can only be heard by a minority of the congregation. Westminster abbey is officially called the collegiate church of St. Peter's, Westminster, and is governed by a dean and chapter of 8 prebendaries, and other officers.—Beside the churches, there are various societies for religious purposes, as the society for promoting Christian knowledge, the religious tract society, the London and the church missionary societies, the society for propagating the gospel in foreign parts, and the British and foreign Bible society. There are about 700 Sunday schools (nearly 400 supported by the dissenting bodies, 259 by the established church, 5 by Roman Catholics, 3 by Unitarians, and the rest by various denominations), attended by nearly 189,000 of both sexes, the girls slightly preponderating.—Charity is extended to the paupers of London by the public poor-houses and workhouses, where about 100,000 are annually relieved. The receipts of poor rates are expected to amount in 1860 to about £1,500,000. Beside this relief granted by law in the most extreme cases of destitution, there are nearly 600 institutions, chiefly supported by voluntary contributions, and spending about £2,000,000 for the relief of all sorts of physical and mental diseases, for the suppression of vice, for the deliverance of poor debtors in prison, for the reform of prostitutes, for the prevention of cruelty to animals, &c. The education of poor children in the so called ragged schools has of late years received a great impulse from the efforts of many eminent philanthropists. About 20,000 children are now annually rescued from a life of crime by the aid of these institutions. Poor children are also educated in the founding hospital, so called because originally intended for foundlings exclusively, and in various other institutions, beside the ragged schools proper. The "Albert Institution" in Gravel lane, Blackfriars road, was opened in Aug. 1859, in one of the most disreputable neighborhoods in London, as a

reformatory establishment. It comprises infant, ragged, and Sunday schools, a reading room, a library, baths, washhouses, and cheap dormitories. The number of such institutions is increasing. The number of hospitals, infirmaries, dispensaries, and other establishments of the kind, was in 1859 about 200. The most celebrated of these are Chelsea hospital for old and disabled soldiers, and Greenwich hospital for disabled sailors. (See *CHELSEA*, and *GREENWICH*.) The most extensive hospital in the city of London is St. Bartholomew's, West Smithfield, which relieves annually upward of 70,000 out-door and in-door patients. The two other greatest hospitals of London are on the Surrey side—St. Thomas's in High street, Southwark, and Guy's hospital in its vicinity, which supports a separate lying-in asylum. Similar institutions are the London (in 1859, 28,290 patients), Westminster, Charing Cross, Middlesex, and other hospitals. Among special hospitals are those for small pox in Upper Holloway, for consumption in Brompton and in the City road, for diseases of the eye in Finsbury and Charing Cross, and the royal orthopedic hospital, Oxford street (in 1859, 1,400 cases of club-foot). The foundation stone of the Royal Victoria patriotic asylum, Wandsworth common, for 800 orphan daughters of soldiers, sailors, and marines, to be endowed from the royal patriotic fund, was laid by the queen, July 11, 1857. The new national hospital for the paralyzed and epileptic was opened in 1860 in Whitechapel, and placed under the direction of Dr. Brown-Séquard. The best known lunatic asylum, the name of which has often been generally applied to establishments for the insane, is Bedlam, or more properly Bethlehem hospital, called so after the priory of St. Mary of Bethlehem, from which it originated in the middle of the 16th century. After various vicissitudes the old building was taken down and the first stone of the present hospital, in St. George's fields, was laid in 1812. It is a fine building, nearly 700 feet long, the centre being surmounted by a dome and supported by 6 Ionic columns. The patients are treated with great skill and kindness. The women are supplied with pianos and the men with billiards and other amusements. A few cells are lined and floored with India rubber and cork, against which the most insane person may fling himself without possibility of injury. It can accommodate about 500. Lock hospital, in Harrow road, was established for the cure of females suffering from disorders contracted by a vicious course of life, and supports a chapel and an asylum for the reception of penitent females recovered in the hospital. The Dreadnought or seaman's hospital ship, called after a ship of war of that name, is moored in the river off Greenwich, and accessible to sick sailors of all nations. The leading charities for the blind and the deaf and dumb are the school for the indigent blind, St. George's fields, Surrey; the London society for teaching the blind to read, in Avenue road, St. John's Wood; and the asy-

lum for deaf and dumb children in Old Kent road, Surrey. There is also a seaman's home near the London docks, which rescues annually from 8,000 to 5,000 sailors from the dirty and disreputable lodging houses which disgrace the courts and alleys of Wapping, Shadwell, and East Smithfield.—Education now receives increased attention in London. Of public day schools there were nearly 900 in 1851, attended by 167,298 scholars (97,675 boys and 69,623 girls), and of private day schools 3,700, usually attended by 87,000 of both sexes. The university of London, established in 1836, consists of government examiners who are authorized to confer degrees in art, law, and medicine upon the graduates of University and King's colleges in London, and other proprietary establishments of a similar character. It is constituted for the sole purpose of promoting knowledge without distinction of sect, rank, or party, and of ascertaining the proficiency of candidates for academical honors. A new charter was granted to the university in 1858, and if the right proposed by the new reform bill brought before parliament in the session of 1860 should ultimately be attained, the university would be entitled to a representative in the house of commons, to fill which the names of Sir John Romilly and others have already been mentioned (June, 1860). The present chancellor of the university is Earl Granville, and the vice-chancellor Sir John George Shaw-Lefevre, the son of the former speaker of the house of commons. University college, Gower street (originally called London university), opened in 1828, teaches most branches of learning excepting divinity, and is open to all religious denominations. Lord Brougham, the principal promoter of this institution, continues to be president. King's college, Somerset house, the rival institution, and founded in the same year, resembles the former in almost every respect, except that divinity is taught there under the auspices of the established church. The new college for Independents possesses a faculty of theology and a faculty of arts. St. Paul's school, founded in 1509, where Milton was educated, was rebuilt in its present form in 1823. Among the other noteworthy institutions are St. Peter's college, or Westminster school, where Ben Jonson, Dryden, Locke, and Gibbon received their education; merchant tailors' school, charterhouse school, and the school called Christ's hospital. (See *CHARTERHOUSE*, and *CHRIST'S HOSPITAL*.) The city of London school for the sons of persons of the middle class was established in 1835. A government school of design or department of practical art was established in Marlborough house and Somerset house in 1837, under the auspices of the board of trade. The Wesleyan normal college, Westminster, was established in 1850; and there is another normal school at Fulham. Medical and surgical schools are attached to the great hospitals, and there are several distinct colleges for the study of those sciences; the college of physicians in Pall Mall

and of surgeons in Lincoln's Inn fields hold examinations for licenses or diplomas to practise in the respective professions. Knowledge is greatly fostered in London by the increasing number of mechanics' institutes and literary societies. The daily and periodical journals and magazines, nearly 500 in number, diffuse a vast amount of intelligence among many people who cannot afford an expensive education. Literature and learning are further promoted by the library of the British museum and other libraries, especially public circulating libraries, which abound in many parts of London, the London library in St. James's square, with about 80,000 volumes, being the largest of the kind. Many of the societies for the promotion of the various branches of science, as the royal society, the zoological, geographical, astronomical, geological, Asiatic, and Linnean societies, and London and Middlesex archaeological society, have a world-wide reputation and influence. The polytechnic institution aims by its exhibitions and by lectures delivered there to popularize the mechanical sciences. Prof. Faraday and other eminent men lecture at the royal institution in Albemarle street, from the same desk from which Coleridge, Sir Humphry Davy, and Sydney Smith once enlightened their audiences. The number of institutions of a similar class, which are all liberally supplied with books and newspapers, is already great, and is continually increasing. There are collections of natural history in the British museum and in various other localities.—The fine arts are promoted by the celebrated Elgin and Townley marbles and by the collections of statuary and pictures in the national gallery. The principal private collections are those of the queen, the duke Sutherland, marquis of Westminster, earl of Ellesmere, Sir Robert Peel, Mr. Hope, Mr. Thomas Baring, &c. The royal academy, where Sir Joshua Reynolds was once president and lecturer, and where annual exhibitions are held, the British institution, the society of painters in water colors, and the society of British artists in Suffolk street, are among the principal art associations. The new Kensington museum was opened in 1857, and contains now the galleries of modern English art. The Ellison gallery, consisting of 50 original English water color pictures, was presented to it in 1860 by Mrs. Elizabeth Ellison. The Vernon and Turner pictures were removed in 1859 from Marlborough house to a part of the same building adjoining the Sheepshank gallery. Some 20 acres of the adjoining grounds are being converted into gardens for the horticultural society, to be provided with a conservatory, so as to form a winter garden. New museums in the Kew gardens and the East India house were also opened in 1857, the latter for Indian works of art, which will soon probably be removed to the British museum, the sale of the E. I. house being proposed. The chief art organ is the "Art Journal;" the "Athenæum" and other literary journals also devote much attention to

the discussion of art. There is an institution for civil engineers, and one of British architects. The architectural union, formed for the purpose of providing a building for the meetings and exhibitions of the various architectural societies, in 1857 took a house in Conduit street, and have erected there 8 galleries. The female school of art and design has been attended since 1852 by about 100 pupils annually, and in 1860 numbered 118. The monuments and statues of London are not remarkable for artistic beauty. They are chiefly in honor of the various sovereigns, and of statesmen and warriors, as Pitt, Fox, Canning, and Wellington. An archaeological institute and association were established in 1848. London, especially the most ancient part of it, the "city," abounds in every direction with objects of study for the archæologist and historian. The most remarkable of the kind is afforded by the tower of London, with its collections of armor, the jewel house containing the regalia and coronation plate, and the Beauchamp tower in which Lady Jane Grey was confined. Opposite the western angle or bastion of the tower is the spot on Tower hill famous for executions; and near the traitors' gate, midway in the tower wall which faces the Thames, is the so called Bloody tower, from the cruel deeds with which it is associated.—The art of music is encouraged in London by the royal academy of music, by the sacred harmonic concerts at Exeter hall, the philharmonic and several other societies, and Mr. Hullah's concerts in St. Martin's hall (St. James's hall, a new hall for musical and other public entertainments and purposes, larger than St. Martin's but smaller than Exeter hall, was opened in 1858), and by Her Majesty's theatre, or the Italian opera house, in the Haymarket. The new Italian opera house in Covent garden, of nearly the same proportions as La Scala at Milan, and about $\frac{1}{2}$ larger in size than the theatre which was burned down in 1856, was built by Mr. E. M. Barry, and opened in May, 1858. Its length is 240, breadth 123, and height nearly 100 feet, and it can accommodate from 2,000 to 2,500. The English and German operas also flourish in London, but only at intervals. Drury Lane is the oldest theatre in London. Among popular theatres are the Princess's, Lyceum, the Haymarket, and the Adelphi. Sadler's Wells theatre has become the home of the Shakespearian drama. The Olympic and Marylebone are also theatres of considerable reputation in their immediate localities. French plays are given during the season at St. James's theatre. Among the smaller theatres are those of the city of London and Garrick and Surrey gardens, and Surrey or circus theatre in Blackfriars road. The most democratic place of theatrical entertainment is the large Victoria theatre, in Waterloo Bridge road, Lambeth, holding about 2,000 people. New theatres are the New Adelphi, holding 1,400 persons; the Britannia theatre, Hoxton, one of the somewhat anomalous places of amusement, and now the largest theatre in

London, accommodating about 8,500 persons; and the New Pavilion, Whitechapel, intended for one of the lowliest audiences of the metropolis. Astley's amphitheatre near Westminster bridge is famous for its equestrian performances, and is now used both as theatre and amphitheatre. The foundation stone of a royal dramatic college was laid June 1, 1860.—The principal club houses in Pall Mall are the Army and Navy, Athenæum, Carlton, Guards, Oxford and Cambridge, Reform, Travellers', United Service, and United University. In St. James's street are Arthur's, Boodle's, Brooks's, the Conservative, and White's. The Junior United Service club, rebuilt and enlarged in 1857, is in Charles street, St. James's; the Windham in St. James's square; the Union in Trafalgar square; the Oriental in Hanover square; the Parthenon in Regent street, to which was joined in 1854 the Erechtheum; the City club, in Old Broad street. The Garrick club, named after David Garrick, and combining the advantages of a club with those of literary society, is in King street, Covent garden. Brooks's is the famous old whig, and Boodle's the equally celebrated old tory club. The Carlton, the Conservative, and the Reform clubs are also of a political nature, the first two tory and conservative, and the last liberal. The two United Service clubs and the Army and Navy club are exclusively professional. The Athenæum is strongly infused with a literary and artistic element. White's is the oldest and most exclusive, and is intimately associated with Addison and Steele, and White's chocolate house of the "Tatler;" the number of members is usually limited, but varies from 500 to 2,000. There are on the whole over 20 large club houses in London, all nearly in one locality, either in or clustering round Pall Mall and St. James's street. The Whittington club and metropolitan Athenæum is an institution in Arundel street, Strand, established mainly for the purpose of offering the conveniences of a cheap club for men and women in the middling walks of life, but counting many literary persons among its members.—The law is represented in London by 4 great inns or societies: the Inner Temple, Middle Temple, Lincoln's Inn, and Gray's Inn. (See INNS OF COURT.) The most important courts of law are held partly in Lincoln's Inn and partly in a wing attached to the W. side of Westminster hall, which forms the vestibule to the houses of parliament. The courts are those of queen's bench, common pleas, and exchequer, of the chancellor, master of the rolls, lord justices of appeal, and vice-chancellors. In vacation, the chancellor holds his court in the old hall, Lincoln's Inn, and the master of the rolls in Rolls court, Chancery lane. The ecclesiastical and admiralty courts sit at doctors' commons. The new court for divorce and matrimonial causes held its first meeting May 10, 1858. The bankruptcy court in Basinghall street, the insolvent debtors' court in Portugal street, the courts of the lord mayor and of the sheriffs of the city of London, 10 of the new county courts for the de-

cision of claims under £50, and various minor courts, make up the sum total of London courts, irrespective of the principal or the central criminal court held at the Old Bailey, which presents a painful and gloomy appearance from the aggravated nature of the offences tried there. The lord mayor is the nominal president of this court, but two judges selected each term from the judges of the queen's bench, exchequer, and common pleas try most of the cases; a few being also presided over by the recorder or common sergeant of the city of London. The vicinity of this court is haunted by the refuse of London lawyers and by some of the worst classes of London society. Inferior offences are tried before the assistant judge at the Middlesex sessions houses. The lord mayor presides over a court at the mansion house, and one of the aldermen holds a court in Guildhall to judge matters of smaller import; beside which there are 11 metropolitan police courts beyond the limits of the city, under the superintendence of the home secretary, making altogether 18 police courts, the magistrates of which have the power to inflict fines and imprisonment for small offences and disorderly conduct, also to inquire regarding capital crimes, and to send prisoners for trial at the central criminal court in the Old Bailey. The police force acting under the commissioner of police, consisting of 18 divisions, is about 6,000, and that under the corporation of the city of London nearly 600. The annual number of offenders against the laws is about 100,000. The number of persons confined for debt in Queen's and Whitecross street prison is about 3,000 annually. Horsemonger lane gaol also includes debtors. Of prisons for criminals there are 12 in the metropolis; the most noted is Newgate, in front of which are executed those sentenced to death for capital crimes committed in London and Middlesex. Convict prisons under the charge of the government are Millbank (for males and females), Pentonville (males), Brixton (females), and Fulham refuge; beside which there are the new house of correction at Holloway, the Cold Bath prison near Gray's Inn lane, the house of detention in Clerkenwell, &c. The number of persons annually confined in the principal gaols sometimes exceeds 40,000.—State affairs are conducted in the government buildings in Whitehall and Downing street, and the legislature transacts its business in the houses of parliament, in the new palace of Westminster, which occupies the site, on the banks of the river, of the old house of parliament, destroyed by fire in 1834. The new palace at Westminster is approaching completion. It will cover an area of upward of 8 acres, and comprise 1,100 apartments, including the houses of lords and commons, the central hall, St. Stephen's hall, &c., each equal in itself to a building of extraordinary magnitude and splendor, and more than 2 miles of corridors and passages. The original estimate of the cost was about £700,000, but it is believed to have reached in 1860 up-

ward of £2,000,000. In 1857 the government offered premiums for a block plan which should exhibit the best scheme for the concentration of the principal government offices, on a site lying between Whitehall and the new palace at Westminster, and extending from the park to the river; and also designs for two buildings, as parts of the general scheme, for the department of the secretary of state for foreign affairs and for that of the secretary of state for war. A new India house is also to be erected, the old East India house in Leadenhall street being inconveniently located for business transactions since 1858, when the Indian government passed into the hands of the crown. Lambeth palace, on the S. side of the Thames, has been the palace of the archbishops of Canterbury from at least the 13th century. (See LAMBETH.) The royal palaces are Buckingham palace, the only town residence of the sovereign; St. James's, in Pall Mall, portions of which are inhabited by the Cambridge branch of the royal family; Kensington palace, westward of Hyde park and between the Kensington and Bayswater roads, in which Queen Victoria was born, and which serves in part as a residence for persons employed at the royal court. These palaces are of little architectural significance. The palaces of Hampton Court and Windsor, in the vicinity of London, are much more interesting.—The troops stationed in London number about 5,000, consisting of 2 regiments of life guards and horse guards and 5 battalions of foot guards. The metropolis returns 16 members to the house of commons, 4 for the city of London, including in 1860 Lord John Russell and Baron Lionel de Rothschild, and 2 each for the city of Westminster and the 5 boroughs. Greenwich also returns 2 members. Chelsea, Kensington, Brompton, and other districts not included in any of the metropolitan boroughs or cities, form part of the constituency of Middlesex. Some of the more populous districts, as Kensington and Chelsea, will probably soon become independent parliamentary boroughs with the right of returning 2 members.—The government of the greater part of the metropolis is under the charge of the home secretary, and administered under his instructions by the commissioners of police; but that portion known as the city is under the exclusive superintendence of the corporation of London, one of the most influential and wealthy municipal bodies in the world. It consists of the lord mayor, the court of aldermen, having 25 members exclusive of the chief magistrate, and 206 common council men. The lord mayor is elected annually from the court of aldermen; he must have previously served as sheriff, and may be reelected. The right of nominating two aldermen worthy of promotion to the mayoralty is restricted to those freemen of the city who have been admitted into the livery of their respective guilds; the aldermen then decide which of the two is to be elected. The aldermen hold office for life. They are elected one for each of the 26 wards of the city, and all res-

ident freemen are entitled to a vote in the election of their ward, whether liverymen or not. The number of liverymen varies between 6,000 and 7,000. Their guilds number upward of 80, 39 of which have separate halls, the rest meeting in Guildhall or in taverns. Among these there are 12 formerly called honorable companies, and still holding a certain preëminence; they are the mercers, grocers, drapers, fishmongers, goldsmiths, skinner, merchant tailors, haberdashers, salters, ironmongers, vintners, and clothworkers. The guild of saddlers is traditionally the oldest of them all; saddles were known in London as early as A. D. 600. Many of the guilds are possessed of large property, and dispense the most lavish hospitality in their halls. Fishmongers' hall, mercers' hall, grocers' hall, merchant tailors' hall, the new clothworkers' hall in Mincing lane, and, above all, goldsmiths' hall, are among the finest. These guilds are intimately connected with the corporation of London. The guildhall, in which the civic deliberative assembly meets, is a large but not very remarkable building. The lord mayor is the representative of royalty in the civil government of the city, chief commissioner of its lieutenancy, and conservator of the river Thames; and on the death of a sovereign he becomes *pro tem.* a member of the privy council. He has the free use of the mansion house, beside the salary of £8,000 per annum, but is expected to maintain the reputation of the metropolis for hospitality. The day on which he enters into office (Nov. 9) is kept as a partial holiday in the city. He then proceeds in state to Westminster hall, where he is sworn in, and in the evening he gives a sumptuous banquet in guildhall, which is attended by ministers and other public personages.—The following are the principal markets of London. The metropolitan cattle market, between Islington and Camden Town, opened in 1855, occupies 80 acres. Smithfield, on which the old cattle market stood, is famous in history for its jousts, tournaments, executions, and burnings, and for the Bartholomew fair, which was held there. Billingsgate, the great fish market, is a little below London bridge on the left bank of the Thames. (See BILLINGSGATE.) Covent Garden market is the great fruit, vegetable, and herb market, with the finest flowers and fruits in the world. Newgate market, the great carcass market, has been likened on market mornings to one continuous butchers' tray, the West End carcass butchers coming here *en masse* for almost all their meat. Leadenhall market, a large market for butchers' meat, fish, poultry, vegetables, leather, hides, bacon, &c., is situated in Leadenhall street between Gracechurch street and the East India house. Of the minor markets of London, Hungerford and Farringdon markets are the largest. The latter is the great market for water cresses, and is crowded with the masses of the poorer population, particularly early on Monday morning. The most valuable horses are sold at Tattersall's, Grosvenor

place, called so after Richard Tattersall, originally a training groom of the duke of Kingston, who made his fortune by purchasing for £2,500 the celebrated horse Highflyer. During the great races at Epsom and Derby, Tattersall's presents a most animated appearance, the betting there regulating that of the whole country. In connection with Tattersall's is a subscription room under the superintendence of the Jockey club in Old Bond street, which is attended by all the patrons of the turf. Hay markets are held at the east end of Whitechapel, at Cumberland market, Regent's park, as well as in Smithfield. Rag fair is held in Middlessex street, near Tower hill, and is almost exclusively devoted to transactions in old wearing apparel. Another market of the kind in Houndsditch occupies a square open area a little off the street, and is of a somewhat more miscellaneous character; broken umbrellas, old iron, bones, pieces of old harness, all sorts of wearing apparel, and articles of the meanest description, are here brought together. The metropolis consumes in one year about 1,700,000 quarters of wheat, 250,000 bullocks, 1,800,000 sheep, 80,000 calves, 40,000 pigs (beside large quantities of ham and bacon), 4,000,000 head of poultry, 2,000,000 game, over 450,000,000 lbs. of fish (more than half of which are herrings), 800,000 barrels of oysters, 325,000,000 lbs. of potatoes, 90,000,000 lbs. of cabbages, 750,000 bushels of apples, and 75,000,000 foreign eggs. For the annual supply of milk and cream over 18,000 cows are required. The consumption of porter and ale reaches nearly 45,000,000 gallons, beside 2,000,000 of spirits, and 70,000 pipes of wine, chiefly sherry and port. The new commercial treaty with France will probably tend to popularize in London the use of the cheap French wines. The number of beer and gin shops, many of the latter appropriately called gin palaces, is 8,000. The arterial system supplies 85,000,000 gallons of water per day. The main drainage of the metropolis has been placed since 1858 in the hands of the metropolitan board of works. The sewerage carries off 10,000,000 cubic feet of refuse. Exclusive of the coal brought by railway, 3,000,000 tons are annually imported by water. The smoke of the coal may be traced at times at a distance of 40 m. To light the metropolis 6,000,000 to 7,000,000 cubic feet of gas are required, independent of the consumption of oil, candles, &c. About 32,000 tailors, 86,000 boot and shoe makers, 70,000 milliners, dressmakers, and seamstresses, irrespective of dealers in ready-made and second-hand clothing, are engaged in supplying wearing apparel. Of domestic servants there are nearly 200,000, mostly females. Beside 80,000 paupers, there are on an average 80,000 persons without ostensible means of employment, the larger proportion females, many of the country girls being turned upon the town, where in want of honest employment they are doomed to a life of shame. On the other hand, there are a few thousand idlers of large fortune

or independent gentlemen, and over 25,000 who live upon annuities, the bulk of whom are ladies. The number of bachelors is nearly 200,000, of spinsters about 250,000, of widowers 37,000, and of widows 110,000. The annual delivery of letters is 46 for each person of the population (only 22 for each of the population in other parts of the United Kingdom); and to facilitate their distribution, the metropolis was divided in 1858 into 10 postal districts.—The climate of London is temperate and moist. The health of the inhabitants has gradually improved, and promises to improve still more rapidly from the recent stringent laws in regard to burials and the amelioration in the drainage. The rate of mortality in the early part of the 18th century was annually 1 in 20 of the population; at present it is about 1 in 40. It is estimated that 169 persons die daily in London, and that a child is born every 5 minutes. All metropolitan burial grounds which prove injurious to the health of the inhabitants are now, by order of government, closed against funerals without a moment's delay. The number of cemeteries in the suburbs is consequently rapidly increasing. Many of them are prettily situated and laid out with taste, as Highgate, Norwood, and Kensal Green cemeteries. The annual number of fires in the metropolis amounts to nearly 700. There are about 50 offices for effecting fire insurances. Every street is provided with fire plugs for the supply of water for the engines. The chief insurance companies maintain fire engine establishments at 22 different stations, and fire escapes are in readiness at convenient spots throughout the metropolis. The increasing thrift of the middle and lower classes is manifested in the prosperous condition of the life insurance offices, of which there are about 200, and of the loan fund societies and the savings banks. The amount due in the latter to about 260,000 depositors (chiefly in Middlessex) is nearly £5,700,000. Many of the lowest descriptions of the population, however, are slow in emancipating themselves from filthy habits, the number of persons belonging to families who live in one single room being estimated as high as 150,000. The dwellings of a large proportion of the inhabitants of the Potteries, Kensington, for instance, are mere hovels, with shattered roofs and unglazed windows, the floor below the level of the external soil, and the walls at times partially damp. Notwithstanding the great number of the squalidly poor and the vicious contained within its borders, London is said to be one of the healthiest cities in the world.—Over 4,000 cabs and 1,000 omnibuses are employed in the streets of London. The electric telegraph company have 20 stations in different parts of the metropolis. The great railway termini in London are the north-western, great western, south-western, eastern, and the south-eastern counties, beside smaller local lines, as those to Greenwich, Blackwall, Hampton Court, &c. The tunnel under the Thames, situated about 2 m. below London bridge, and

extending from the Middlesex side of the river in High street, Wapping, to Rotherhithe on the Surrey side, was built by the late Sir Mark Isambert Brunel, and completed in 1840. The difficulty of approach makes the tunnel of little convenience for purposes of traffic, but it is visited by thousands who admire the wonderful character of the work. The metropolitan railway, designed to establish a communication between the city and the great series of railways on the N. of the Thames, is in course of construction, and will probably be opened in 1862. It will start from opposite the great western railway hotel at Paddington, with a fork up to South Wharf road to join the great western railway on the level near the site of the old passenger station. The line then crosses the Edgeware road and enters the New road, which it follows to King's Cross, where a tunnel was commenced in 1860, it being one of the peculiarities of this railway that throughout the greater part of its course it is to run underneath the existing roadways, thus avoiding the great expenditure which would otherwise have been necessary for the purchase of valuable house property. From King's Cross the line takes an almost straight course to Farringdon street, and this part, except when passing under roadways, will be in open cutting.—The port of London extends nominally and in the eyes of the law $6\frac{1}{2}$ m. below London bridge, to a point called Bugsby's Hole, over against Blackwall, but the port itself does not reach beyond Limehouse. The "Pool" commences just below London bridge, where the river is divided into two channels by the treble range of colliers anchored in it to discharge their cargoes. Only a certain number of the colliers are admitted into the Pool at once, the remainder waiting in the lower pool until the flag which denotes that it is full is lowered, when those enter whose turn is first. Close to London bridge there is water sufficient for vessels of 800 tons. The legislature has placed the shipping of the port and their moorings under the direction of harbor masters nominated by the city corporation and ratified by the Trinity house. The society of the Trinity house, on Tower hill, incorporated in 1815, possesses great wealth; it has the superintendence of the placing and repairs of landmarks and buoys to indicate the channels, and of the whole English lighthouse system, and the appointment and control of pilots. Although the conservation of the river is in some measure under the care of the corporation, Trinity house has concurrent jurisdiction. The principal docks are the West India, East India, London, St. Katherine's, Victoria, and Commercial docks. (See Docks.) A little below the tower of London are the St. Katherine's docks, enclosed by warehouses, over which the masts of the larger shipping are observable. Next are the London docks, with the famous wine vaults, holding 65,000 pipes and more. On the opposite shore is the grand Surrey dock, devoted together with the commercial docks to the timber and corn trades. A little

below the Pool, where the river bends abruptly in its course at Limehouse reach, is one of the entrances to the West India docks, which run across the base of the tongue of land called the Isle of Dogs and open into Blackwall reach, the vast number of masts seen across the pasturage resembling a forest of leafless trees. Deptford, on the right hand from Limehouse reach, is a government dockyard, and the seat of the victualling department. Opposite Greenwich are many ship builders' yards. Below Greenwich the shores on either side are exceedingly flat until Blackwall is reached, where the East India docks, full of the largest merchant ships, are situated. Still further down the river is Woolwich arsenal, the largest government ordnance depot, and a depot for convicts. Gravesend, the last town on the banks of the Thames, is about 80 m. from London. Parallel to the basin near Dog and Duck stairs, sometimes called the East Country docks, which leads to the Commercial docks, is the Surrey canal, which communicates with the Croydon canal. The Regent's canal (9 m. in length, and provided with 12 large locks) communicates with the grand junction canal, passes from Paddington by a tunnel under Maida hill to Regent's park, thence to Islington, under which it is carried by a tunnel $\frac{1}{4}$ m. long, and so on to Hoxton, Hackney, and Limehouse. Some of the local traffic is carried on by means of these canals. The principal commerce of London passes through the docks. About 80,000 vessels are engaged in the foreign trade of London, and 20,000 in the coasting trade. The fishing interest, on the east coast, from London as far north as Scarborough, embraced, in the spring of 1860, 1,757 vessels, with a total tonnage of 75,533, and employs 28,079 men and an invested capital of about £1,800,000. The total registered shipping numbers nearly 8,000, tonnage 1,000,000. The aggregate amount of imports and exports is annually over £55,000,000; the former consist of corn, sugar, silk, wool, wood, oil, tea, wine, spirits, tallow, butter, coffee, &c., and the latter mainly of British and Irish produce and manufactures.—The principal manufacture of London is silk, which employs about 116,000 persons, mostly females. The manufacture of beer and porter is of great magnitude. Sugar refining, clock and watch making, the manufacture of mathematical, surgical, and musical instruments, jewelry, gold and silver plate, and other small articles, are extensively carried on. Some of these manufactures, and particularly London-built carriages, enjoy a high reputation. The transactions in English and foreign government stock and in bills of exchange are immense. The exports of gold from London in 1858 amounted to £13,875,390, and of silver to £6,921,260; total £20,796,650. The imports of gold in the 6 months ending Dec. 31, 1858, were £10,998,560, and of silver, £2,756,880; total £13,755,390, or in the year about £37,000,000. It is this remarkable combination of commercial, manufacturing, and financial ac-

tivity which makes London the regulator of the money markets of the world.—The first authentic notice of the existence of London (*Londinium*) occurs in Tacitus. About 100 years after Julius Cæsar's invasion, it was taken by the Romans under Claudius, called *Augusta*, and placed under a Roman administration. In A. D. 61 the Britons under Boadicea captured and burned the city, which was soon however rebuilt. It is supposed to have remained unprotected by fortifications until the reign of Constantine the Great, who, judging from many coins which have come to light, is believed to have constructed the walls of London and to have erected it into an episcopal see. The walls commenced in the vicinity of the present tower, and their compass was completed by another wall along the banks of the Thames. Gates were added to these walls, and roads laid out which led to different parts of the country. The names of the gates are still preserved in Ludgate, Aldersgate, Moorgate, Bishopsgate, Newgate, and other streets and localities. The great Roman roads Watling street and Ermin street had their termini at the so called London stone. A portion of the stone or Roman *milliarium* still exists, and is inserted in the most prominent part of St. Swithin's church, Cannon street. Under the Saxons, London is believed to have become the capital of the East Saxon kingdom, and to have quickly recovered from the sufferings to which it had been subjected after the departure of the Roman troops from England. Bede calls it even at that early period "a princely town of trade." St. Paul's and St. Peter's, Westminster, were founded almost immediately after the introduction of Christianity. Under Egbert London became the metropolis of the united Saxon monarchies, or of the consolidated kingdom, so that the metropolitan character of London has existed 1,000 years. The Danish invasion was disastrous to the prosperity of London, but it soon recovered under the glorious reign of Alfred. William, to whom the city submitted after the battle of Hastings, granted a charter to it which is still extant. A new charter was given by Henry I. in 1100, which is said to have served as a model for Magna Charta; it restored the privileges which the Londoners had enjoyed before the conquest, and permitted them to elect their own magistrate. In 1191 the chief magistrate was for the first time addressed by the court of aldermen under the title of lord mayor. The first stone of Westminster abbey was laid by Henry III. in 1221. The insurrection of Wat Tyler in 1381 produced a temporary alarm. In the wars of the roses, London sided chiefly with the house of York, in consequence of which the lord mayor and sheriff and a number of aldermen were knighted by Edward IV. after the battle of Barnet (1471). About this time Caxton introduced the printing press. The city, which had already improved considerably, derived great advantage from the suppression of religious houses by Henry VIII.

Intellectual and religious zeal were powerfully fostered by the reformation; educational and charitable institutions were introduced; the refugees of the Low Countries naturalized their industrial arts and manufactures in London; and the prosperity of the city advanced with rapid strides during the reign of Elizabeth. The chief part of the metropolis consisted then and during the reign of James I. of Newgate street, Cheapside, the Poultry, and Cornhill, and the crooked streets and dingy alleys leading from them to the river. Both sides of the Strand, toward Westminster, were flanked with houses. The south river side of the Strand was then the head-quarters of the aristocracy. The other parts of London did not yet exist, excepting from Charing Cross toward Whitehall palace, and to Westminster abbey. There were but few buildings in Lambeth and Southwark, and only a small number of scattered houses from Horselydown to Tooley street. A majority of the corporation took a decided part with the commons during the civil war. After the restoration London began to revive, but the plague, which had already visited it in 1348 and in 1604, again raged in the city from June till the end of Dec. 1665, carrying off nearly 20,000 persons, or $\frac{1}{3}$ of the population. Fire, which had nearly consumed the city in 893 and at various other periods, especially 1077 and 1086, broke out a year after the visitation of the plague, commencing Sept. 2, 1666, in Pudding lane, Monument yard, and ending in Pie corner, Giltspur street, having lasted 4 days and nights, and reduced to ashes $\frac{1}{4}$ of the whole city within the walls. The city was however rebuilt within 4 years. The first stone of St. Paul's was laid in 1675. In 1685 many French Protestants, whom the revocation of the edict of Nantes had driven from France, found an asylum in London, when they settled in Spitalfields, introducing the silk manufactures which have since become of the utmost importance for the city. In the reign of Anne an act was passed (1711) for building 50 new churches, in consequence of the increase of the population. Clerkenwell, Soho, and other streets and districts were then annexed to the metropolis. Street lamps had been used as early as 1416, but the streets were first generally lighted under the reign of Anne. Some additions to London in the reign of George I. were followed by important enlargements during that of George II. Grosvenor square, Westminster bridge, and new streets were then built, and great roads laid out in several directions. Extension and improvement became still more the order of the day under George III. Blackfriars bridge was built, and many new dwellings erected on the Surrey side. The American war caused a suspension of activity, which however after the peace in 1788 was doubly increased. With the increase of trade with this country and other parts of the world, the ground near the water side was soon covered with buildings, and docks were construct-

ed, while the increase of wealth led to a demand for houses in fashionable districts, and squares and streets in the west soon sprung up as if by the spell of magic. From the regency in 1811 dates the astonishing progress of London in the elegance of its parks and new streets. Regent's park was then formed and surrounded with handsome terraces. The movement commenced at the beginning of this century has since advanced with great celerity; and with the new elements of prosperity which California and Australia have infused into commerce, the constant increase of wealth must lead to a corresponding increase in the territory of the metropolis, especially in the regions of fashion in the west, as has been already shown by the success of the new districts of Tyburnia and Belgravia. In 1141 the population of London was estimated at 40,000; in 1841 it was 1,652,902, showing an average increase of 200,000 for each of the preceding centuries. The increase within the first half of this century was 80,000 per year, the population having risen from 900,000 in 1801 to about 2,400,000 in 1851. The actual population in 1801 was 958,863; in 1811, 1,188,815; in 1821, 1,378,947; in 1831, 1,654,994; in 1841, 1,948,417; and in 1851, 2,362,236. The increase between 1801 and 1811 was 179,952, or 18.76 per cent.; between 1811 and 1821, 240,132, or 21.08 per cent.; between 1821 and 1831, 276,047, or 20.06 per cent.; between 1831 and 1841, 293,428, or 17.78 per cent.; between 1841 and 1851, 418,819, or 21.23 per cent.; and between 1851 and 1861, 1,215,853, or 47.24 per cent.—The great associations of London with the history and literature of England invest the streets, particularly those in less modern parts of the town, with an indescribable interest. Hardly any of them can be passed without treading upon the great memories of the past. Some of the streets teem with the remembrances of Oliver Cromwell, Hampden, and Milton, the heroes and poets of civil and religious liberty; others with those of Bacon and Newton, Spenser and Shakespeare, the thinkers and poets of humanity. In the same street (Bread street, Cheapside) where Milton was born, stood the Mermaid tavern, frequented by Shakespeare, Raleigh, and Ben Jonson. Not far from the Cockpit in Charing Cross, where Oliver Cromwell lived for some time, died Spenser, the author of the "Faerie Queen." In Palace yard, Westminster, Sir Walter Raleigh was executed. Down Little Queen street Lord William Russell was led to the scaffold in Lincoln's Inn fields. On Tower hill, the earl of Strafford, Algernon Sydney, and other eminent men were put to death. The whole region of the tower of London abounds with the most terrible reminiscences of English history, and Anne Boleyn, Catherine Howard, and many others who were executed, are buried there. Charles I. was executed in the street facing the banqueting house at Whitehall. Tabard inn, Southwark, was the starting place of Chaucer's pilgrims. In the

Inner Temple lane is the house where Pope and Warburton first met. Fielding wrote his "Tom Jones" in Bow street, Covent Garden, the building now occupied by a court of police. The regions of Fleet street, with the Mitre tavern, where Johnson and Boswell met, and of Temple Bar and the Strand, abound with associations of Dr. Johnson, Oliver Goldsmith, and their contemporaries. The following is an alphabetical list of the more prominent persons associated with the streets of London:

Addison, when a bachelor, lived at 22 St. James's place, St. James's street (the same house in which Mr. Rogers the poet died in 1855), and died in Holland house, Kensington.
 Bacon, Lord, born in York house, on the site of Buckingham street, Strand.
 Becket, Thomas I., born behind the mercers' chapel in the Poultry.
 Bentham, Jeremy, lived in Queen square house, Westminster, looking upon St. James's park—the same house in which Brunel perfected his block machinery.
 Blanc, Louis, on his flight from Paris, took up his residence in Piccadilly.
 Blicher, when in England in 1814, lived in St. James's place.
 Bonaparte family.—Joseph and Lucien Bonaparte lived at 93 Park crescent, Portland place. Napoleon III, while Prince Louis Napoleon, lodged at 8 King street, St. James's square.
 Boswell died at 147 Great Portland street, Oxford street.
 Bulwer, the novelist and statesman, resides at 1 Park lane.
 Bunyan was buried in Bunhill fields.
 Burke, Edmund, lived at 87 Gerard street, Soho.
 Burnet, Bishop, died in St. John's square, Clerkenwell.
 Butler, author of "Hudibras," died in Rose street, Covent garden, and was buried in the churchyard of St. Paul's.
 Byron was born at 24 Holles street, Cavendish square, and spent the brief period of his married life at 139 Piccadilly. In his rooms at the Albany he wrote his "Lara."
 Campbell, Thomas, had his last London residence at 8 Victoria square, Pimlico.
 Canning was born in the parish of Marylebone.
 Carlyle, Thomas, resides at 5 Great Chelyne row, Chelsea.
 Chantrey died in Eccleston street, Pimlico, corner of Lever Belgrave place.
 Charles V. of Spain resided in Blackfriars.
 Charles X. of France resided at 79 South Audley street.
 Chatham, earl of, born in the parish of St. James's, Westminster.
 Chesterfield died at Chesterfield house, Mayfair.
 Clive, Lord, died at 45 Berkeley square.
 Cornwallis, Lord, was born in Grosvenor square.
 Crabbe resided at 87 Bury street, St. James's.
 Cromwell, Oliver, lived in Long Acre; in King street, Westminster; in the Cockpit, near the site of the treasury; and at Whitehall palace.
 Dickens, Charles, resided for a long time at 1 Tavistock villa, Tavistock square.
 Disraeli, Benjamin, resides at 1 Grosvenor gate.
 Dryden died at 45 Gerard street, Soho, in the same street in which Burke lived.
 Eldon, Lord, lived at 6 Bedford square, and at the W. corner of Hamilton place, Piccadilly, where he died.
 Fielding lived in Bow street, Covent garden, in a house on the site of the present court of police.
 Fox lived in St. James's place, and afterward at St. Anne's cottage, Hampstead Heath.
 Franklin, Benjamin, was employed as a printer in Bartholomew close, West Smithfield, and lived also at 7 Craven street, Strand.
 Gainsborough died in the W. half of Schomberg house, Pall Mall.
 Garrick died in the centre house of the Adelphi terrace.
 Gibbon wrote his defence of his "Decline and Fall" at 1 Bentinck street, Manchester square.
 Gladstone lives at 11 Carlton House terrace.
 Goldsmith, Oliver, died at 3 Brick court, Temple.
 Gray was born at 41 Cornhill.
 Guizot resided at 21 Pelham crescent, Brompton.
 Hallam resided at 24 Wilton crescent, Belgrave square.
 Handel lived and died at 57 Brook street, Grosvenor square.
 Harvey, William, lived with his brother in Cockaine house in the city.
 Hill, Lord, resided in the large house S. W. corner of Belgrave square.
 Hogarth, born in Bartholomew close, Smithfield, died in Leicester square, in the N. half of the present Fablonnière hotel.

Hood, Thomas, born in the Poultry, spent most of his life in London, and was buried in Kensal Green cemetery.

Jenner lived at 14 Hertford street, Mayfair. A statue of him is in Trafalgar square.

Johnson completed his dictionary while living at Gough square, Fleet street, and died at Bolt court, Fleet street.

Jonson, Ben, is said to have been born in Hartshorne lane, near Northumberland street, Charing Cross.

Jones, Inigo, was born in or near Cloth Fair, Smithfield, where his father was a cloth worker.

Kean, Edmund, lived at 12 Clarges street, when at the zenith of his fame.

Keats wrote some of his poems on the 2d floor of 71 Cheapside.

Kenseth resides at 21 Alpha road, Regent's park.

Lamb, Charles, was born in the Inner Temple, and spent most of his life in London, and the last 6 years of it at Islington, Enfield, and Edmonton. Charles and Mary Lamb's celebrated Wednesday evening parties took place in his chambers in Inner Temple lane.

Lawrence, Sir Thomas, died at 65 Russell square.

Land, Archbishop, lived at Lambeth palace.

Leighton, Archbishop, died in the Bell inn, Warwick lane, Newgate street.

Locke dates the dedication of his "Essay on the Human Understanding" from Dorset court, Fleet street.

Louis Philippe resided at Cox's hotel, Jermyn street, and after his flight in 1848 at the palace of Clermont.

Macaulay lived for many years at the Albany, and died on the evening of Dec. 28, 1858, in his residence at Holly lodge, Campden hill, Kensington.

Mansfield, Lord, when only Mr. Murray, lodged at 5 King's Bench walk, Temple.

Marlborough died in Marlborough house, Pall Mall.

Marvell, Andrew, resided in Maiden lane when he refused a bribe from the lord treasurer Danby.

Milton was born in Bread street, Cheapside, and resided in a garden house in Petty France, now 19 York street, Westminster.

Montagu, Lady Mary Wortley, died in Great George street, Hanover square, and was buried in South Audley street chapel.

Moore, Thomas, dedicated in 1806 his "Odes and Epistles" from 27 Bury street, St. James's street; and the advertisement to the 4th number of his "Irish Melodies" in 1811 is dated from the same street.

More, Sir Thomas, born in Milk street, Cheapside, resided at Chelsea, immediately opposite the present Battersea bridge, and was buried in Chelsea old church.

Neill Gwynn died in a house on the site of 79 Pall Mall.

Nelson resided at 141 New Bond street after the battle off Cape St. Vincent and the expedition to Teneriffe.

Newton lived in St. Martin's street, S. side of Leicester square, where his observatory is still visible on the top of the house.

O'Connell, Daniel, lived at 14 Pall Mall.

Oriana, Philippe (Egalité), duke of, lived at 21 South street, Grosvenor square.

Palmerston, Lord, lived in Carlton Gardens for a long time, and now resides at Cambridge house, Piccadilly.

Peel, Sir Robert, died at his house in Privy Gardens, Whitehall.

Penn, William, born in the house of his father the admiral, on Great Tower hill, on the E. side, within a court adjoining London wall, lived in the last house on the left hand side of Norfolk street, Strand.

Peter the Great resided in a house on the site of the last house on the W. side of Buckingham street, Strand, and frequented the Czar of Muscovy public house, 43 Great Tower street.

Pitt lived in chambers in Old square, Lincoln's Inn, and in the latter part of his life in Hertford street, Mayfair.

Pope is by some authorities supposed to have been born in Lombard street.

Priestley was a resident of Lansdowne house, Berkeley square, when he made the discovery of oxygen.

Reynolds, Sir Joshua, lived at the centre of the W. side of Leicester square.

Richardson lived in Salisbury square, Fleet street.

Rogers, Samuel, lived nearly 60 years and died at 22 St. James's place.

Romilly, Sir Samuel, died at 21 Russell square.

Russell, Lord John, lives at 27 Chesham place, Belgrave square.

Scott, Sir Walter, resided when in London corner of White Horse street, Piccadilly, and at Mr. Lockhart's, 24 Sussex place, Regent's park.

Shakespeare is supposed to have lived on the Bankside, in Southwark, near the Globe theatre, and owned a house in Ireland yard, Blackfriars.

Shelley resided at 41 Hans place, Sloane street.

Sheridan died at 7 Saville row, Burlington gardens.

Siddons, Mrs., lived at 49 Great Marlborough street, died in Siddons house, top of Upper Baker street, Regent's park.

Smith, Sydney, lived in Saville row.

Somers, Lord Chancellor, born in East Smithfield, near the tower (it is said), lived in the large house N. W. corner of Lincoln's Inn fields.

Spenser died in King street, Westminster.

Stael, Mme. de, resided at 20 Argyll street, Regent street.

Sterne died at 41 Old Bond street.

Strafford, the great earl of, was born in Chancery lane.

Swedenborg resided in Great Bath street, Coldbath fields, and was buried in the Swedish church in Ratcliff highway.

Talleyrand resided at the house of the French embassy, N. side of Manchester square.

Thackeray, W. M., resides at 36 Onslow square, Brompton.

Thurlow, Lord Chancellor, died at 45 Great Ormond street, where the great seal was stolen from him.

Turner lived at 47 Queen Anne street, Cavendish square.

Vandyke died in Blackfriars, and was buried in St. Paul's churchyard.

Voltaire, when in London in 1726, resided at the White Peruke in Maiden lane.

Walpole, Horace, lived at 5 Arlington street, Piccadilly.

Walton, Isaac, lived in Chancery lane, 7th house on the left hand from Fleet street to Holborn.

Wellington lived over 80 years in Aspley house.

Wilkes, John, lived in Prince's court, Great George street, Westminster.

Wilkie painted his "Rent Day" at 24 Upper Portland street, and his "Chelsea Pensioners" at 24 Lower Phillimore place, Kensington.

LONDONDERRY, a N. maritime co. of Ireland, province of Ulster, bounded N. by the Atlantic ocean and Lough Foyle, E. by the co. of Antrim and Lough Neagh, S. and S. W. by the co. of Tyrone, and W. by Donegal; area, 810 sq. m.; pop. in 1851, 191,868. In the centre and toward the S. the surface is mountainous, and elsewhere mostly lowland, which is generally fertile. The principal rivers are the Foyle, Bann, and Roe. Agriculture, though improving, is not in a very advanced state. The principal manufacture is the weaving and bleaching of linen. The greater part of the county is held by lease under the Irish society and the 12 London companies to whom it was granted by James I. after the rebellion, whence the prefix of London to the ancient name. The county returns 2 members to parliament, beside 2 for Londonderry city and the borough of Coleraine.—LONDONDERRY, the capital, a city, parliamentary borough, and port, is situated on the left bank of the Foyle, here crossed by a bridge 1,068 feet long, 5 m. above Lough Foyle, and 128 m. N. N. W. from Dublin; pop. in 1851, 19,604. The city is picturesquely built on an oval-shaped hill, the site of ancient Derry, surrounded by walls, beyond which however it has greatly extended. On the summit of the hill stands the cathedral of Derry, 114 feet long and 66 feet wide, with a spire 178½ feet high. The diamond or market place, a quadrangular area, is situated in the centre of the town, and contains the corporation hall; and from the middle of the sides of this 4 principal streets lead to the 4 original gates. A Doric column, surmounted by a statue of the Rev. George Walker, celebrated for his defence of the town in the memorable siege of 1689, was erected in 1828 at a cost of £4,200. Communication by steamers is maintained with Liverpool, Glasgow, Greenock, and Campbellton.

LONDONDERRY. I. ROBERT, 2d marquis of. See CASTLEREAGH. II. CHARLES WILLIAM STEWART VANE, 3d marquis of, a British soldier and diplomatist, half brother of the preceding, born in Dublin, May 18, 1778, died in Lon-

don, March 6, 1854. At the age of 15, as ensign of a foot regiment, he accompanied the earl of Moira to the Netherlands, and took part in the campaign of 1794. Subsequently, while attached to the British mission at Vienna, he was severely wounded at the battle of Donauwerth. During the Irish rebellion of 1798 he commanded a regiment of dragoons, and also in the expedition to Egypt under Sir Ralph Abercrombie, in the course of which he was again dangerously wounded. He next commanded a hussar brigade under Sir John Moore in Spain, and covered the retreat of the British army to Corunna with great skill and valor. After a few months' absence he returned to the Peninsula, and until May, 1813, held the position of adjutant-general under Sir Arthur Wellesley, signalizing himself at Busaco, Talavera, Fuentes d'Onoro, Badajoz, and elsewhere. During the campaign of 1814, in which he was made a lieutenant-general, he performed the duties of military commissioner of the armies of the allied sovereigns, and in the same year was appointed ambassador to Austria, having previously exercised similar functions at the court of Berlin. His participation in the congress of Vienna in 1815, as one of the 5 British plenipotentiaries, was the last public act of importance of his life. In 1814 he was raised to the peerage as Lord Stewart; in 1822, on the death of his brother, he succeeded to the marquise of Londonderry; and in 1823 he was created Earl Vane, having in 1819 contracted a second marriage with the only daughter of Sir Harry Vane Tempest, and assumed the name and arms of Vane. With a view of developing the agricultural and mineral resources of his large estates in Durham, he constructed the harbor of Seaham, one of the most costly and useful works ever undertaken by private enterprise. In politics he was an uncompromising tory. In 1837 he was raised to the rank of general in the British army. He is the author of a "History of the Peninsular War" (4to., 1808-'13), and edited the correspondence of his brother, Lord Castlereagh, which was published in 1850.

LONG, GEORGE, an English scholar, born in Poulton, Lancashire, in 1800. He was educated at Trinity college, Cambridge, where he obtained a scholarship in 1821, and subsequently a fellowship. In 1824 he accepted the professorship of ancient languages in the university of Virginia. In 1826 he returned to London, in order to become professor of the Greek language and literature in the London university. In this office he remained until 1831, when he began to edit, for the society for the diffusion of useful knowledge, their "Journal of Education," which he continued until 1835. From 1832 to 1848 he edited the "Penny Cyclopædia," and at the conclusion of the 27th volume, the society and publishers (O. Knight and co.) offered their thanks "to the editor, by whose learning, unwearied diligence, and watchfulness, unity of plan has been maintained during 11 years, and error as far as possible avoided."

During this time Mr. Long became a student of law in the Inner Temple, and was called to the bar in 1837. In 1846 he was invited by the society of the Middle Temple to deliver a course of lectures on jurisprudence and the civil law. This office he soon resigned, but in 1849 was appointed professor of classical literature at Brighton college, where he has since remained. Among his works are editions of Cæsar's "Gallic War" and Cicero's "Orations," a "Classical Atlas," and large contributions to Dr. W. Smith's classical dictionaries. He has translated selections from "Plutarch's Lives" (5 vols., 1844), and published in 1850 "France and its Revolutions."

LONG, ROGER, an English clergyman and astronomer, born in Norfolk about 1680, died in Cambridge, Dec. 16, 1770. He was educated at Pembroke hall, Cambridge, of which he became vice-chancellor in 1729, and master in 1738. In 1749 he was appointed Lowndes professor of astronomy, and in 1751 rector of Bradwell in Essex. At his death he bequeathed £600 to his college. He was the inventor of the uranum, a singular astronomical machine for facilitating the study of his favorite science, which may still be seen at Pembroke hall. It is a hollow sphere 18 feet in diameter, and capable of containing 80 persons. The inner surface is covered by a map of that portion of the heavens visible in Britain. The most important of Long's works are: "The Rights of Churches and Colleges Defended" (1731); "Treatise on Astronomy," in 5 books (2 vols. 4to., Cambridge, 1742-'64; 2d ed., 1784); and "Life of Mahomet" (1757), which is prefixed to Ockley's "History of the Saracens."

LONG, STEPHEN H., an American military and civil engineer, born in Hopkinton, N. H., Dec. 30, 1784. He was graduated at Dartmouth college in 1809, subsequently taught school in Germantown, Penn., and in Dec. 1814, was commissioned a lieutenant in the corps of engineers of the U. S. army. After discharging the duties of assistant professor of mathematics at West Point for about a year, he was in April, 1816, transferred to the topographical engineers with the rank of major. During the next 8 years he was employed in a series of explorations of the western frontier, from the northern boundary of Texas to Lake Superior and the sources of the Mississippi, traversing within that period more than 26,000 miles of wilderness, and procuring valuable information respecting those portions of the national domain. An account of an expedition from Pittsburg to the Rocky mountains (of which one of the highest summits was named from him Long's peak) in 1819-'20, from the notes of Major Long and others, by Edwin James, was published in 1823; and in 1824 appeared "Long's Expedition to the Source of St. Peter's River, Lake of the Woods," &c., by W. H. Keating (2 vols. 8vo., Philadelphia). He was subsequently employed for several years in duties connected with the improvement of various western rivers, and between 1827 and 1829 took part in

the construction of the Baltimore and Ohio railroad. He was one of the pioneers of railroad enterprises in the United States, and his "Railroad Manual" (1829) was the first original treatise of the kind published in this country. Subsequently he was much occupied in surveying routes for railroads, and from 1837 to 1840 was engineer-in-chief of the western and Atlantic railroad in Georgia, in which capacity he introduced a system of curves in the location of roads, and a new species of truss bridges, which have been generally adopted in the United States. He has since been almost constantly engaged in explorations and improvements of western rivers, in superintending the construction of hospitals and steam vessels, in surveys of harbors and roads, and in other labors connected with the engineering department of the U. S. army. He now holds the brevet rank of lieutenant-colonel.

LONG ISLAND, an island belonging to the state of New York, between lat. 40° 33' and 41° 6' N., and long. 72° and 74° 2' W.; area, 1,682 sq. m.; pop. in 1855, 808,527. It is bounded on the N. by Long Island sound, and on the E. and S. by the Atlantic ocean; the Narrows, New York bay, and the East river, connecting the ocean with the sound, complete the boundary on the W. and N. W. The greater portion of its extent is opposite the S. shore of Connecticut. Several small islands which lie in the adjacent waters are attached to it politically, among which the principal are Shelter (area, 9,000 acres), Gardiner's, Fisher's, and Plumb islands. From Fort Hamilton on the W. to Montauk point on the extreme E. the distance is variously estimated at from 115 to 140 m. The average width is 14 m., and the extreme width 23 m. The coast is deeply indented with numerous bays and inlets, abounding with shell and other fish. A large deep bay, divided into Gardiner's bay, Little Peconic and Great Peconic, extends inland 80 m., and divides the E. end of the island into two distinct parts, the northern terminating at Oyster Pond point, and the southern at Montauk point, about 20 m. further E. Along the S. border is a remarkable bay nearly 100 m. long and from 2 to 5 m. broad, formed by the Great South beach, a narrow strip of fine white sand from $\frac{1}{4}$ m. to 1 m. wide, with occasional openings to the ocean. Jamaica, Hempstead, Oyster, and Huntington bays are toward the western end of the island. The coasts of Long island, being on the track of a vast commerce, have been provided by government with an excellent system of lighthouses, and 30 life-boat stations have been established provided with proper facilities for affording aid to vessels in distress. Though much diversified, the surface presents no great elevations. A ridge of hills extends, with occasional interruptions, from the N. boundary of New Utrecht in the W. nearly to the extreme end of the northernmost eastern branch of the island. The highest of these are Harbor hill, at the head of Hempstead harbor,

and Jane's hill, one of the West hills in the town of Huntington. A number of spurs known under various names proceed from the main range. To the N. of these hills the surface is generally uneven and broken; to the S., remarkably level, with a gradual inclination toward the sea. There are several large tracts of apparently infertile plains, among which the great Hempstead plain toward the W. is most noted. It is about 12 m. long by from 5 to 6 broad, producing naturally only coarse grass; of this tract about 16,000 acres are still used in common. By the application of suitable manures large portions have been put under profitable cultivation during the last few years. The island, which has always been abundantly supplied with wood, still contains large forests from which the deer have not yet been entirely exterminated. The great pine plains commence about 40 m. from the W. end, and continue almost uninterruptedly for about 50 m., occupying for that extent nearly one half of the island. There are many springs and small streams; the largest of the latter, the Peconic, flows into Great Peconic bay after a course of 15 m., in which it furnishes numerous mill seats. Fine natural ponds or lakes abound, and many swamps and marshes are scattered over the surface. Of salt marsh the island is computed to contain 116 sq. m. The soil is generally very fertile and under a high state of cultivation, a large portion of the agricultural industry of Kings and Queens counties being engaged in providing vegetables for the New York market. The climate, owing to the influence of the sea, is more temperate than the same latitude in the interior, the thermometer seldom falling below zero or rising above 90°, the mean temperature being about 51°. There are 8 counties, Kings, Queens, and Suffolk. The principal cities and towns, with their populations in 1855, are: in Kings co., Brooklyn (including since 1854 Williamsburg and Bushwick), pop. 205,250; Flatbush, 3,280; New Utrecht, 2,780; and New Lotts, 2,261; in Queens co., Hempstead, 10,477; North Hempstead, 9,446; Oyster Bay, 8,047; Flushing, 7,970; Jamaica, 5,632; and Newtown, 4,694; in Suffolk co., Brookhaven, 9,696; Huntington, 8,142; Southampton, 6,661; and Southold, 5,676. Among the many public resorts for fishing and sea bathing are Bath, Coney island, Rockaway, Babylon, Fire island, Montauk point, &c. The Long Island railroad passes through nearly the entire length of the island, from Hunter's Point, adjoining Brooklyn on the E., to Greenport; beside this there are the Brooklyn and Jamaica railroad, the Flushing railroad connecting with Hunter's Point, two branches of the Long Island railroad, and horse railroads ramifying through Brooklyn and the surrounding country.—When first discovered, Long island was inhabited by 13 tribes of Indians, of whom there now remain but 200 or 300, mixed with negro blood, and retaining no knowledge of their ancient language. The first settlement was made in 1625 by some French Protestants

from near the river Waal in the Netherlands, under Dutch protection; and immigrants from New England established themselves in different localities soon after. Its name, which it received from the Dutch, was changed by the colonial legislature to that of the island of Nassau, which was never adopted by the people. The E. extremity was claimed by the colonies of New England, and became the subject of frequent disputes until the final extinction of the Dutch authority by the English. During the troubles which preceded the revolution the inhabitants of Long island manifested a strong spirit of patriotism; but the reverses of the American arms, which placed it in the power of the British during the war, suppressed the active coöperation of the people in behalf of independence. After the evacuation of Boston by the British, strenuous efforts were made by Washington to fortify the city of New York and its approaches. Gen. Greene was intrusted with the defence of Long island, in command of a considerable body of troops, many of them raw recruits, and constructed a line of intrenchments and redoubts from Wallabout bay to Gowanus cove, about a mile from the village of Brooklyn. The main works at the former end were on the hill afterward known as Fort Greene, on which the ditch and embankment still existed a few years since, but which is now considerably reduced in dimensions, and laid out as Washington park; on the other extremity, a battery was erected at Red Hook, and a fort on Governor's island, nearly opposite. About 2½ m. from the intrenchments, between them and the S. side of the island, was the range of hills already mentioned, then densely wooded, and crossed by three roads, one, on the right of the works, passing near the Narrows to Gravesend bay, the central one through Flatbush, and the third far to the left through Bedford to Jamaica. Much confusion was created by Gen. Greene falling sick in the midst of his preparations, and the command devolving upon Gen. Sullivan, then just returned from Lake Champlain, and unacquainted with the ground and with Greene's plans. On Aug. 22, 1776, the British landed 9,000 strong at New Utrecht, on Gravesend bay, without resistance. They were commanded by Sir Henry Clinton, assisted by Lords Cornwallis and Percy, Gen. Grant, and Sir William Erskine. Lord Cornwallis, rapidly advancing to the central pass, found it occupied by the rifle regiment of Col. Hand, and, unwilling to risk an encounter, took post at Flatbush. On the 24th Washington visited and inspected the American lines, and appointed Gen. Putnam to their command. On the 25th the British were reinforced by two Hessian brigades under Gen. De Heister, and on the 26th began to carry out their plan of operations, which was to menace the first two passes mentioned, while Sir Henry Clinton with a body of chosen troops was to take possession of the road leading from Ja-

maica to Bedford. While the works were strengthened and other preparations made to resist attack, the pass by Bedford had been neglected, and only visited by an occasional patrol, who on this night failed to discover the approach of the enemy. Gen. Clinton, accompanied by Gen. Howe, the commander-in-chief, and by Lords Percy and Cornwallis, secured the defile and took possession of the heights without molestation or discovery, being guided by a tory of the neighborhood. The advance of Gen. Grant with the left wing along the road by Gravesend and the Narrows was resisted by Col. Atlee with a guard of Pennsylvania and New York militia. He retired fighting until he had fallen back upon Lord Stirling, who with two regiments had hastened to his relief. Here active firing was kept up by both sides without an attempt at a general action. At the same time De Heister opened a cannonade from Flatbush upon Col. Hand and his riflemen, but without offering to advance, and the guns of the British men-of-war were brought to bear upon the battery at Red Hook. These, however, were mere diversions. Clinton having descended the pass opened his guns on the Americans, and at this signal of his success De Heister ordered the redoubt, of which Gen. Sullivan had taken the command, to be stormed; but the latter, who found his left flank engaged and himself in hazard of being surrounded, ordered a retreat, not soon enough however to escape the light infantry of the British, who drove him back upon De Heister and his Hessians. The Americans still fought with desperate valor, a large body cutting their way through to the intrenchments, the rest who were not killed either escaping among the hills or surrendering as prisoners. Among the latter was Gen. Sullivan. On hearing the cannonade of Clinton, Lord Stirling, who had maintained his position in front of Gen. Grant, endeavored to return to the lines, but found himself cut off by Cornwallis. He gallantly attacked the enemy, and with such determination that the British held their ground only by the assistance of reinforcements, when Stirling, seeing no further hope, surrendered. The enemy, having forced all the approaches, were now before the American works, and soon proceeded to intrench themselves and plant their batteries. With this formidable force before him, and with indications that the British fleet intended moving up the river so as to cut the force in Brooklyn entirely off, Washington, who was now in personal command, determined to recross with the American army. This retreat was effected on the night of the 29th with complete success. Long island from this time until the close of the war remained in the possession of the British. The whigs were subjected to much ill usage, and a partisan warfare between the tories and the whigs from Connecticut was kept up during the greater part of that period.

LONG ISLAND SOUND, a large body of water lying between Long island and New

York and Connecticut, about 110 m. long, and varying from 2 to 20 m. wide. On the W. it is connected with the Atlantic by a strait called the East river, New York bay, and the Narrows, and on the E. by a narrow passage called the Race. The principal rivers flowing into the sound from the mainland are the Housatonic, Connecticut, and Thames. It is in the route of a very large and important trade between the city of New York and the East, and is navigated by numerous regular lines of packets and steamers. There are 15 light-houses on its coasts.

LONGET, FRANÇOIS ACHILLE, a French physiologist, born in St. Germain-en-Laye in 1811. In 1838 he began to devote himself exclusively to anatomy, and especially to the nervous system, and in 1843-'6 published a *Traité d'anatomie et de physiologie du système nerveux de l'homme et des animaux vertébrés*, which was followed by a *Traité complet de physiologie* (1850-'55). In the latter work he follows vital development through the whole range of zoology, and confirms by many new experiments the discoveries of Sir Charles Bell relative to the distinct functions of the nerves. He has also devoted much time to investigating the laws of nervous action, the irritability of muscular fibres, and the action of electricity on the nerves. He experimented much with Matteucci on this last subject, the results of which were published in 1840. He opposes the so called electro-nervist school, holding that irritability is a property inherent in the living muscle, on which electricity acts only specially and exhaustively. He has also made experiments on the action of sulphuric ether, and in acoustics. He has been a member of the French academy of medicine since 1844.

LONGEVITY. See AGE.

LONGFELLOW, HENRY WADSWORTH, an American poet, born in Portland, Me., Feb. 27, 1807. He is the son of the Hon. Stephen Longfellow, for many years an eminent member of the bar in that city. At the age of 14 he entered Bowdoin college, where he was graduated in 1825. During his academic course he gave evidence of the abilities which have since gained him such high distinction both as a scholar and a poet. Among his productions at this period may be mentioned "Hymn of the Moravian Nuns," "The Spirit of Poetry," "Woods in Winter," and "Sunrise on the Hills." After leaving college, he entered the office of his father with some vague intention of studying law, but soon relinquished it for a more congenial occupation. Having been appointed professor of modern languages and literature at Bowdoin college, with the privilege of residing some years abroad for observation and study, he gladly accepted the office, and in 1826 sailed for Europe, passing that year in France and the next in Spain. Italy and Germany employed two years more. On his return to the United States in 1830, he entered upon the duties of his professorship, and held it for 5 years. Dur-

ing this time, in his contributions to the "North American Review," in his translation of the *Coplas de Manrique*, printed in 1833, and in his "Outre-Mer, a Pilgrimage beyond the Sea," published in 1835, he exhibited his desire to familiarize the cultivated mind of America with the national literature and national character of European countries. In 1835, on the resignation of Mr. George Ticknor, he was appointed professor of modern languages and belles-lettres in Harvard college; and after passing that year and the next in a tour through Denmark, Sweden, Holland, Germany, and Switzerland, he for 17 years performed the duties of his office to universal satisfaction. In 1854 he resigned, and has since resided at Cambridge. In 1839 he published his exquisite prose romance of "Hyperion," and in the same year his "Voices of the Night," which first gave him an extended reputation as a poet. These were followed by "Ballads and other Poems" (1841); "Poems on Slavery" (1842); "The Spanish Student" (1848); "Poets and Poetry of Europe" (1845); "The Belfry of Bruges and other Poems" (1846); "Evangeline," perhaps his greatest work (1847); "Kavanagh," a novel (1849); "Seaside and Fireside" (1850); "The Golden Legend" (1851); "The Song of Hiawatha" (1855), his most popular work, judged by the immense circulation it has attained; and "The Courtship of Miles Standish" (1858). A number of his poems, scattered over numerous periodicals, still remain uncollected in a permanent form. The wide range of Mr. Longfellow's studies at an early period of life, as well as his introduction to the picturesque and quaint features of society and manners in foreign nations, has served to give a certain cosmopolitan character to the productions of his pen. As a translator, he is singularly happy in transfusing not only the ideas, but the spirit of his originals, into apt and expressive diction; as a critic, whether commenting on character or literature, he is the genial interpreter, rather than the censorious judge; and as a poet, he appeals to the universal affections of humanity, by thoughts and images derived from original perceptions of nature and life. His fellow-feeling with his kind gives him easy admission to the common heart. Averse both by temperament and habit to every thing harsh, bitter, disdainful, or repellent, there is no element in his poetry to call forth an ungracious or discordant emotion. It is always tolerant and human, kindled by wide sympathies, and with a tender sense of every variety of human condition. Mr. Longfellow combines in a rare degree the sentiment of the artist with the practical instincts of the man of the world. His thoughts are uniformly lucid and transparent, and never clouded by fanciful speculations. The clearness, simplicity, and force of his leading conceptions leave the impression of unity even on his longest poems. However vivid his imagery, it never seduces the attention from his main idea. Without attempting to represent the depths of passion, in his own sphere of feeling he is a

genuine master, and the purity, sweetness, and refinement with which he delineates the affections of the heart, make him the most welcome of visitants at the domestic fireside. Though not destitute of the creative and shaping faculty, the best expression of his imagination is perhaps to be found in the subtle essence of beauty which pervades his writings, and seems to form the natural atmosphere of his mind. His susceptibility to the historical associations of Europe lends a peculiar charm to his poetry. The antiquities of Nuremberg and Bruges make but a faint impression on the Bavarians and Belgians who grow up in the shade of the quaint town hall, or within the sound of the lofty belfry; but they cast a spell over the imagination of the poet, and haunt him with perpetual visions of romance.—Mr. Longfellow's works have passed through repeated editions both in this country and in England, and have called forth some of the most admirable specimens of contemporary art in their illustration.

LONGFORD, a central co. of Ireland, province of Leinster, bounded N. by Leitrim and Cavan, E. and S. by Westmeath, and W. by Roscommon; area, 421 sq. m.; pop. in 1851, 82,350. The Shannon borders the county for about 50 m. Its principal lake is Lough Gow-nagh. Grazing farms are numerous, and large quantities of butter are made. Linens and coarse woollens are manufactured. It returns 2 members to parliament. Capital, Longford.

LONGHI, GIUSEPPE, an Italian engraver, born in Monza, near Milan, Oct. 13, 1766, died in the latter city, Jan. 2, 1831. Among his principal works are the "Vision of Ezekiel," after Raphael; the Magdalen of Correggio; the *Madonna del lago*, after Leonardo da Vinci; "Galatea," after Albano, &c. He also engraved fine heads of Napoleon I., Washington, Michel Angelo, the doge Dandolo of Venice, &c. Among his masterpieces were the plates known as the *Fasti di Napoleone il Grande*, after the designs of Appiani. His biography was published by Sacchi in Milan in 1831, and by Barretta with comments on his works in 1837.

LONGINUS, DIONYSIUS CASSIUS, a Greek critic, born at Athens, or at Emesa in Syria, about A. D. 213, executed at Palmyra, A. D. 273. He studied under his uncle, Phronto of Emesa, a teacher of rhetoric at Athens, visited many countries, heard the lectures of the philosophers Ammonius Saccas and Origen, made himself familiar with the works of Plato, and, having settled at Athens, opened a school of philosophy, criticism, and rhetoric. Longinus subsequently removed to the East, and having been invited to the court of Zenobia, queen of Palmyra, he became not only her literary instructor, but also her principal political counsellor. Zenobia was desirous of throwing off the Roman yoke, and making good her right to supreme sovereignty by force of arms. The Attic philosopher sanctioned her designs, and on the capture of Palmyra was put to death by order of the emperor Aurelian. Longinus was the greatest

philosopher, critic, and writer of his age. The doctrine of the universal influence of soil and climate on the intellectual capacities and on the civilization of mankind is especially due to him. The only important fragment of his voluminous works now extant is a portion of his celebrated treatise "On the Sublime." The first edition of this fragment is that of Robortello (Basel, 1554), the latest and best that of Morn (Leipsic, 1769-'73). It has been translated into English by William Smith (London, 1739), by M. Carew (Dublin, 1834), and by W. T. Spurdens (Norwich, 1886). Complete editions of all his extant writings were published at Leipsic in 1809, at Oxford in 1820, and at Paris in 1837.

LONGITUDE, in geography, an arc of the equator included between the meridian of a place and the meridian whence the degrees are counted, which is usually called the first meridian. The ancient geographers drew the first meridian through Ferro, the westernmost of the Canary islands, and they are still followed by the geographers of Germany and eastern Europe. The English call the first meridian that which passes through Greenwich; the French, Paris; the Spaniards, Madrid. The inhabitants of the United States use Greenwich for geographical purposes, although there is a desire with a few to use some place within their own boundaries.—An easy method of ascertaining the longitude at sea had been wanted since the improvements in navigation, and, after the discovery of the quadrant by Hadley and Godfrey, was the thing most desired to make navigation perfect. When deduced from the course and the distance, as was then the custom, the mariner had but little trust in his own work; and as late as 1830 vessels at sea on speaking each other never omitted the inquiry: "What is your longitude?" a common sympathy also causing them on "heaving in sight" to steer toward each other. Almost every method of determining the longitude depends on the obtaining the difference of time between your first meridian and that which passes through the place where you are; the time at the latter can be easily obtained by means of altitudes of the sun or other heavenly bodies, but the great difficulty is to find the time elsewhere, the difference of time being one hour to 15° of longitude. John Werner was the first to recommend the use of lunar distances for this purpose (1514); but at that time there were neither lunar tables nor instruments for measuring a distance between the moon and a star. Gemma Frisius was the first to suggest the use of time-keepers (1530), but the art of watch-making was then in its infancy. The great importance to navigation of determining the longitude induced various governments to offer rewards for some practical method. Spain offered 1,000 crowns for its solution as early as 1598, and the states of Holland soon after 10,000 florins; but it was not until 1714 that encouragement was offered in Great Britain, when an act was passed in parliament allowing £2,000 toward making experiments, and offering a re-

ward to the person who should discover the best means of determining the longitude at sea, proportioned to the degree of accuracy that might be attained by such discovery. The result was the invention by John Harrison and the gradual perfection of the chronometer, which is now in general use, and to which alone we are indebted for the shortening of passages at sea, as by its use vessels can steer as direct for port as the ocean and winds will allow without fear of falling to leeward as formerly. (See CHRONOMETER, and HARRISON, JOHN.) When the final award was made to Mr. Harrison, the acts concerning longitude were repealed, except so much as related to the publishing of the nautical almanac and other useful tables. It was also enacted that any person who should discover a method for finding the longitude by means of a timekeeper the principles of which had not previously been made public, should be entitled to a reward of £5,000, if after certain trials made by the commissioners the said method should enable a ship to keep her longitude during a voyage of 6 months within 60 geographical miles or a degree of a great circle, to £7,500 if within 40 geographical miles, and to £10,000 if within 30 geographical miles. If the method be by improved astronomical tables, the author becomes entitled to £5,000 when they show the distance of the moon from the sun and stars within 15" of a degree, answering to about 7' of longitude, after allowing half a degree for errors of observation and under certain restrictions, and after comparison with astronomical observations for a period of 18½ years, during which the lunar irregularities are supposed to be completed. The same rewards were likewise offered to any person who should discover any other method of determining the longitude at sea with the accuracy above mentioned. At that period timekeepers were expensive and less to be depended on than at the present day; they could easily be consulted, but prudent mariners were cautious, and the motion of the heavenly bodies was more to be trusted. The eclipses of Jupiter's satellites, although answering well on land for determining longitude, could not be observed at sea on account of the ship's motion, and the more practical method of observing lunar distances for this purpose was adopted, Dr. Maskelyne, the astronomer royal, being the first to introduce them into use. The difficulties which had attended this method when first suggested were now removed. Prof. Mayer of Göttingen had formed lunar tables sufficiently correct to induce the commissioners of longitude to promote their practical application by the annual publication of the nautical almanac, commencing in 1767, and proper instruments for observing lunar distances had come into general use. The method of ascertaining the longitude at sea by lunar observations was followed until the great perfection with which chronometers were made caused it to be neglected.—The last discovered and most accurate of all methods of determining

differences of longitude is by the use of the electro-magnetic telegraph. Capt. Charles Wilkes, U. S. N., is entitled to the credit of having made the first attempt in that way, soon after the wires were placed between Washington and Baltimore; since that time the method of recording transits on a chronographic register by means of a galvanic circuit has been introduced, and in connection with telegraphic wires enables remote observers to record transits of the heavenly bodies simultaneously and with a degree of accuracy almost incredible. This method is called in Europe the American, but it may with greater propriety be called the U. S. coast survey method, as it had its origin and was perfected in that service.

LANGLAND, ROBERT. See LANGLANDE.

LONGMAN. I. THOMAS, the founder of the English publishing house of that name, born in Bristol in 1699, died in London, June 18, 1755. In 1716 he was apprenticed to John Osborn, a stationer and bookseller of London, with whom, having considerable means of his own, he entered into partnership in 1725, under the title of J. Osborn and T. Longman, at the "Ship and Black Swan" in Paternoster row, now known as No. 89, and still occupied in the same business by his kindred and successors. The chief publications in which he was concerned were Chambers's "Cyclopædia of Arts and Sciences," the precursor of the elaborate compendiums of information, bearing the name of cyclopædias, which have appeared in Europe and America during the last 100 years, and Johnson's "Dictionary," of which latter work he was one of the 6 original proprietors. He was an amiable and upright man, and amassed a fortune by his business. II. THOMAS, nephew of the preceding, born in London in 1731, died at Hampstead, Feb. 5, 1797. He was taken into partnership by his uncle in 1754, and after the death of the latter succeeded to the business. He was largely concerned in the provincial trade, and was one of the first to export books to America, a branch of his business to which he gave much attention. He published several enlarged editions of Chambers's "Cyclopædia." III. THOMAS NORTON, son of the preceding, born in London in 1771, died at Hampstead in 1842. He became a partner with his father about 1792, the firm being then one of the largest in the city, both as publishers and booksellers, and during the 50 years that he remained connected with it greatly extended its operations and enhanced its reputation. Various partners were from time to time admitted into the house, but during nearly the whole of the period above indicated Thomas Norton Longman remained at its head. At the commencement of the present century the Longmans were the proprietors of the valuable copyright of Lindley Murray's "English Grammar," and about the same time issued some of the first poems of Wordsworth, Coleridge, and Southey. They continued for many years to publish for Wordsworth, and with Southey established a business

relation which lasted until the death of the latter. They also published Scott's "Lay of the Last Minstrel" and several of the Waverley novels, and subsequent to 1811 were the exclusive publishers of Thomas Moore's works, with the exception of his "Life of Lord Byron," issued by Murray. Among other eminent authors they have introduced to the public are Herschel, Sir James Mackintosh, Macaulay, and McCulloch. Their miscellaneous publications comprise Todd's edition of Johnson's dictionary, Flaxman's compositions, Kirby and Spence's "Introduction to Entomology," Britton's "Cathedral Antiquities," Mrs. Hutchinson's "Memoirs," Watt's "Bibliotheca Britannica," Malte-Brun's "Geography," the latter in connection with Adam Black of Edinburgh, and other substantial and standard works. In 1826 they became part proprietors with Black of the "Edinburgh Review," a connection still subsisting, and between 1829 and 1846 published the 183 volumes of Lardner's "Cabinet Cyclopædia." Another important enterprise of the house was the reconstruction of the old Chambers's "Cyclopædia," which under the editorship of Dr. Abraham Rees, who had conducted a previous edition to a successful issue, was expanded into a work in 89 vols. 4to., with 6 vols. of plates (1802-'19). Mr. Longman was a man "with a heart of his own," as Southey once observed of him, well known for his liberality and integrity, for the amenity of his manners, and the consideration with which he treated the many eminent literary men with whom he sustained business relations. His sons, THOMAS and WILLIAM, have succeeded him in the firm, which is now known under the style of Longman, Green, Longman, and Roberts, and is one of the largest houses in England.

LONGSTREET, WILLIAM, an American inventor, born in New Jersey in the 2d half of the 18th century, died in 1814. He removed to Georgia, and in 1790 wrote a letter to Thomas Telfair of Savannah asking his assistance in raising the means to construct a boat to be propelled by steam. This letter was published in the Savannah and Augusta newspapers, but funds were not immediately obtained, though he stated his entire confidence in the success of his scheme. He was subsequently furnished with the necessary means for experiment, and constructed a small model boat, upon a plan very different from Fulton's, which went on the Savannah river against the stream at the rate of 5 miles an hour. Cotton had previously been ginned by two rollers, not quite one inch in diameter, which caught the fibres, pressed out the seed, and delivered the clean cotton on the other side, where it was taken by the ginners' hand, and deposited in a bag attached to his person. Longstreet invented and patented the "breast roller," moved by horse power, which entirely superseded the old method. The inventor set up two of his gins in Augusta, which were propelled by steam, worked admirably, and promised him a fortune. They

were, however, destroyed by fire within a week. He next erected a set of steam mills near St. Mary's, Ga., which were destroyed by the British in an invasion in the war of 1812. These disasters exhausted his resources and discouraged his enterprise, though he was confident that steam would soon supersede all other motive powers.—AUGUSTUS BALDWIN, son of the preceding, an American jurist and author, born in Augusta, Ga., Sept. 22, 1790. He was early sent to school, but made little progress in study, and was more expert as a cotton picker, a wrestler, and a marksman. His mother, however, kept him resolutely to his tasks, and, becoming at length associated at school with George McDuffie, the influence of the latter first gave him a relish for books. He was graduated at Yale college in 1813, began the study of law at Litchfield, Conn., and was admitted to practice in Georgia in 1815. In 1821 he represented the county of Greene in the legislature; in 1822 he was made judge of the superior court of Ocmulgee circuit; and in 1824 was a candidate for congress with every prospect of success, when he withdrew from the canvass in consequence of the death of a child. This event deeply impressed him with religious feeling, and it was his custom from that time to open his court with prayer. Declining reelection to the bench, he returned to the bar, and was especially distinguished for his efforts and successes in criminal cases. In 1838 he entered upon the ministry of the Methodist Episcopal church, and was stationed in 1839 in Augusta, which was then visited with unusual malignity by yellow fever, but he did not leave his post. In that year he was elected president of Emory college, which office he held till 1848, when he was invited to the presidency of Centenary college, La. This position he soon exchanged for the presidency of Mississippi university, which he resigned in 1856, designing to retire to private life. But in the following year he accepted the presidency of the South Carolina college, a station which he continues to hold (1860). From an early period of life he was accustomed to write for newspapers, magazines, and reviews, and many of his speeches before literary societies, charges to juries, and sermons have been published. His inaugural address on assuming the presidency of Emory college, his baccalaureate to the graduating class of the South Carolina college (1858), and a sermon on infidelity before the young men's Christian association, are among his best performances. He extended his reputation by his "Letters to Clergymen of the Northern Methodist Church" on the subject of slavery, by his speech in the convention at Louisville, Ky., for organizing the southern Methodist church, by his "Letters from Georgia to Massachusetts," and by an able review of the decision of the supreme court in the case of *McCulloch vs. the state of Maryland*. His miscellaneous writings include many of a humorous character. The first of his publications was a letter purporting to come from two

convicts, under sentence of death, who had broken gaol and escaped. His peculiar vein of humor is conspicuous in the "Georgia Scenes," a volume of sketches, which has passed through numerous editions. Many of his papers in periodicals, as the "Magnolia Magazine," the "Southern Literary Messenger," and the "Methodist Quarterly," have not been collected. A novel from his pen, entitled "Master William Mitten, or the Youth of Brilliant Talents who was Ruined by Bad Luck," has appeared serially in the "Field and Fireside," a literary journal of Georgia, and is about to be reproduced in a volume.

LONGUEVILLE, ANNE GENEVIÈVE DE BOURBON, duchess, a French beauty and politician, born Aug. 29, 1619, died April 15, 1679. Her father, Henry II., prince of Condé, was prisoner in the chateau of Vincennes at the time of her birth. Her brothers were the great Condé and the prince of Conti. Her mother, a member of the Montmorency family, imparted to her strong sentiments of piety, but her education was neglected. When after some hesitation she yielded to the request of her friends and attended a court ball, her beauty and remarkable personal traits created a sensation which tempted her to become a regular habituée of the royal circle. The prince de Joinville, to whom she had been betrothed, having died in the flower of his manhood while in Italy, she was in 1642 prevailed upon to bestow her hand upon the duke de Longueville, a widower who was double her age, and whose former mistress, Mme. de Montbazon, caused great annoyance to the duchess by accusing her of a love intrigue with Coligni, for which at that time there does not seem to have been any foundation. The duke was sent to Münster in 1645. During his absence from Paris, the duchess occasionally saw the duke de La Rochefoucauld (prince of Marsillac); and it being reported that she was not indifferent to his attentions, the duke de Longueville caused his wife to join him in Westphalia, where she remained till 1647, following with interest the negotiations of the treaty of peace of Münster, and imbibing a fondness for politics, which on her return to Paris she displayed most actively in the part which she took in the Fronde. Her principal source of inspiration, however, in throwing herself with the whole genius and impetuosity of her ardent but disinterested nature into that movement, was her love for La Rochefoucauld, one of its chief leaders. Among others who joined it were her brother Conti and the duke de Bouillon; but as it was intimated that they were both wavering in their revolutionary zeal, Mme. de Longueville was detained in the Hôtel de Ville as hostage for her brother, and Mme. de Bouillon for her husband. While there, in the night of Jan. 26, 1649, the duchess gave birth to a son (Charles, who became a noted gallant, and was killed in the campaign against Holland in 1672), of whom La Rochefoucauld was supposed to be the father. In order to punish the duchess, her brothers and

husband were arrested by order of Anne of Austria, the regent, in 1650; but the brave woman persisted in her resistance to the court, and after failing to shake the loyalty of the people of Normandy and barely escaping with her life on her flight from Dieppe, she gained Rotterdam and repaired to the citadel of Stenay in Flanders, of which she took the command, and succeeded in making Turenne, whom she met there, join the Fronde and accept the assistance of the king of Spain in levying troops against France. After the conclusion of this alliance, Mme. de Longueville endeavored to reconcile herself with the government by throwing the culpability of her conduct upon Mazarin. Her husband and brother were set free in the beginning of 1651, when she went to Paris; but declining to remain with the former, who was firm in his loyalty to the king, she set out on a new revolutionary expedition to Bordeaux, in company with La Rochefoucauld, the duke de Nemours, and her brothers Condé and Conti. Dissensions however broke out between her and the last named. Bordeaux opened negotiations with the duke de Vendôme. A general amnesty was proclaimed in 1653, after which the duchess returned to private life. Afflicted by the loss of her mother, who had died in 1650, and by the desertion of her lover, for whom she retained a lively affection, notwithstanding his egotism and indifference, and in spite of her temporary intimacies with the duke de Nemours and others, and baffled in her schemes against the court, which, after all, she had cherished more for her lover's than for her own sake, she resolved to renounce the world. But after having spent some time in various convents, she was again attracted by the pleasures of society; and while in this unsettled state of mind, she accepted an invitation of her husband to rejoin him in Normandy. The duke died in 1663, and the duchess now devoted herself almost entirely to a religious life. She was called the "mother of the church," and her influence in Rome was said to have secured for the Jansenists the so called peace of Clement IX. (1668). The latter part of her life was darkened by the loss of her son, and spent in the Carmelite convent of Paris in the most stringent observance of religious duties and in the practice of charity. Her death was even affirmed to have been either voluntary, or at all events hastened by the influence of an abstemious and penitential life upon her health. Although not learned herself, she could appreciate the genius of those who were, as is attested by her letters to Chapelain, Scudéry, and above all to the Port Royalists. Cousin, in his interesting work on *Madame de Longueville* (6th ed., Paris, 1859), calls her "the soul of the Fronde."

LONGUS, a Greek sophist, who is supposed to have lived about the close of the 4th or the beginning of the 5th century A. D. Concerning his history nothing is known. He was the author of a pastoral romance entitled "The Pastorals of Daphnis and Chloe," of which the

best editions are by Vilhoisson (Paris, 1778) and Passow (Leipsic, 1811). Villemain, in his work *Sur les romans Grecs*, compares Longus to Bernardin de St. Pierre; and Alexander von Humboldt says of him, that in his pastoral romance the tender scenes taken from human life greatly excel his expression of the sensations awakened by the aspect of nature.

LONGWORTH, NICHOLAS, an American wine manufacturer and horticulturist, born in Newark, N. J., Jan. 16, 1782. In his youth he passed several years in South Carolina in the capacity of clerk in the store of an elder brother; but finding the climate unfavorable to his health, he returned home and commenced the study of the law. At the age of 21 he emigrated to the then remote and unimportant settlement of Cincinnati, where, under the instructions of Jacob Burnet, one of the ablest lawyers in the North-West territory, he was fitted for the bar. Conceiving that Cincinnati was destined to be an important centre of commerce and manufactures, he contrived, out of the slender earnings of his professional practice, to purchase considerable tracts of adjoining land, which have long since been covered by the rapidly increasing city. After about 25 years' experience at the bar he retired from professional life in order to devote himself to the management of his landed property. To the cultivation of the grape, with a view of manufacturing wine, he also gave much attention, though at first with little success, having adopted the erroneous notion of the early American vine growers, that foreign plants were alone to be relied upon. He had imported many different species from every vine-growing country in Europe, before the idea occurred to him to try those indigenous to the United States. About 1828 he commenced the experiment, and has ever since been endeavoring to introduce such native vines or their seedlings as would prove applicable for his purpose. Among the results of his labors has been the production of wine from two species, the Catawba and the Isabella, which has now a high marketable value, as well as of other varieties of equal promise, but whose reputation is not yet fully established. He has necessarily been largely engaged in the manufacture of wine, and has planted upward of 200 acres of vineyards, beside establishing a large wine house in the vicinity of Cincinnati, where the raw juice is purchased of the vine dressers and converted into the several varieties of wine, known to commerce. As a horticulturist Mr. Longworth is favorably known by his experiments on the sexual character of the strawberry, with reference to the productiveness of the plant.

LÖNNROT, ELIAS, a Finnish philologist, born in Sammati, in the district of Helsingfors, April 9, 1802. The son of a poor tailor, his early education was very limited. At the age of 18 he entered a druggist's shop, and in 1822 he was admitted to the university of Åbo. He became M.D. in 1833, and in 1853 was called

to succeed Castrén as professor of Finnish literature at the university of Helsingfors, a post which he still holds (1860). For an account of his literary labors, see FINLAND.

LOO CHOO ISLANDS (*Lieu Khieu* in the language of the natives), a group in the Pacific ocean, dependent in some degree on both China and Japan, between lat. 24° and 29° N., and long. 127° and 129° E. The number of islands is said to be 86, and they lie at considerable distances from each other. Great Loo Choo, the principal and much the largest island, is the southernmost of the group, and is about 65 m. in length by 15 in average breadth, with an area of about 1,000 sq. m. It extends from N. E. to S. W., and is intersected by a range of hills, the highest summit of which is 1,100 feet above the sea. The general surface rock is argillaceous, either compact or shaly, and is intersected at frequent intervals by dikes or ridges of secondary limestone. The shores of the island are green and beautiful, diversified with groves and fields of the freshest verdure, resembling the richest scenery of England. The crests of the hills are crowned with woods of cedar or pine, while their slopes are covered with gardens and fields of grain. The principal seaport is Napa, which stands at the bottom of a deep bay near the S. W. point of the island, and is a town of considerable size. Shoodi, the capital and residence of the king, is a short distance inland from Napa, and is about a mile in length. It contains a massive castle, built of large blocks of limestone, of excellent masonry. The private dwellings are mostly constructed of bamboo, and the houses and also the streets and gardens are kept remarkably neat and clean. Among the minerals of Loo Choo are iron, coal, and sulphur, and it is said that mines of copper and tin exist. The chief vegetable productions are rice, millet, sweet potatoes, sugar, cotton, tobacco, indigo, and tea; among the fruits are bananas, pineapples, oranges, peaches, and plums. Fowls, ducks, geese, pigs, goats, and neat cattle are abundant, and there is a small but strong and active breed of horses. Wild boars are found in the forests. Sugar and saki, an intoxicating liquor distilled from rice, are exported to Japan. Irrigation is well understood, and agriculture diligently and successfully conducted, and very large products are drawn from the fertile soil under a singularly genial climate. The manufactures of the islanders are paper, grass cloth, coarse cottons, pottery, lacquered ware, tiles, pipes, hair pins, and baskets. The trade is entirely with Japan, from which country each year about 40 junks arrive of 450 tons each. One or two Loo Chooan junks are sent annually to China with tribute. The population, which appears to be very dense, is a mixture of Chinese and Japanese, the latter element greatly preponderating; and the language is akin to the Japanese, though the literature and civilization are Chinese. In complexion the Loo Chooans are dusky olive, with black eyes and hair. Their system of education is Chinese, and their books

are in the ordinary Chinese character. The Japanese character, however, is also in use. Their religion is a mixture of Confucianism and Buddhism, with some superstitions peculiar to themselves. The government appears to be in the hands of an aristocracy consisting as in China of the literary class, but is nominally administered in the name of a king, who in 1853 was represented as a boy 11 years old. Commodore Perry, however, who visited the islands in that year, distrusted the very existence of such a potentate, and believed the chief magistrate was a governor appointed by the Japanese and controlled by Japanese spies. He found reason to believe that there was a Japanese garrison in Napa, though no soldiers were seen during his visit. The population is divided into classes, and the distinctions of rank are indicated as in China by the costume, and chiefly by the hair pin. The crown of the head to the extent of 2 or 3 inches is shaved, and into the vacant space the residue of the hair is all drawn and plaited into a circular form with a comb. Two large hair pins are then passed through the mass to keep it in place, and the front end of the lower pin is finished with a head in the form of a star made of gold, silver, brass, lead, or pewter. The different metals indicate the rank of the wearer. The lower class generally wear brass, and the very poorest lead or pewter. The poor are greatly oppressed, and are in a very abject condition, the chief part of their earnings going to support the literary class in idleness. Great respect is shown for the dead, and elaborate and costly tombs of stone form a conspicuous feature in the landscape.—The first account of the Loo Chooans which reached Europe was written by a learned Chinese in the early part of the 18th century, whose narrative was translated and published by the Jesuit Gaubil in the *Lettres Édiſſantes*. The squadron which conveyed the British ambassador Lord Amherst to China in 1816 touched at Loo Choo, and Capt. Basil Hall, who commanded one of the vessels, and Mr. McLeod, the surgeon of another, published accounts of their visit, which attracted great attention by representing the islanders as living in a sort of golden age of simplicity, innocence, happiness, and peace. They were described as without weapons, ignorant of money, docile, tractable, and honest, scrupulously obedient to their rulers and laws, and as loving one another too well to do harm or show unkindness. For a time these representations were received without question or suspicion in Europe. It appears, however, from Capt. Hall's journal, that they were not credited by Napoleon Bonaparte, to whom he related them during a visit to St. Helena in 1817 on his return from China. "No arms!" said Napoleon, clenching his fist and raising his voice; "how then do they fight?" "I could only reply," says Capt. Hall, "that, as far as we had been able to discover, they had never had any wars, but remained in a state of internal and external peace." "No wars!" cried Napo-

leon, in a scornful and incredulous manner. "In like manner," continues Capt. Hall, "but without being so much moved, he seemed to discredit the account I gave him of their having no money, and of their setting no value upon our gold and silver coins." Subsequent investigations, and particularly those of Commodore Perry, have shown that Napoleon's incredulity was well founded, and that the Loo Chooans, though amiable and pacific, are not greatly different from other people. They are cunning and deceitful, and have arms in their possession, though they endeavor to conceal them from visitors. "As to money," says Commodore Perry, "they know the value of gold and silver very well, and proved themselves to be somewhat 'smart' in the matter of exchange when the disbursing officers of the squadron came to settle with them, and showed no reluctance to take our eagles and half eagles." Loo Choo during the last 50 years has been frequently visited by exploring vessels, but nothing was known of the interior of the island till the visit of Commodore Perry in May, 1853, when it was traversed in various directions by a party, among whom was Mr. Bayard Taylor, who in his "India, China, and Japan" thus describes it: "The island is one of the most beautiful in the world, and contains a greater variety of scenery than I have ever seen within the same extent of territory. The valley and hillsides are cultivated with a care and assiduity which puts even Chinese agriculture to shame; the hills are crowned with picturesque groves of the Loo Choo pine, a tree which the artist would prize much more highly than the lumberman; the villages are embowered with arching lanes of bamboo, the tops of which interlace and form avenues of perfect shade; while from the deep indentations of both shores, the road along the spinal ridge of the island commands the most delightful prospects of bays and green headlands on either side. In the sheltered valleys, the clusters of sago palm and banana trees give the landscape the character of the tropics; on the hills the forests of pine recall the scenery of the temperate zone. The northern part of the island abounds with marshy thickets and hills overgrown with dense woodland, infested with wild boars, but the southern portion is one vast garden. The villages all charmed us by the great taste and neatness displayed in their construction. In the largest of them there were buildings called *cung-quas*, erected for the accommodation of the agents of the government, on their official journeys through the island. They were neat wooden dwellings, with tiled roofs, the floors covered with soft matting, and the walls fitted with sliding screens, so that the whole house could be thrown open or divided into rooms at pleasure. They were surrounded by gardens, enclosed by pine hedges, and were always placed in situations where they commanded the view of a pleasant landscape." Little is known of the other islands of the group. The history of Loo Choo goes back

to the 12th century of our era, at which period the chief island was divided into three kingdoms or principalities. These were afterward consolidated into one, which became tributary to China, and subsequently to Japan. The present dynasty is said to be related to the imperial family of Japan. As a dependency of Japan, Loo Choo was included in the treaty negotiated by Commodore Perry with the government of Yeddo, and the port of Napa was opened to American commerce.

LOOMIS, ELIAS, an American physicist, born in Tolland co., Conn., in Aug. 1811. He was graduated at Yale college in 1830, where, after 3 years devoted to teaching and professional studies, he received the post of tutor, which he held for 3 years. He was the first person in America to obtain a view of Halley's comet, at its return in Aug. 1835, and his observations on that body, with a computation of its orbit, were published in the "American Journal of Science." He also made a series of hourly observations on the declination of the magnetic needle, continued through more than a year. In 1836 he visited Europe, spending a year in Paris, where he attended the lectures of Poisson, Biot, Dulong, and Pouillet. Returning home in 1837, he assumed the duties of professor of natural philosophy in the Western Reserve college, Ohio, where he remained for several years. Here he made, among other observations, those of 260 moon culminations for longitude, 69 culminations of Polaris for latitude, 16 occultations, 5 comets with sufficient accuracy to determine their orbits, beside a multitude directed to the regulation of the clock and other purposes. He observed the magnetic dip in nearly all the northern states, from Massachusetts to Wisconsin; and keeping a full meteorological journal, he made the most complete investigation that had hitherto appeared of several American storms, introducing some new methods of his own. Of these researches, the larger portion appear in 10 memoirs contributed to the "Transactions of the American Philosophical Society" (vols. vii.-x.). In 1844 he accepted the professorship of natural philosophy in the New York university, which office he still occupies. A portion of the time between 1845 and 1849 he was employed in connection with the late S. C. Walker and others, under the direction of the superintendent of the coast survey, in determining the difference of longitude between New York and other cities, by means of the electric telegraph. In the course of these experiments, the observations at the New York station being uniformly made by Prof. Loomis, the velocity of the electric current through telegraph wires was first determined. The contributions of Prof. Loomis to science cover a great variety of subjects, but relate more especially to astronomy, magnetism, and meteorology. Beside the memoirs above referred to, some 80 or more papers of his have appeared in the "American Journal of Science;" one, on storms, in the "Smithsonian Contributions to Knowledge;"

two astronomical papers in Gould's "Astronomical Journal;" and one or more yearly in the "Transactions of the American Association for the Advancement of Science." His published works consist of "Elements of Algebra;" "Elements of Geometry and Conic Sections;" "Trigonometry and Tables;" "Elements of Analytical Geometry, and of Differential and Integral Calculus;" "Introduction to Practical Astronomy;" "Recent Progress of Astronomy;" "A Treatise on Arithmetic, Theoretical and Practical;" and "Elements of Natural Philosophy."

LOON, a web-footed bird. See DIVER.

LOPE DE VEGA. See VEGA.

LOPEZ, NARCISO, a Cuban revolutionist, born in Venezuela in 1799, garroted in Havana, Sept. 1, 1851. He was the son of a wealthy merchant, and displayed at an early age much sympathy with the national independence of South America, although he served for some time in the army of the king of Spain, from which he retired in 1822 with the rank of colonel. After the evacuation of Venezuela by the Spanish troops, he established himself in Cuba, and afterward during a stay at Madrid he joined the constitutional party of Isabella against Don Carlos, and became successively adjutant of Gen. Valdes, governor of the Spanish capital, and senator for Seville, but threw up his offices after the refusal of the cortes to admit the representatives of Cuba. Valdes became governor-general of that island, and Lopez on returning thither was employed by him in various capacities, and also turned his attention to the exploration of copper mines. His enthusiastic nature was soon attracted by the project of throwing off the yoke of Spain, and he proceeded in 1849 to the United States, where he sunk almost his whole fortune in the organization of three successive expeditions to Cuba: the so called Round island expedition in 1849, the "invasion of Cardenas" expedition in May, 1850, both of which failed, and lastly the Bahia-Honda expedition, which set out in Aug. 1851, and which ended fatally. Lopez, with several hundred persons of different nationalities whom he had enlisted in various parts of the United States, landed at Morillo, near Havana, where he left 200 of his men under the command of Col. Crittenden, who were soon taken by the Spaniards and shot. Lopez himself went to Las Pozas, where he succeeded in repelling an attack of the Spanish soldiers; but, isolated from his friends, he sought refuge in the mountains, where he was captured and taken to Havana. He was sentenced to death, which he met with great firmness. He left a wife and a son; the latter, now (1860) about 27 years old, was at the time of his father's death pursuing his studies in Switzerland.

LOPHIODON (Cuv.), an extinct tapirid pachydermatous animal, found in the eocene tertiary deposits of central Europe—the genus *tapirotherium* (Blainv.). The dental formula, according to Pictet, is: incisors $\frac{3}{1}$, canines $\frac{1}{1}$, and molars $\frac{3}{2}$. The dentition resembles that of the tapira, and the generic name indi-

cates the transverse ridges of the molars; but these are more oblique than in the tapirs, single in the anterior teeth, and triple in the posterior. Their remains are not found in the diluvium, pliocene, or miocene, but in the eocene fresh water strata. Of the 8 species mentioned by Pictet, the largest is the *L. Isotelense* (Cuv.), one third larger than the Indian tapir, and of the size of a small rhinoceros.

LOPHOBRANCHS, an order of bony fishes, whose gills, instead of hanging in regular fringes, are disposed in tufts arranged in pairs along the branchial arches. The external skeleton resembles the armor of the ganoids, and they are placed by some as an order of this class; the body is almost fleshless, and the form is generally stiff and angular; the snout is elongated and tubular, the gill opening very small, and the air bladder without a duct. This order includes, among others, the genera *hippocampus* (Cuv.), *pegasus* (Linn.), and *syngnathus* (Linn.). In the *hippocampus*, or sea horse, the head resembles that of a miniature horse surmounted by spines or knobs; by means of the prehensile tail they can suspend themselves from submarine objects; like the chameleon, they possess the faculty of directing one eye forward and the other backward; they inhabit all parts of the ocean. Among the strange and beautiful forms in this order may be mentioned the *phyllopteryx* of the Australian seas, having the most exquisite red and purple tints, and adorned with numerous leaf-like appendages. In the mailed *pegasus*, with its spiny rings, the mouth opens at the base of the prolonged snout, as in the sturgeons. *Syngnathus* will be noticed under PIPE FISH. One of the most curious peculiarities in this order is that the males carry the eggs about in ventral or caudal pouches until they are hatched.

LORAIN, a N. co. of Ohio, bordering on Lake Erie, drained by Black river and Beaver creek; area, 550 sq. m.; pop. in 1850, 26,086. The surface is level and the soil fertile. It is intersected by the Cleveland, Columbus, and Cincinnati, the Cleveland and Toledo, and the Lake Shore railroads. The productions in 1850 were 142,881 bushels of wheat, 385,837 of Indian corn, 174,210 of oats, and 262,500 lbs. of wool. There were 4 grist mills, 22 saw mills, 1 foundery, 1 woollen factory, 6 tanneries, and 8,027 pupils attending schools. Capital, Elyria.

LORD, NATHAN, D.D., an American clergyman, born in Berwick, Me., in 1792. He was graduated at Bowdoin college in 1809, and passed 2 years as an assistant at Phillips Exeter academy. After a year spent in general studies, he entered upon the study of theology at Andover theological seminary, completing his course in 1815. In May, 1816, he was ordained pastor of the Congregational church in Amherst, N. H., where he remained 12 years. In 1828, upon the resignation of the Rev. Bennet Tyler, D.D., he was chosen president of Dartmouth college, a position which he still retains. Dr. Lord has been an occasional contributor to theological reviews, and has published numerous sermons

as well as essays and letters on topics in theology and ethics. Among the latter may be mentioned a "Letter to the Rev. Daniel Dana, D.D., on Prof. Park's Theology of New England" (1852); an essay on the millennium, read to the general convention of New Hampshire (1854); two "Letters to Ministers of the Gospel of All Denominations on Slavery" (1854-'5), in which he endeavors by biblical and religious arguments to prove the lawfulness of slavery; and some others on kindred subjects, which have attracted attention from their peculiarities of opinion as well as the vigor and earnestness with which the author maintains his views. He has also edited with an introductory notice a selection from the sermons of his son, the Rev. John K. Lord, a Congregational clergyman, who died in Cincinnati in June, 1849 (Boston, 1850).

LORD'S DAY, the legal name of Sunday. In the early ages of Christianity it does not seem to have been supposed that Sunday had taken the place of the Jewish sabbath; but from the days of the apostles it was regarded with veneration, as the *dies dominica*, or the Lord's day. In Great Britain and the United States there is however a different feeling toward Sunday from that which prevails elsewhere in Christendom; and this is manifested equally in the provisions of law and in common usage. From early times the day was set apart as one not to be employed in secular business, and hence came the maxim quoted by Coke: *Dies dominicus non est juridicus*. So early as in the 27th of Henry VI. (1449) an act was passed prohibiting fairs and markets on certain feast days, Easter Sunday, and "other Sundays." In the 1st of James I. (1603) dealers in leather were prohibited from exposing for sale shoes, &c., on Sundays; and in the 1st of Charles I. (1625) a statute prohibited meetings of persons for any sports and pastimes out of their parishes, or for "bull or bear baiting, common plays, interludes, or other unlawful games and exercises, within their parishes." But in the 29th of Charles II. (1678) the statute was passed which may be regarded as the foundation of all the present law on the subject, in England and in the United States. It enacted "that no tradesman, artificer, workman, laborer, or other person whatsoever, shall do or exercise any worldly labor, business, or work of their ordinary callings, upon the Lord's day or any part thereof (works of necessity and charity only excepted);" and "that no person or persons whatsoever shall publicly cry, show forth, or expose to sale, any wares, merchandises, fruit, herbs, goods, or chattels whatsoever, upon the Lord's day or any part thereof." This act was followed by a series of decisions which, proceeding upon the ground that all prohibitory statutes must be construed rigorously, have certainly confined the operation of the statute within narrower limits than were intended. Thus, while it says that "no other person whatsoever" shall, &c., it has been held, that because general words following particular words must be con-

strued as *ejusdem generis*, therefore the previous particular words, "no tradesman, artificer, workman, laborer," are to be taken as including all those to whom the statute applies; and on this ground it has recently been held by Lord Tenterden, that drivers and proprietors of stage coaches are not included, and that a contract to carry a passenger in a stage coach on a Sunday is not unlawful in England. So, too, the words, "any worldly labor," are, after some fluctuation, now controlled and limited by the subsequent words, "or work of their ordinary callings;" and therefore one who sold a horse on Sunday was permitted to recover the price because it was not "the exercise of his ordinary calling;" and Baron Parke (now Lord Wensleydale) is the only eminent judge who has recently doubted this very narrow limitation of the statute.—In this country we have but little nice construction of this kind applied to what are called, in common parlance, the Sunday laws, although the statutes always speak of Sunday as the Lord's day. The Puritan colonists, if they did not introduce, at least adopted and established to the full extent of their influence, the idea that Sunday was the Christian sabbath, and that it was to be kept holy not merely by the absence of all labor, but by that of all amusement. One reason for this probably was, although they may not have been conscious of its operation, an earnest desire to confirm and perpetuate the distinction, or rather the opposition and hostility, between them and the Roman Catholic church, and that English Episcopal church which they considered as only the Roman church thinly disguised. Hence their customs in relation to Sunday were rigid to the last extreme, and their laws almost equally so. Ludicrous stories are told of them, as that no one was permitted to make beer on Saturday, lest it should "work" on Sunday; but for all these there is probably no better foundation than the fact of very rigorous laws against labor and recreation. These laws remained in full force as long as they were sustained by the feelings and habits of the people. But the excessive severity of the earliest years of our colonies could not be maintained either in usage or in law. There was a gradual relaxation, which by the time of the revolutionary war had become very considerable. When the colonies became states, the Sunday laws assumed a form which they have maintained substantially ever since; although it is certain that the observance of these laws has become much less constant and universal than it was formerly, and violations are now habitual and disregarded, which would have formerly been visited with immediate punishment. The laws, in their letter, are very similar in nearly all the states, and are substantially the same with the earliest laws of the states of New England. They provide generally, perhaps universally, but with some diversity of language, that no persons shall engage in any labor, business, or work, excepting only works of necessity and charity, on the Lord's

day.—Among the questions which have arisen under these laws, the most important was, whether a contract made on Sunday in violation of law was nevertheless valid, leaving the parties liable to punishment for their breach of the law. This was the construction put upon the statute in Massachusetts until recently, and in other states there were rulings to a similar effect; but the prevailing if not the universal law now is, that the contract itself, by means of its illegality, is wholly void, conferring no rights and imposing no obligations upon any party. In Ohio a distinction has been made somewhat like that taken in the English courts, and a contract made on Sunday for the sale of land was held to be valid, apparently on the ground that this was only the case of a single sale out of the ordinary course of business, while the statute was intended only to prevent the pursuit of one's ordinary business on that day. But in Indiana, where the words of the statute are precisely the same as in Ohio, it is held, in conformity with the prevailing rule, that all contracts made on Sunday are void. It is, however, admitted, that a contract begun on Sunday, and agreed upon as to all its terms but not in fact completed until the next day, is binding. Thus if A agrees to sell an article to B for a certain price, and the whole bargain is arranged and agreed to on Sunday, and, in the execution of it, on Monday morning A gives to B the article and B gives to A his promissory note for the price, the property in the article passes, and the note is as valid as if the whole bargain had been made on Monday. But whether a bargain wholly made on Sunday, and therefore void thus far, can be rendered valid by a mere subsequent recognition, is uncertain on the authorities; but their tendency is to the negative. So, too, we have authority, though certainly not uncontradicted, for saying, that if a sale is made on Sunday and the property then delivered to the buyer, and the price is not then paid, the seller cannot maintain an action for the price, because the contract, being void, imposed no obligation on the buyer; and neither can the seller, if the buyer refuses to return the article, maintain an action for it or its value, because he has parted with the possession by his own wrongful act, and both parties being violators of the law and in equal fault, the law leaves them to suffer the consequences of their acts, and will not interfere to help either against the other.—The question as to what is covered by the exception of works of necessity or charity, has frequently been raised. Thus, when a defect in a highway endangered passengers, it was held in Massachusetts to be not only the right but the duty of the proper authorities to repair it on that day. In Pennsylvania, where a son hired a carriage to visit his father, it was declared to be a legal contract, there being no evidence that it was a mere "excursion of pleasure." And in Alabama it was held that a creditor might lawfully enter into a contract with his debtor on Sunday, if he could satisfy a jury

that it was necessary to do this on that day in order to save his debt or obtain indemnity. But in a case which came before the English house of lords, although we should hardly expect to find it there, it was solemnly adjudged that a barber could not lawfully require his apprentice to attend in his shop on Sundays, to shave customers, because this was a work of convenience only, and neither of necessity nor of mercy. An interesting question was once raised in Pennsylvania, whether the exception in the Sunday laws extended to the contract of marriage; for in that state, as in most others, a very large proportion of the marriages which take place are celebrated on Sunday. If this contract be illegal, it is void, and fearful consequences would ensue. Without, however, the aid of authoritative decision, it seems to be generally conceded that a marriage celebrated on Sunday is valid, either because it is a continuing contract, remade every successive day, or because it stands in the same class with baptisms, funerals, and other acts which have a religious character imparted to them, and for which Sunday is a proper day. But it appears now to be settled law, that there is no class of contracts and no acts of a business character which of themselves, and by their own nature, are works of necessity or charity; while any act may be made so by circumstances. Thus, even the solemn act of making a will is not one which may lawfully be made on Sunday, unless the circumstances of the case give to the execution of that will at that time the character of a work of necessity or charity; while, as we have seen, even a bargain of business may be justified and made valid by necessity. In relation to the degree or kind of necessity required to justify an act, a considerable change in public opinion has unquestionably taken place. But a few years since, prosecutions were maintained for slaughtering animals for food in weather so hot, that if killed on Saturday the meat would be spoiled on Monday; but now such things are never heard of. On one point, which has come before various courts, there is as yet no settled law. If A makes a bargain with B on Sunday in violation of law, and by an abuse of this bargain inflicts an injury on B, has B no remedy? Thus, if A hires B's horse for a specific journey on Sunday, B cannot recover the hire of the horse; but if A goes four times as far and rides the horse to death, has B still no remedy? So it has been held in Massachusetts; but in New Hampshire the doctrine is, that while B acquires no rights under the contract, he has all his rights to recover damages for the wrong done to him. This we hold to be the better doctrine, and in conformity with the established principle that the Sunday laws are intended to prohibit and do prohibit only contracts and the transaction of business on that day, but are not intended to permit a man to commit with impunity on that day a wrong which, if committed on any other day, would expose him to

punishment, or give the injured party a claim for damages.—The extent of the Lord's day is not quite certain. Some of our statutes define it, and indeed most of them do so now, but not yet all. In Connecticut it has been defined by the courts as extending only from daybreak to the closing of daylight on the Sunday. Generally it is from sunset on Saturday to sunset on Sunday; but for many purposes it begins only at midnight between Saturday and Sunday and ends with the next midnight. The very important rule has been asserted, that if a contract is proved, as by an uncontradicted date upon it, or otherwise, to have been made on Sunday, this is not enough to invalidate it, unless it can be also shown to have been made within the protected hours. For if an act may have been legal, the law will presume that it was so if there be no evidence to the contrary. Some of the state statutes contain exceptions, providing that the Sunday laws shall not apply to those who conscientiously observe Saturday as the sabbath, if they do not disturb others in their observance of Sunday.—Formerly a question was raised, not before the courts, but before congress, which produced much excitement, and almost rose to the dignity of a political question, as to the running of the mails on Sunday. But it was practically settled by the system which now prevails through the country, by which the short and local mails do not run on Sunday, nor are the post offices generally open for delivery; but the long mails continue on their route, and the largest post offices are open a part of the day.—In some of the states, or rather of the largest cities, as New York, St. Louis, and Cincinnati, a question has practically arisen, which will probably soon come up for legislative action, how far the provisions of the Sunday laws should be qualified to bring them into better accordance with the tastes and habits of the citizens of foreign birth who form a large part of their populations.

LORDS, HOUSE OF. The parliament of the United Kingdom of Great Britain and Ireland is composed of the sovereign and the three estates of the realm, the lords spiritual, the lords temporal, and the commons. Of these, the lords spiritual and lords temporal constitute the house of lords. The former consist of the archbishops of Canterbury and of York, 24 English bishops, and 4 bishops of the church of Ireland, of whom one is regularly an archbishop. Constitutional writers are not unanimous upon the right or tenure by which the lords spiritual sit in parliament. In the Saxon times, certainly, they sat by virtue of their ecclesiastical office. At the conquest, says Blackstone, the spiritual tenure of frank almoign, or free alms, upon which the bishops held their lands under the Saxon government, was changed into the feudal or Norman tenure of barony; and it was by succession to these baronies, which were inalienable from their respective dignities, that the bishops and abbots were allowed their seats in the house of lords. So the constitutions

of Clarendon (see HENRY II.) declared that the bishops should hold their lands as baronies, and attend the king's court. It is probable that the prelates are now summoned to parliament as territorial barons, and it may be that this title by tenure merges all claims founded upon episcopal dignities and supported by ancient usage. The bishops were excluded from parliament during the commonwealth, but were restored by statute. With this single interruption, the bishops have always been present in parliament, and with unquestioned right. The lords spiritual are lords of parliament, though not peers of the realm. When therefore a peer is to be tried, the bishops are entitled to take part in the proceedings, though, in conformity with the canons of the church, which forbid them to vote in capital causes, they are generally absent from the judgment. Being not of noble blood, like the hereditary peers, for a capital offence they are tried by a jury like other commoners.—The lords temporal are divided into dukes, marquises, earls, viscounts, and barons. They are the hereditary peers of the realm, ennobled in blood, and subject to loss of their dignities only by attainder or by act of parliament. Since the union with Scotland in 1707, and with Ireland in 1801, 16 Scottish and 28 Irish representative peers have been returned to parliament by the peerages of Scotland and Ireland. They enjoy all the privileges of parliament, and may sit upon the trial of peers. A peer is made so by the royal patent or writ which summons him to parliament, and the dignity is usually made hereditary by limitation to the heirs male of his body, although it is sometimes provided that it may descend to others, as for instance, to his nephew or brother. The power of the crown to create a life peerage raised in 1856 a very important question, and one which was very earnestly debated. On retiring from the bench Sir James Parke (Lord Wensleydale) was created baron of the United Kingdom for and during his life, instead of the usual limitation. Government urged as a reason for granting life peerages, the convenience of adding to the number of law lords in the house, the law lords being peers who have held high judicial office in the kingdom, and who substantially alone determine all judicial causes. It had happened in 1855 that only two law lords, the lord chancellor and Lord St. Leonards, had sat to hear arguments. Upon some of the causes they differed in opinion, and as, upon a familiar maxim in the procedure of the lords, this equality of votes led in each case to affirmance of the decrees brought up from inferior courts, appellants argued that there was virtually no decision, and expressed great discontent. For the remedy of this and other mischiefs the creation of life peerages was proposed. After prolonged discussion, however, the lords decided, if not against the strict legality of the measure, yet against its constitutional expediency. The crown retreated from its position, and Lord Wensleydale received a patent in the usual form.—The peers of the realm possess

titles of honor which give them the privileges of rank and precedence; and they are individually the hereditary counsellors of the crown; with the lords spiritual they form, when not assembled in parliament, the permanent council of the sovereign, though they may act in the same capacity when so assembled, as for example in addressing the throne upon matters of foreign or of domestic policy. When sitting in parliament the peers form in conjunction with the lords spiritual a branch of the supreme legislature of the kingdom; and, in the exercise of peculiar functions, they constitute a court of judicature. In its judicial office the house of lords possesses a distinctive character as the highest tribunal of the realm. The lords have an original and exclusive jurisdiction in the trial of peers, and under reference from the crown upon claims of peerage and affairs of honors. By the acts of union they have a like jurisdiction over cases of contested elections, or the rotation of the Scottish or Irish representative peers. They have also a general jurisdiction as the supreme court of appeals from the other courts of the kingdom. These judicial functions the house of lords retains as the representative of the ancient *concilium regis*, or council of the king. Without going so far back into antiquity as the witenagemote, which was indeed the highest judicial tribunal of the Anglo-Saxons, and like the house of lords paramount to every other, a closer resemblance to the present order may be found in the institutions of the early Norman kings. William the Conqueror erected a new court, the *curia*, or *aula regia*, composed of the high officers of the state, which, when affairs demanded, was increased by the king's chief barons, his tenants *in capite*. This court transacted all business, civil and criminal, as well as that which concerned revenue or war. This *magnum concilium*, as Lord Holt calls it, was the same as the present high court of parliament, the house of lords, and had jurisdiction, as just mentioned, both in civil and criminal causes, especially in those relating to great persons and to king's officers of state, and by way of appeal from all other courts; and now the lords possess an appellate jurisdiction as a court of last resort for the correction of errors from inferior tribunals.—In respect to the construction of the house for any purpose, legislative or judicial, there is no distinction between the lords temporal and the lords spiritual. The presence of three members, whether spiritual or temporal, who have been duly summoned and sworn, is necessary and sufficient; and when a speaker has been appointed, the house is constituted and may proceed to act either as a branch of the legislature or as a supreme court of judicature. The lord chancellor or lord keeper of the great seal is speaker *ex officio*, and an ancient order declares it to be "his duty ordinarily to attend the lords' house of parliament." To make provision, however, for his necessary absence, deputy speakers are appointed by commis-

sion from the crown, "to officiate from time to time during the royal pleasure in the room and place of the lord chancellor." The office is generally conferred upon the chief justice of the king's bench, or the chief baron of the exchequer. In the absence of both the lord chancellor or keeper and the deputy speakers, the lords themselves select a speaker *pro tempore*. The person who acts as speaker need not be a member of the house, nor indeed of the peerage. Commons have often been raised to the office. They may sit as speakers upon the woolsack, for constitutionally that is not within the limits of the house. The lords answer "content" or "not content" in voting, and on an equality of votes the effect is the same as if there were a majority of "not content," for the maxim of the house is: *Semper præsuntur pro negante*. In conformity to this rule, the question upon appeals or writs of error is upon the reversal and not the affirmance of the decrees of the court below.—In its judicial capacity the house of lords is undoubtedly a court of record, though it is not so, says Lord Kenyon, when acting as a legislative body. Though, in matters of a legislative character, all proceedings in the house of lords drop with the session, yet all judicial processes remain *in statu quo*, notwithstanding the prorogation, or even the dissolution of parliament. Upon all questions before the house in its legislative character, proxies may be and often are used; but by a standing order of the year 1697 no proxies are permitted to be used in any judicial matter. The lords are entitled constitutionally to the assistance of certain high legal functionaries of the realm. The justices of the king's bench and of the common pleas, the barons of the exchequer, the attorney-general, solicitor-general, and king's sergeants are commanded by the writ, under the great seal, which accompanies the patents of their offices, "to give their attendance in parliament, and to treat, confer, and give their advice." These officers were originally summoned as members of the *concilium regis ordinarium*, who at a very remote period probably gave their votes on judgment. Their duties were anciently of the first importance. No cause was heard without their assistance; they gave opinions and advice upon questions of law and equity, prepared special judgments, and drew up issues when trials at law were directed. But for more than a century and a half the judicial functions of the house of lords have been exercised almost entirely without the assistance or even presence of the judges. They appear very rarely now in the house, and then only when specially summoned. The summons is usually directed to the common law judges, for they are excluded from the house of commons, while the attorney-general, the solicitor-general, master of the rolls, and king's sergeants are not. This order for the attendance of the judges may issue either upon the proper motion of the house or upon petition of suitors, if it appear from the character of the

case that judicial assistance will be needed.—The jurisdiction of the lords upon writs of error is of great antiquity, but that upon appeals from courts of equity is of recent origin. The first instance of an appeal is found in the year 1621. During that century the exercise of this jurisdiction by the lords led to angry and prolonged disputes between the two houses of parliament. The right to exercise it was questioned by some of the first lawyers of the time. Sir Matthew Hale contended that the power of their lordships to examine the judgments of courts of law was derived solely from the commission implied in the royal writ of error, and that the house could not adjudicate upon an appeal without violating the great constitutional maxim which supposes all jurisdiction to be derived immediately and exclusively from the crown. Particularly in the celebrated case of Dr. Sherley against Sir John Fagg, was this question most vigorously contested. The commons were not fairly defeated, yet they finally acquiesced, and since that period no resistance has been made to the lords' claim of power to receive and determine appeals from the equity courts. This triumph of the peers is usually ascribed to the earl of Shaftesbury, who insisted that the lords' power of review extended over all the courts in the kingdom, civil, criminal, and ecclesiastical. But from the last named courts appeals have never been entertained. So orders made on motion or petition in matters of idiocy, lunacy, or bankruptcy cannot be carried up to the lords, but must be presented to the king in council. Appeals lie from all courts of equity in England and Ireland, and in Scotland from the courts of session and from the commission of teinds, composed of the judges of the court of session, and established for "the plantation of kirks and valuation of tithes." The decrees or sentences of her majesty's court of exchequer are also reviewable by the house of lords; but as appeals are competent only upon proceedings which follow the forms of equity practice, and as these are unknown to the Scotch court of exchequer, the mode of relief from this court is by writ of error to parliament and not upon appeal.—The ancient course of proceeding upon error was, says Sir Matthew Hale, either by petition or by writ, both forms however being substantially the same. During 18 months of the session of the long parliament, from May, 1646, to Dec. 1648, 162 writs of error were brought before that body. This fact indicates that this jurisdiction was even then familiar and popular; indeed, the forms of procedure at present do not differ materially from those settled upon three centuries ago. Writs of error to the lords are confined to matters of law. They lie from all judgments of the courts of exchequer chamber in England and Ireland, and from all judgments in common law of the court of exchequer in Scotland; from all such judgments of the courts of queen's bench in England or Ireland as are not immediately reviewable by the courts of exchequer chamber

of the two countries; from all judgments of the common law or petty bag side of the high court of chancery; and from decisions of the commissioners of error appointed to review the common law proceedings of the London municipal jurisdictions. Sir Matthew Hale says the lords have power to reverse their own judgments; but no example of an exercise of this power can be found within several centuries. In the case of Titus Oates, the lords in 1689 affirmed the rigorous judgment of the court of king's bench. Subsequently they were disposed to recall their decree, and the concurrent action of both houses seems to indicate that an act of parliament, which was then proposed though not carried, is the only means by which a judgment of the lords can be reversed.—Until 1857 divorce in England was of two kinds, judicial and parliamentary. When consanguinity or affinity within the forbidden degrees, physical incapacity or mental imbecility, rendered the parties incapable of making a contract of marriage, the ecclesiastical courts might pronounce the nullity of a presumed marriage, or in other words declare that it had in fact never existed; in cases of conjugal infidelity they might decree a separation or divorce *a mensa et thoro*; but in neither branch of their jurisdiction of divorce did the courts assume to break the legal bond of marriage. Divorce *a vinculo* was possible only upon an act of parliament. The jurisdiction in causes of divorce was not indeed exclusively reserved to the upper house, but it formed an important branch of its judicial functions. The divorce act of 1857 (20–21 Victoria, c. 85) introduced important modifications into the English law of divorce, and into the jurisdiction over it both of the ecclesiastical courts and of parliament. The act transfers the power of the ecclesiastical courts in this province to the newly created "Court for Divorce and Matrimonial Causes," which is empowered in certain prescribed cases to decree an absolute dissolution of marriage. From the decision of this court, upon petition for dissolution, the act permits either party to prosecute an appeal before the house of lords. Cases are now frequently tried in the house of lords, and reports of these cases fill many large volumes. But, in point of fact, the trial or argument proceeds almost always before the "law lords," with a very few other peers who attend for form's sake, and usually take no part in the hearing or decision.

LORD'S SUPPER, a sacrament instituted by Christ on the night before his death. Some denominations, as the Paulicians in the ancient church, and the society of Friends in modern times, have denied that it was the intention of Christ to make this a religious institution for future times; but the vast majority of Christians from the earliest period of the church have regarded it as an ordinance or sacrament instituted by Christ, and celebrated as such. Some denominations (Roman Catholics, the eastern churches, and Lutherans) believe that in it Christ as God-man is really present and communicates

himself to the receiver; others (the Calvinists), denying the real presence of Christ in the elements, yet believe that there is in it a real communication of Christ with the believer; others again, that it is essentially a commemorative institution in remembrance of the sufferings and death of Christ. This last view prevails among most Protestant churches. The name Lord's supper is scriptural, being taken from 1 Cor. xi. 20. Other biblical names are "the Lord's table" and "the Lord's cup" (1 Cor. x. 21). Many other terms were early introduced in the church, of which "communion" (borrowed from 1 Cor. x. 16) and "eucharist" (Gr. *ευχαριστια*, thanksgiving) are the most common. The most important passages for determining the doctrine of the Bible respecting the Lord's supper are the accounts which the evangelists Matthew (xxvi. 26–29), Mark (xiv. 22–25), and Luke (xxii. 19–20), and the apostle Paul (1 Cor. xi. 24–26), give of Christ's last supper with his disciples. All four say in substance that "Jesus took bread, and blessed it, and brake it, and gave it to the disciples, and said: Take, eat; this is my body;" and that he "took the cup, and gave thanks, and gave it to them, saying: Drink ye all of it; for this is my blood of the new testament." Matthew has after "my blood of the new testament" the additional words: "which is shed for many for the remission of sins." Luke and Paul have also the words: "this do in remembrance of me." Paul warns the Corinthians (1 Cor. x. 16–21) that they cannot partake of the Lord's table and at the same time eat of the pagan sacrifices, because "the things which the gentiles sacrifice, they sacrifice to devils, and not to God;" and in another place of the same epistle (xi. 27–29), that "whosoever shall eat this bread and drink this cup of the Lord unworthily shall be guilty of the body and blood of the Lord," and "eateth and drinketh damnation to himself, not discerning the Lord's body." There are many other passages in the New Testament which some interpreters refer to the Lord's supper, but none of them as explicit as those mentioned above.—The words of the Bible were early interpreted in different ways. In the earliest periods of the church there were sects which felt at liberty to change the elements, and to take water instead of wine, and cheese instead of, or in addition to, bread. Many of the words of the early fathers concerning the Lord's supper are capable of various interpretations, and have been claimed by various parties for the confirmation of their views. But it is generally admitted that the celebration of the Lord's supper in the early church was a general usage, and was regarded by many fathers not only as something very solemn, but as something highly mysterious. Ignatius, Justin, and Irenæus laid great stress on the mysterious connection existing between the Logos and the elements. Other fathers spoke of the elements as the symbols of the body and blood of Christ; thus Tertullian and Cyprian, both of whom, however, occasionally call the Lord's supper the body and

blood of Christ. It was especially the Alexandrian school (Clement of Alexandria, Origen, &c.) that advocated the symbolical aspect, and even opposed those who made no distinction between the external sign and the thing itself. The church writers became more explicit on the subject of the Lord's supper when after the 8d century the liturgical part of divine service was more developed. Chrysostom called it an "awful mystery." Some of the fathers spoke of "a real union" of the communicants with Christ; others of "a real change" from the visible elements into the body and blood of Christ. The idea that the Lord's supper was also a sacrifice, offered by man, and especially by the priest, was propounded as early as the end of the 2d century.—The first great eucharistic controversy was called forth by a book of Paschasius Radbertus in 831 (*De Corpore et Sanguine Domini*), in which he advanced the doctrine that the substance of the consecrated bread and wine in the eucharist was changed into the very body of Christ which was born of the Virgin. This was declared to be an act of creation by almighty power, though invisible to any but an eye of faith. He was especially opposed by Ratramnus, a monk of Corbie, who adhered to the view that in the Lord's supper there is a communion of the earthly with the heavenly. The controversy was brought before the highest ecclesiastical authorities, when Berengarius, archdeacon of Angers, maintained that there was a change in the sacramental elements only in a figurative sense. He contended that not the earthly elements themselves, but their influences, were changed by their connection with Christ in heaven, who was to be received not by the mouth but by the heart. These views were in particular expressed in a letter to Lanfranc, afterward archbishop of Canterbury, who asserted that the body of Christ in heaven remained entirely unaffected by the change in the elements on earth. Several synods in succession, between 1050 and 1079, condemned the views of Berengarius. At the synod of Rome in 1059 Berengarius consented to subscribe to a confession in which, in very strong expressions, a bodily participation in the flesh and blood of Christ was asserted. He recalled this confession, and resumed the controversy, but in 1079 consented to a still more decided declaration. The term "transubstantiation" was used in the 12th century by Hildebert of Tours, and was soon generally adopted as best expressing the general belief of the church. Similar expressions, as "transition," had been used before. The 4th council of Lateran, in 1215, declared transubstantiation an article of faith, and in 1267 a special holy day (*Corpus Christi*) was instituted, to give annually a public exhibition of the belief of the church. Already a considerable time before, it had become customary in the Latin church to give to the laity the Lord's supper only under the form of the bread, though, as the church declared, solely from reasons of ex-

pediency. The council of Basel expressly confirmed the doctrine that Christ exists wholly in either of the elements (for which doctrine the theologians used the term "concomitance"). Abbot Rupertus Quotiensis, in the 12th century, had advanced the doctrine of the union of the body and blood of Christ with the bread (impanation), and was followed by several theologians, even after the definition of the dogma of transubstantiation by the Lateran council. Wycliffe opposed both transubstantiation and impanation, and, with Berengarius, believed in a change from an inferior into a superior. The Greek church, when it separated from the Latin, also believed in a change of the elements into the body and blood of Christ; and in the efforts for a union of the two churches, the question of leavened or unleavened bread was the only point of difference with regard to the Lord's supper.—With the reformation of the 16th century the controversy respecting this doctrine began anew. The reformers agreed in rejecting the mass and transubstantiation, and demanded, as the Hussites had done before them, that the sacrament should be given to the laity under both forms. But they differed among themselves concerning the words of institution and the essence of the sacrament. Luther maintained the real and substantial presence of the body and blood of Christ, taking place, not by a transmutation of the external elements, but by a supernatural, though inconceivable, union (*unio sacramentalis*) of the body and blood of Christ with the consecrated bread and wine. Christ is present, according to the words of the larger catechism of Luther, in and under the bread, and is received not only by the good, but also by the wicked. In connection with his doctrine of the Lord's supper Luther maintained the ubiquity of the body of Christ. The objective effect of the Lord's supper, according to Luther, is the remission of sins; the subjective consists in the confirmation of the regeneration which commenced in baptism. Zwingli regarded the bread and wine only as momentous signs of remembrance of the body and blood of Christ, which are in heaven. The effect, in his opinion, consists in a confirmation of our faith in the redemption of mankind through the death of Christ. He explained the "is" in the phrase "this is my body" in a figurative sense, as synonymous with "signifies." Ecclampadius differed from Zwingli only in the grammatical construction of the words of institution, taking, not the word "is," but the whole phrase, and in particular the words "my body," in a figurative sense. Calvin agreed with Zwingli in taking bread and wine only as external signs, but with Luther he believed in a real though only spiritual participation of the body and blood of Christ. This participation does not consist in the infusion of a divine substance, but in a spiritual, animating power which from the glorified body of Christ streams over into our souls. As the glorified body of Christ is now only in heaven, the soul, in order to partake of it, must be elevated in a mysterious

manner, through the agency of the Holy Spirit, to heaven, where it receives the body of Christ not with the mouth, but by faith. Unbelievers do not receive the body of Christ, but only the sign to their own damnation. When, in the 2d half of the 16th century, some Lutheran theologians inclined, after the example of Melancthon, to the doctrines of Calvin, the Crypto-Calvinistic controversy arose in the electorate of Saxony; it ended with the banishment of the Crypto-Calvinists. Most of the other Protestant denominations which arose in and after the 16th century adopted the views of Zwingli, while the society of Friends rejected the Lord's supper altogether as a Jewish ceremony, which Christ had observed like many other ceremonies, but which was not instituted and had no signification for spiritual Christians. The modern German theology of the United Evangelical church aims generally at a compromise between the views of Luther and Calvin, emphasizing real, objective communication of Christ to the worthy receiver, but dropping Luther's doctrine of the ubiquity of Christ's body. In the Lutheran church and the Protestant Episcopal church eucharistic controversies have often occurred, as one party in each church still lays great stress on the real and substantial presence of Christ in the Lord's supper, while another party strenuously opposes it. Those divines of the Lutheran church who adhere to Luther's views concerning the real presence, are generally opposed to an admission of members of the Calvinistic or Zwinglian confessions to the celebration of the Lord's supper in Lutheran churches, and, still more, to Lutherans receiving the sacrament in Calvinistic or Zwinglian churches. A similar question (open or close communion) is agitated in the Baptist churches (see BAPTISTS), where one party maintains that none can be admitted to the Lord's supper save those who have been baptized (immersed) on a personal profession of their faith in Christ, while others admit all evangelical Christians.—The elements used at the Lord's supper are generally bread and wine. Christ, when celebrating the passover with his disciples, used unleavened wheaten bread. The apostolic church took the leavened bread which Christians used to bring with them for offerings. When these offerings ceased together with the agapæ, the Greek church retained the leavened bread, while in the Latin church since the 8th century unleavened bread has been used. At the separation of the Greek church from the Latin, the use of unleavened bread by the latter formed one of the principal charges of unsound doctrines brought against them by the Greeks, and proved afterward one of the greatest obstacles to a reunion of the two churches. The council of Florence, in 1439, which attempted this reunion, determined that either leavened or unleavened bread might be used; but the eastern church soon rejected this compromise together with the union of the churches. The Latin church gave to the bread the form of a wafer, which received the name

"host" from the Latin *hostia*, offering. On one side of it symbolic signs are stamped; since the 18th century, a crucifix with the letters I. N. R. I. (*Jesus Nazarenus Rex Judæorum*). The Lutherans retained the wafer, but the Reformed and other Protestant denominations declared themselves against it, and took again common bread, and most of them also reintroduced the custom of breaking it. What kind of wine Christ used at the passover has not been determined with full certainty. The church, from the earliest time, considered the color of wine unessential, but white wine was soon generally preferred, as it is still with a majority of the Christian churches. The custom of mingling water with wine is said to have been introduced by Pope Alexander I.; it was expressly enacted in the 12th century, by Clement III., and regarded as a symbol of the blood and water which streamed from Christ's side on the cross. The Roman Catholic church mingles water with wine once before the consecration; the Greek church twice, cold water before, and warm water after the consecration. The Armenian and Protestant churches take unmixed wine.—It is admitted by all that in the primitive church the Lord's supper was always celebrated under the two forms of the bread and the cup, and that sects, like the Manichæans, who rejected the wine, were strongly censured. It was, however, an early custom to carry to sick persons merely the bread dipped in wine. In the 18th century Robert Pulleyn, of Oxford, declared it a good custom to give to the laity the bread only, to avoid the danger of spilling any of the wine. This view was very soon adopted by all the scholastics, who maintained that Christ was wholly present under either form, and that one form was sufficient for a valid celebration of the Lord's supper. Thomas Aquinas and Bonaventura especially recommended the universal introduction of the communion under one form, and this soon became the practice of the entire church. All the sects and reformers of the middle ages, as the Waldenses, Huss, Wycliffe, and Savanarola, protested against this withholding of the cup from the laity. The Protestant churches agreed in regarding the use of both forms as essential for the celebration of the ordinance. The practice of the Roman Catholic church was confirmed by the council of Trent in 1563, and has always since been adhered to by the church. Only those portions of the eastern churches which have acknowledged the supreme jurisdiction of the pope (United Greeks, Armenians, Copts, &c.) have been permitted to retain the communion under both forms, and the same was offered to the Protestants in the attempts to effect a corporative union between them and the Roman Catholic church.—In the ancient church bread and wine were consecrated by the bishops and presbyters and distributed by the deacons. In what this consecration consisted is, like the essence of the Lord's supper itself, a subject of controversy among the various Christian denominations. The Roman Catholic